IMPULSE CONTROL, SUBSTANCE ABUSE AND CLINICAL FACTORS IN HABITUAL CRIMINAL VIOLENCE: A NEUROPSYCHOLOGICAL APPROACH

Martine J C van der Westhuysen

University of Cape Town

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ABSTRACT

Past research is reviewed in relation to criminal violence, psychopathy, disordered impulse control and neuropsychological findings in these areas. Drawing upon publications from fields such as neurology, psychiatry and biochemistry, a theoretical foundation for a link between a functional disorder of impulse control and habitual impulsive violence is presented. Research on pharmacological treatment of violence is reviewed as a possible alternative method to assist the habitually violent offender to inhibit violent impulses.

In order to assess whether functional impairment of impulse control may be a factor which contributes to the high local rate of habitual criminal violence on an interpersonal level, 50 violent and 50 non-violent prisoners from Pollsmoor and Brandvlei Prisons in the Western Cape were compared on a self-report dyscontrol scale, neuropsychological measures of impulse control, incidence of substance abuse, prior head injury, and certain clinical and demographical variables.

The violent group was selected on the basis of serving a current sentence for violent crime, plus a history of habitual interpersonal violence of a non-political nature from their criminal records in the prison files. The crime category of robbery was excluded from both subject groups, as it was considered to be a planned crime with an economic motive rather than an impulsive act of violence. The non-violent sample was required to have no violent convictions of any nature, but the number of previous offences had to be comparable to those of the violent group. The total number of convictions per person ranged from 2 to 25 (mean 9.6).

Participants were non-psychotic males from the so-called "coloured" or Asian community, as the majority of offenders in the Western Cape prisons are from this population. A uniform group was preferred to avoid language difficulties and possible intercultural variations on e.g. neuropsychological tests. Subjects were matched for age and education level. The criterion for education level was a minimum of Std. 4, and for age range 24 to 45.

Each subject was interviewed in privacy at the prison on an individual basis. After explanation of the purpose of the study, the person was asked if he was willing to participate on a voluntary basis.

The project was regarded as an exploratory pilot study. Data analysis comprised *t*-tests, chi-square tests and Pearson's correlations. *Post hoc* comparisons were made between certain subcategories to find out whether any of the variables under investigation are particularly characteristic of e.g. murderers, rapists, high dyscontrol, groups who reported depression and anxiety, and the group with a high number of features from a cluster of five symptoms - comprising tendencies for impulse dyscontrol, aggression dysregulation, depression, suicide attempts, and anxiety - which have hypothetically been related on the basis of a common biological substrate from consistent findings in that respect in previous literature.

The most important results revealed by this study are the following:

The numerous relevant and significant relationships with and inter-relationships between the cluster of five variables support the hypothesis expressed in several studies from the literature, that a common underlying biological disorder may exist in these psychopathological dimensions, since the same neurochemical disturbance (i.e. a reduced CSF level of the serotonin metabolite 5-hydroxyindoleacetic acid (5-HIAA)), has consistently been reported in all these conditions in previous studies.

The Monroe Dyscontrol Scale was a significant discriminator between the violent and non-violent groups, indicating that impulse dyscontrol is a prominent feature of violent offenders. Notably high scores were also exhibited by murderers, the groups reporting depression and anxiety, and the group with a high number of features from the cluster of five symptoms.

In relation to rapists and sexual offenders, the most prominent finding was a high frequency of Mandrax abuse in the form of a "white pipe" (i.e. snoked with cannabis), both on its own and in combination with alcohol. They were furthermore heavy users of cannabis alone and of alcohol and cannabis together.

Suicide attempts was a prominent feature of violent offenders, the high dyscontrol group, depressives, the group reporting anxiety, and the group with a high number of features from the cluster of five symptoms. A family history of suicide attempts, violent family members, and previously imprisoned family members furthermore correlated significantly with several subgroups in various patterns.

Previous head injuries were prevalent among the violent group, the high dyscontrol group, and depressives. There was a high incidence of depression in the high dyscontrol group, and a similar relationship with anxiety and the five-symptom cluster. Other clinical symptoms frequently occurring within the various subgroups in various combinations, were headaches, blackouts, and chronic fatigue, while high blood pressure was primarily a feature of murderers.

The Stroop and the Trail-making Test discriminated between the group with a high number of features from the cluster of five symptoms, and the depressive group. Only part A of the Trail-making Test discriminated between violent and non-violent offenders.

Substance use was a prominent feature in various combinations among rapists, high dyscontrol men, depressives, the group reporting anxiety, and the group with a high number of features from the cluster of five symptoms. Prisoners' opinions of the causes of crime most frequently implicated alcohol abuse and Mandrax abuse.

In conclusion, the most significant findings of this study were the high incidence of impulse dyscontrol among violent offenders, murderers, depression and anxiety groups, and the five-symptom cluster group; as well as the strong support for the theory that the cluster of psychopathological dimensions, comprising tendencies for impulse dyscontrol, aggression, depression, suicide attempts, and anxiety, are interrelated, most probably on a biological basis - such as a diminished level of the serotonin metabolite 5-HIAA in the CSF, which has been demonstrated to have a relationship with these symptoms in a significant number of previous studies. Although these features may, on the surface, appear to constitute separate syndromes or diagnostic categories, these data endorse the supposition of several researchers in this field that they may, in fact, represent a unitary disorder of regulation as the manifestation of a specific biological dysfunction.

In relation to the literature reviewed, particularly with regard to Gray's BIS/BAS theory and related findings, it seems very likely that these psychopathological dimensions are the overt indications of a dysfunctional behavioural inhibition system (BIS), and that a constitutional variation in neurochemical metabolism towards the extreme end of a continuum may underlie a dysfunctional BIS. The significantly positive findings in terms of family history support the contention that these behavioural disorders may moreover be hereditary.

Violent criminals do not seem to be an entirely homogeneous group. It is possible that some head injured subjects may have pathology of a different nature, thus constituting a separate subgroup. Rapists, furthermore, seem to comprise another distinct subset of violent offenders.

An interdisciplinary approach to the problem of criminal violence is suggested. Ideas for further research are discussed.

TERMINOLOGY AND STYLE

The term "violence" as one of the topics of this investigation, refers to a chronic tendency for harmful or destructive physical interpersonal aggression or attack, and does not pertain to collective aggression, political violence, or premeditated predatory aggression with a profit motive as in robbery.

Although this study has drawn heavily upon the psychiatric literature, the terminology used in this paper does not necessarily imply adherence to the DSM-III classification system. For example, "disordered impulse control" does not signify the DSM-III category "Intermittent Explosive Disorder" in particular, but is rather conceived from a functional viewpoint, in line with the theory that a biological dysfunction of the inhibitory system at a neuronal level may underlie not any one particular psychiatric syndrome, but rather certain clusters of psychopathological dimensions which may exist across even seemingly unrelated conditions like aggression, depression and anxiety disorders. The focus of the present research is on the dysfunctional manifestation of impulse dyscontrol in the form of externally directed interpersonal violence of a fairly serious and chronic nature, rather than on "impulsivity" as a normal variation in personality style.

Although the term "psychopathy" is generally considered to be outdated or vague at present, it it still commonly used in a descriptive sense because of its communicative value (Reid, 1981). As the term "psychopathy" was used in many of the studies reviewed and methods of categorisation differed across studies, this term will be used interchangeably with or instead of the DSM-III classification "antisocial personality disorder," to denote the well-known syndrome of persistent seriously irresponsible, socially deviant and sometimes abnormally aggressive behaviour with little or no feeling of guilt.

"Mandrax" refers to the illegally produced drug of abuse which originally consisted of a combination of methaqualone and diphenhydramine, but which may now also contain various other substances which are added in the illicit manufacturing process.

In order to conform to APA standards, the decimal point will be used in this document instead of the locally customary comma.

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INTRODUCTION

ESCALATING CRIME RATES - A CAUSE FOR CONCERN

An international survey revealed that of the world's 100 largest cities, Cape Town had the highest murder rate at 64.7 murders per 100 000 people per annum. With a population of 2.4 million, this indicates that 1 553 murders per year are committed in the metropolitan area of Cape Town, as compared to 911 per year in Johannesburg, which has a population almost twice as large at 4.6 million and a murder rate of 19.8 (Braun, 1990).

Furthermore, compared to 1989, the murder rate for South Africa (excluding the independent and self-governing states), rose by 28.5 percent in 1990 to a figure of more than 15 000 (an increase of 3 359 cases). For this period, serious crime overall rose by a record 8.5 percent to an alarming 1.5 million cases, the highest individual increase in the past ten years, and, according to the Commissioner of Police, probably the highest increase in the history of South Africa (Morris, 1991).

In the light of these alarming facts, a closer investigation of factors possibly related to this high incidence of violent crime especially in Cape Town, was imperative.

NEED FOR ALTERNATIVE STRATEGIES FOR PREVENTION OF VIOLENT CRIME

In 1992 South Africa was furthermore reported to have the highest recidivism rate in the world, and the second highest prison population rate with more than 357 prisoners per 100 000 of total inhabitants in 1991. The USA had the highest rate at 425 per 100 000, while Europe, on the other hand, had a rate of less than 100 prisoners per 100 000 (SABC-TV, Note 1). At the time the cost to the South African government per prisoner was reported to be R42 per day (i.e. R15 330 per person per year). In view of this astronomical expense especially in a time of economic recession, South Africa cannot afford to postpone investigation of the problem of such a high recidivism and crime rate,

and a concerted effort needs to be made to develop additional and/or alternative approaches for the prevention and reduction of crime.

As part of a report on their national research programme on social security and affordable personal safety, the Human Sciences Research Council (1987) noted that it is generally agreed that criminologists have not yet succeeded in formulating an integrated theory of criminal behaviour. They suggested that the crime problem in South Africa should be reviewed on the basis of all three historical perspectives with regard to the causes of crime, i.e., (1) biological or genetic factors, (2) individually acquired psychological factors, and (3) the currently favoured sociological theories.

DIFFERENT PERSPECTIVES ON THE CAUSES OF CRIME

Criminologists and social scientists have for several decades now vehemently opposed any biological approach in relation to crime causation, e.g. the much publicised XYY chromosome theory of the late 1960s and 1970s. Some criminologists who strongly opposed the idea that internal characteristics may predispose someone to a criminal lifestyle, even referred to the XYY studies as "demonism revisited" (Sarbin & Miller, 1970, quoted by Mednick, 1987, p. 2). This negative attitude towards the role of organic factors in crime originated around the early 1900s in reaction to the mechanistic application of Darwin's evolution theory to criminal behaviour amongst other things. Another reason why social scientists are so sceptical about the possibility that habitual criminality may partially be due to biological factors, is that it is regarded as either a hopeless and untreatable condition, thus producing a pessimistic attitude towards treatment, or they may fear that it might lead to radical medical intervention like the lobotomies done on schizophrenics before the advent of antipsychotic medication.

It has therefore not been surprising that "men and women interested in social justice have a tendency to view with suspicion any new speculations or empirical investigations linking biological factors with human social conduct, especially crime among the underprivileged.... [and] prefer to seek causes of crime among economic, social, and political factors" (Mednick, Moffitt, & Stack, 1987, p. ix).

In view of the need for an alternative approach to the problem, Hoffer (1978) expressed the following opinion:

> For decades every possible psychosocial factor has been invoked as a cause for criminal behavior. At the same time scant attention has been given to biophysical factors. Perhaps it is for this reason that the results of all psychosocial corrective measures have been so ineffective. The explosive development of theory and practice in psychology and sociology has not been accompanied by any improvement in either our understanding of or the prevention and treatment of antisocial behavior. (p. 42)

Hoffer suggested a change in attitude from a purely psychosocial perspective to a more holistic approach, in which biochemical, as well as psychosocial and biophysical knowledge is used.

The resurgence of interest in the relation between violence and brain function over the last two decades together with the rapid advance in the field of scientific technology, has led to new theories and findings. There is considerable evidence that a large percentage of violent offenders exhibit signs of brain damage which can play a contributory role in dysfunctional aggression (Lewis, 1990; Mednick, Brennan, & Kandel 1988), although this does not necessarily imply that all brain-damaged people exhibit violent behaviour.

Whereas a genetic component has not been proven in violent criminal behaviour, positive indications of hereditary transmission of criminality have been found in nonviolent offenders (Cloninger and Gottesman, 1987; Mednick et al., 1988; Moffitt, 1987).

Evidence thus exists that, in addition to environmental influences, biological factors may play an aetiological role in some instances of criminal behaviour, especially of the chronic kind. One should therefore rather regard the origin of habitual violence to be multifactorial in nature, implicating interactive effects of social, personal, and organic factors which could predispose a person to committing antisocial acts on a habitual basis. Violence should rather be viewed as a symptom "not solely psychogenic in origin or due to brain dysfunction or a product of social disorganization, but as resulting from the interplay of all three factors" (Bach-y-Rita, Lion, Climent, & Ervin, 1971, p. 1474).

The importance of socioenvironmental factors in the creation of criminal behaviour is therefore not denied. Mednick (1987) noted, however, that these factors are less useful in the prediction of habitual criminality. In contrast, Mednick found strong evidence that certain biological factors are particularly effective in identifying chronic offenders who have a tendency to commit serious crimes. He reported that this category of felons constitutes only about 4% to 5% of males; nevertheless this comparatively small group commits more than 50% of crimes in society, particularly the more severe types of crime.

If this target group could therefore be identified with relative success, even a moderately effective intervention strategy would have significant implications in terms of reducing the level of serious crime. A further benefit would be the potential to identify inexperienced offenders who are unlikely to become habitual perpetrators of serious crime, who may then be merely reprimanded or fined instead of imprisoned (Mednick, 1987). This should also help to reduce the prison population (and thus state expenditure), and would prevent inexperienced offenders from being exposed to the potentially detrimental influence of the "Crime College," as prison is often referred to!

In an effort to investigate whether certain factors might be contributing to the high rate of murder and violence in the Cape Peninsula, as well as possibly identify factors that would discriminate habitually violent from nonviolent offenders, this study investigates the problem of interpersonal criminal violence from a biological perspective. In view of the advances in knowledge made in recent years in the field of neuropsychiatric medications, biological vulnerabilities need, however, not be regarded as either immutable characteristics or signs of fundamental immorality.

Past literature is reviewed in relation to criminal violence, psychopathy, disordered impulse control and neuropsychological and -biological findings in these areas. Drawing upon theory and research from various disciplines in the field of neuroscience, such as neurology, neurophysiology, psychiatry, and biochemistry, a theoretical foundation for a link between a functional disorder of impulse control and habitual impulsive violence is presented.

IMPULSIVITY: A MULTIDIMENSIONAL CONSTRUCT

In some of the literature on impulse dyscontrol the term "impulsivity" has been used seemingly to denote the same concept. This rather vague term can be interpreted in different ways, however - both in everyday lay usage, and in scientific terminology, which furthermore makes it rather difficult to measure. For example, Plutchik and Van Praag (1989) identified two bipolar components of impulsivity: resisting urges vs. yielding to urges, and responding immediately to a stimulus vs. planning before taking action, while Prentky and Knight (1986, p. 142) made the following distinction between positive or functional impulsivity vs. negative or dysfunctional impulsivity:

Functional impulsivity: In colloquial usage "impulsivity" is often used in a positive way to describe a non-maladaptive personality trait similar to spontaneity. The impulsive person is inclined to act suddenly, make quick decisions, and often behaves in an unpremeditated way. "Thus, to be impulsive is to be actuated by an involuntary, impelling force" (Prentky and Knight, 1986, p. 141). The consequences of impulsivity can, however, be positive or functional under circumstances where a rapid response style is optimal, provided that the potential cost of making an error in haste is not too high.

Dysfunctional impulsivity: In clinical terminology, on the other hand, the term "impulsivity" usually has a dysfunctional implication. Whether or not the term conveys a negative connotation is determined by the nature of the impulsive behaviour. Whereas a prosocial act will be praised, an antisocial act will gain disapproval. However, dysfunctional impulsivity obviously covers a wider spectrum of behaviour than that which is, in the strict sense, criminal.

Self-destructive or addictive behaviour, for example, can be described as impulsive. The DSM-III describes the classification "Disorders of Impulse Control Not Elsewhere Classified" as a residual diagnostic class for disorders of impulse control that are not classified in other categories, e.g., as a Substance Use Disorder or Paraphilia. The following categories are specified: Pathological Gambling, Kleptomania, Pyromania, Intermittent Explosive Disorder, Isolated Explosive Disorder and Atypical Impulse Control Disorder.

A further distinction in the interpretation of the term "impulsivity", is that while it is seen by some as a homogeneous construct, others maintain that it consists of different components. The first example of impulsiveness as a unitary construct is the above description of functional impulsivity, where it is seen to represent a single trait of normal personality. An example of dysfunctional impulsivity as a unitary construct is the theoretical argument of Gorenstein and Newman (1980) who suggested that a common underlying syndrome, possibly of genetic origin, which they call "disinhibitory psychopathology", may exist in a variety of impulsive behaviour patterns, e.g. psychopathy, alcoholism, hysteria and attention deficit disorder (hyperactivity).

On the other hand, Saunders, Reppucci, and Sarata (1973) claimed that they had empirically illustrated that the construct "impulsivity" can be interpreted in several different ways. In a study of impulsivity in delinquents, they found that the Barratt and the Hirschfield Impulsivity Scales correlated strongly with each other, while two performance tests, the Matching Familiar Figures Test and the IES Arrow-Dot Test showed significant intercorrelations. The self-report questionnaires seemed to tap a similar dimension to which the performance measures were not related. On the basis of these findings they concluded that the conception of impulsivity as a unitary character trait was not supported and that standard tests seem to tap different dimensions of impulsivity.

On the basis of past literature reviewed, Prentky and Knight (1986) suggested that dysfunctional impulsivity could be broken down into general lifestyle impulsivity (i.e. psychopathy) and offence-related impulsivity (episodic dyscontrol), as it was found that the criteria for psychopathy as laid down by Cleckley and Hare, loaded on separate factors for these two constructs. While they share a common underlying factor in the form of disordered behavioural control, Prentky and Knight pointed out the dissimilarity in the global lifestyles of these two impulse-related disorders. Psychopaths are characterised by lack of empathy or concern for others, callousness, an unstable, impulsive lifestyle, low anxiety, superficial interpersonal relations, and poor behavioural control, which often results in a history of frequent, relatively non-violent antisocial behaviour. On the other hand, the episodic dyscontrol syndrome produces a different type of antisocial behaviour, e.g. physical assault; sexual assault and impulsive sexual

behaviour; motor vehicle offences; and violence in association with pathological intoxication. This type of person may appear to be "overcontrolled", withdrawn, socially isolated, anxious, and disorganised, but suppressed aggressive impulses may erupt from time to time as spontaneous, unpredictable expressions of violence. Prentky and Knight suggested that separating dysfunctional impulsivity into different categories, i.e. psychopathy and episodic dyscontrol, would facilitate the classification process.

Since my focus of interest is the nosologically non-specific functional impairment underlying disordered behaviour, the problem under investigation in the present study (which will be referred to as "impulse dyscontrol" rather than "impulsivity"), probably most closely resembles Gorenstein and Newman's (1980) description of dysfunctionally disordered impulse control as a unitary construct which may be an underlying factor in a variety of maladaptive and dyscontrolled behaviour patterns and specifically in the form of crimes of violence. The exact mechanism of this disturbance is unknown, but possibly constitutes a complex interplay of biochemical, electrophysiological, psychological, and social situational factors (perhaps superimposed upon a biological or genetic vulnerability), resulting in inadequate or fluctuating inhibitory function of the brain, which impairs the ability of the individual to control maladaptive impulses and possibly also undermines cognitive function.

IMPULSE DYSCONTROL AND BEHAVIOUR DISORDERS

Several researchers have recognised and described a behaviour disorder syndrome related to impulse dyscontrol.

Plutchik and Van Praag (1989) considered a tendency for impulsiveness as an important factor in the estimation of violence risk. Assessment of 100 psychiatric inpatients on scales for violence risk, suicide risk and impulsiveness, revealed a moderate intercorrelation between these scales, with violence risk in men best predicted by impulsive behaviour and trouble with the law.

Lion, Bach-y-Rita, and Ervin (1969) observed that assaultive or destructive behaviour is often the result of poor biological controls superimposed upon psychosocial situations. They criticised most sociologic or philosophic discussions of individual violence for their implicit assumption that the persons under discussion have unimpaired adaptive potential, whereas, they pointed out, a considerable percentage of the population in general has impaired brain function which limits their potential to understand, channel, and redirect aggressive energies. They also drew attention to the equally large number of violence-prone patients who voluntarily seek psychiatric help, often in vain, having been labelled a psychopath or personality disorder - labels that detract from adequate evaluation and management.

As mentioned above, Gorenstein and Newman (1980) hypothesised that a common underlying "disinhibitory psychopathology" of genetic origin may exist in a variety of impulsive behaviour patterns, although they speculated that this may also exist in psychopathy, unlike Prentky and Knight (1986), who suggested that dysfunctional impulsivity should be separated into different categories, i.e. psychopathy and episodic dyscontrol.

PSYCHOPATHY

The term "psychopathy" originates from the label "constitutional psychopathic inferiority" introduced by Koch in 1891, who believed that this disorder had a physical basis as a result of congenital or acquired inferiority of brain constitution, although he admitted that

an organic basis could not be structurally or physiologically validated. Under the influence of social learning theory, the term "sociopathy" came into favour, but, also considered to be a value laden term, was later abandoned in favour of "antisocial personality disorder" (Millon, 1981).

The clinical concept of psychopathy constitutes a cluster of symptoms and personality traits which has been studied and described by numerous authors. The following summary of clinical features, behavioural signs and symptoms of the "antisocial personality disorder" is given by the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) from an atheoretical aetiological perspective:

- History of continuous and chronic antisocial behaviour in which the rights of others are violated.
- Persistence into adult life of a pattern of antisocial behaviour that started before the age of 15.
- Antisocial behaviour is not due to either severe mental retardation, schizophrenia, or manic episodes.
- Early signs typically present since childhood are
  - lying;
  - stealing;
  - fighting;
  - truancy;
  - resisting authority.
- In adolescence there is often
  - unusually early or aggressive sexual behaviour;
  - excessive drinking;
  - use of illicit drugs.
- In adulthood this pattern of behaviour is continued, with the addition of
  - failure to accept social norms with respect to lawful behaviour;
  - inability to sustain consistent job performance over a period of several years;
  - inability to function as a responsible parent;
  - almost always a markedly impaired capacity to sustain lasting, close, warm, and responsible relationships with family, friends, or sexual partners.

- The following signs of personal distress are frequently associated features:
  - complaints of tension;
  - inability to tolerate boredom;
  - depression;
  - the conviction (often correct) that others are hostile toward them.
- Illiteracy and substance use disorders are frequent complications.
- After age 30 the more flagrant aspects may diminish, e.g. sexual promiscuity, fighting, criminality, and vagrancy, but interpersonal difficulties and dysphoria tend to persist into late adult life.

Cleckley (1982) provided an incisive and thorough clinical description of the psychopath, and considered the following as primary characteristics: guiltlessness, incapacity for object love, impulsivity, emotional shallowness, superficial social charm, and an inability to learn from experience.

Hare and Schalling's research group discerned the following as core characteristics of the psychopath: "impulsiveness, thrill-seeking, lack of foresight, long-term planning and goal-directed behaviour, and lack of self-control, consistency and stable habits" (Schalling, 1978, p. 85). From the same group, Ziskind (1978) listed five necessary diagnostic characteristics: impulsiveness, irresponsibility, superficiality of affect, inability to profit from past experience or punishment, and impairment of conscience. He also gives the following five exclusion criteria: mental retardation, organic brain syndromes or obvious brain damage, psychosis, neurosis, and situational maladjustments.

Harrington (1972) gave the following description of the psychopath:

> He lives free of form, predictable only in his impulsiveness and the probability that if confined in any sort of routine he will break out of it, bringing trouble to somebody. He refuses to delay gratification; he wil not yield to the rules of any game but his own.... According to Lindner, he has a "completely defective sense of property." Characteristically, he may steal, "not live up to his family obligations;" he violates time and duty, wipes out boredom with drugs or drunkenness, blithely or coldly takes what he

> wants, grins happily or suddenly explodes in anger like a baby, ... hits out, loves, leaves, grasps, exploits without guilt and regardless of warnings that he's out of line and subject to punishment. (p. 38)

Most psychopaths do not differentiate much when it comes to sex, and will take whatever is available, preferably without delay, which, in some cases leads to rape. They also need people around them constantly, or may otherwise fall into inertia and even critical depression. Psychopaths have, however, often been found to mature out of their antisocial behaviour later in life (Harrington, 1972).

Different subclassifications of psychopathy have been advanced. Barton (1975) described the following categories of psychopaths as proposed by Henderson:

- Inadequate psychopaths typically exhibit persistent lying. This personality is especially known to present a false, idealised image of himself to others. They often present as confidence tricksters who employ their dishonesty with glibness to the unfair disadvantage of their victims. Gambling, passing dud cheques, petty thievery, promiscuity, debts, suicidal attempts, alcoholism, drug abuse, and failing to provide for their families by spending housekeeping money on alcohol, cigarettes or drugs are frequently found in the history of inadequate psychopaths.

- Aggressive psychopaths exhibit aggression as the dominant feature in addition to other inadequacies. There is a history of belligerence and hostility with episodic physical assaults, fights and explosive rage, and frequently malicious damaging of property, alcoholism, persistent harassment of mistresses, wives, ex-wives or family members, and carrying of dangerous weapons.

- Creative psychopaths show considerable creative talent, often in some form of the arts, yet cause great distress to others through their unprincipled behaviour.

Fagan and Lira (1980) described Cleckley's distinction between primary and secondary psychopaths as follows:

- Primary psychopaths (characterised by emotional unresponsiveness and stimulation-seeking behaviour) are "underaroused individuals whose low level of internal arousal (a) precludes or interferes with the normal fear conditionability necessary for adequate avoidance or inhibition learning to occur and (b) propels the primary sociopath into situations that will increase his level of stimulation to a more optimal internally comfortable level" (p. 495). Primary psychopaths have been found to become aggressive more frequently than secondary psychopaths.

- Secondary psychopaths have been characterised as individuals whose antisocial behaviour is a symptom of anxiety associated with frustration or inner conflict. In contrast to primary psychopaths, they are overaroused by sensory input from external sources. "Antisocial behavior is regarded as an ineffective, self-defeating means of reducing internal conflict. The secondary sociopath, unike the primary sociopath, has generally been found to be more likely to profit from aversive experiences and can learn to control inappropriate responses that have been punished in the past" (p. 493).

In a study of inmates at a correctional institution, Fagan and Lira (1980) found that primary psychopaths engaged in significantly more frequent and severe antisocial behaviour than secondary psychopaths and nonpsychopaths, with an inverse relationship between anxiety and both frequency and severity of antisocial incidents for psychopaths. They concluded that these findings lend credence to Cleckley's distinction between primary and secondary psychopaths.

Many investigators from various fields have tried to find an explanation for the elusive riddle of psychopathy.

Defective inhibitory control at a neuronal level (manifesting as variable degrees of impulsiveness) has been proposed as a mechanism underlying antisocial behaviour (Kipnis, in Waid & Orne, 1982). Waid and Orne explained this as follows:

> Restraining aggressive impulses, for example, may be conceptualized as involving the inhibition of aggressive responses and the substitution of others. Apart from any aggressive or other antisocial drives that might be dominant in an individual, reduced ability to inhibit dominant

> response tendencies and substitute others could lead to considerable antisocial behavior. Individuals who are little aroused physiologically by response conflict, as undersocialized subjects are hypothesized to be, might have more difficulty inhibiting the dominant impulse. (p. 770)

Trasler (1978) suggested that one of the theories that was fairly influential was that of Eysenck, who proposed that the ability to respond to conditioning or to learn to inhibit undesirable behaviour in the process of socialisation is not a given constitutional absolute in everyone, but varies along a continuum. The primary psychopath would then be situated at the extreme end of insusceptibility to conditioning, with non-psychopathic criminals and other social deviants falling into the intermediate region between the psychopath and the normally-socialised non-deviant person. Trasler pointed out that what Eysenck failed to distinguish, however, was that the psychopath's learning deficit does not apply to conditioning with either positive reinforcers or punishment, but is restricted to an <u>inability to learn to modify behaviour from threats of punishment</u>. Trasler cites work which has shown that, at least in animal studies, this form of learning is mediated by different physiological structures from those involved in other kinds of learning, and maintained that the theory that the primary psychopath is unable to respond to signals of impending punishment, is therefore fundamentally quite possible.

<u>Clinical factors associated with psychopathy</u>

In addition to excessive use of alcohol, drug abuse, belligerency and assaultiveness, various medical complaints are often a feature of psychopathy, such as nervousness, back pain, headaches, blackouts (although questioning often reveals that this does not refer to loss of consciousness but possibly dizzy spells), fatigue, insomnia, nausea, depression and suicide attempts (Barton, 1975).

THE EPISODIC DYSCONTROL SYNDROME

Monroe (1978, p. 3) described episodic dyscontrol as "the result of an imbalance in the urge-control mechanisms, in which either intense urges (drives) overwhelm normal control mechanisms, or normal urges are left unrestrained by inadequately developed or secondarily compromised control mechanisms".

The episodic dyscontrol syndrome, according to Prentky and Knight, has been associated with specific antisocial behaviours: physical assault, sexual assault and impulsive sexual behaviour, motor vehicle offences, and violence in association with pathological intoxication. They maintain, however, that episodically dyscontrolled individuals often appear withdrawn, socially isolated, disorganised, anxious, and over-controlled, and it seems as if their suppressed aggressive impulses surface periodically in unpredictable expressions of violence, usually in response to minimal or no apparent provocation. The authors speculated that these individuals would have a criminal record consisting of relatively few offences but with a high degree of violence.

The dyscontrol syndrome - a clinical syndrome in which frequent episodes of intense rage seem to be triggered by trivial irritations was first described by Mark and Ervin (1970). It is accompanied by verbal or physical violence with a primitive quality, e.g., biting, gouging, kicking, or multiple stabbing. The attack is sometimes followed by remorse, but in some cases the person is untroubled by his behaviour or denies it, as in the aggressive type of psychopath. Inability to visualise the consequences of an act compounds impulsiveness and could explain why, so often, little or no attempt is made to avoid discovery. This latter defect is similar to one of the characteristic behavioural disturbances associated with prefrontal dysfunction (Elliott, 1978).

In 1970, Monroe (cited in Rickler, 1982) identified a similar syndrome characterised by impulse dyscontrol, which he labelled "episodic behavioural disorder". He defined this disorder as "an abrupt, single act or short series of acts with a common intention carried through to completion with at least a partial release of tension or gratification of a specific need" (ibid., p. 50). Monroe noted that dyscontrol acts usually represent an impulsive expression of primitive fear-rage

affects, and hence are socially or self-destructive. For this reason, such individuals often come to the attention of the police or courts. Acts of dyscontrol are usually characterised by the feeling "I just did it, I don't know why", and the subjective experience of having acted "without a clear and complete sense of motivation, decision or sustained wish, so that it does not feel completely deliberate or fully intended" (Shapiro, in Fenwick, 1989, p. 373).

In agreement with Monroe's above-mentioned observations, Fenwick also stated that these impulsive episodes are either self- or socially destructive, and are based on primitive emotions of fear, rage, or sensuous feelings without concern for the effect on the immediate environment or the long-term consequences. He regarded these acts as disinhibitions of behaviour (in the motor sense) which often manifest as sadistic or bizarre crimes, suicidal attempts, or aggressive or sexual acting out. He proposed that this impulsive behaviour could be described as representing a "short circuit" between the stimulus and response, resulting in precipitous action. This suggests that the behaviour is not inhibited by reflection on past experience or by thinking of possible future consequences, which has the effect that the acts are usually self-destructive or self-defeating for the individual, or appear antisocial to the observer.

Elliott (1976, 1982) described the dyscontrol syndrome as explosive rage, triggered by seemingly minimal provocation, accompanied by physical or verbal aggression. He noted that it occurred in a percentage of patients with temporal lobe epilepsy (both ictal or interictal); occurred more often in males; sometimes runs in families; may occur as a sequel to a brain injury (major or repeated minor injuries - even closed head injuries) or metabolic disorder e.g. hypoglycaemia (i.e. low blood sugar); can often be traced to perinatal trauma; and occurs commonly in children with minimal brain dysfunction and the hyperkinetic syndrome. He also emphasised the role played by the social setting in triggering an attack, as he found that the condition could be readily reproduced in the laboratory by, for example, administration of the same amount of alcohol in patients susceptible to pathological intoxication, or by inducing hypoglycaemia during a five-hour glucose tolerance test in people who are susceptibile to attacks under hypoglycaemic conditions.

Maletzky (1973) studied the episodic dyscontrol syndrome, and found that patients who fit this description, demonstrate violent loss of control upon minimal provocation; auras and post-ictal states surrounding such episodes; a history of alcoholism and increased aggression after taking alcohol; a history of childhood hyperkinesis and truancy; a family history of alcoholism, psychopathy and violence in the males and depression in the females; intermittent impotence in some cases and an aggressive approach in sexual relations in others; frequent infringements of the law; and proneness to aggressive use of an automobile. A number of soft neurological signs were present in the sample of 22 patients - e.g. anxiety (100%), depression (91%), suicidal ideation (82%), suicide attempts (36%), headaches (77%), amnesia for episode (45%), sexual abnormalities (41%), and impairment of recent memory (41%). Although no placebo controls were used, 86% of the subjects improved on treatment with Dilantin (phenytoin), with a decreased frequency and diminished severity of episodes.

Pontius (1984), after a careful clinical study of eight men who had committed dyscontrolled, senseless, serious acts of violence (for example, murder and rape), proposed as differential diagnosis to e.g., episodic behaviour disorder or impulsive acting out, the syndrome she labelled "psychotic trigger reaction". She defined this as sudden, transient, ego-alien, profoundly disturbed violent behaviour in response to an individual and apparently innocuous stimulus which the person relates in an obscure way to a past traumatic event. Afterwards, these people felt that they experienced a severe loss of control, which they were totally unable to explain. Shortly after the violent action, the person regained full behavioural control, so that at the time of examination there was no longer evidence of overt psychopathology. Pontius suggested that poor impulse control with inappropriate violent response to a specific stimulus could possibly be explained by frontal lobe/limbic system dysfunction.

Nell (1990a & b) reviewed several dimensions of "rage dyscontrol", which he defined as outbursts of rage that are markedly disproportionate to the provoking stimulus. He proposed an additive system for grading the severity of the dyscontrol on the three dimensions of intensity, frequency and spread. He argued that dyscontrol is a neglected clinical entity which is seldom diagnosed, and which is inadequately addressed in the DSM-III-R, since the diagnostic category

that best describes this syndrome, i.e. Intermittent Explosive Disorder, excludes both the presence of substance abuse and brain damage, which frequently form part of the history. Rage dyscontrol furthermore has a dubious status as an extenuating factor in forensic cases in South Africa, and with regard to treatment of this condition, Nell prefers to use psychotherapy rather than pharmacological treatment.

Gorenstein and Newman (1980) described the behavioural manifestations of the dyscontrol syndrome in terms of a theoretical construct which they called "disinhibitory psychopathology" that correlated with the behavioural syndrome produced by lesions of the medial septal, hippocampal, and orbito-frontal areas in animals. They hypothesised that this behavioural syndrome, possibly genetic in origin, may be a common denominator in a variety of impulsive behaviour patterns, i.e. psychopathy, alcoholism, hysteria, hyperactivity, and impulsive personality. The term "disinhibition" here refers to human behaviour that has seemingly occurred from inadequate or decreased controls on response inclinations. Disinhibited persons seem to be unable to control their immediate response tendencies in order to achieve long-term goals or to avoid long-term discomfort, with psychopathy as probably the most extreme example. Psychopaths do not readily acquire negative avoidance conditioning, possibly on the basis of a low arousal level and, like hyperactive children, they actively seek sensory stimulation and thrills - perhaps to try to compensate for their low arousal. Another symptom of disinhibitory pathology is a disturbed sense of time perception - one aspect of which is that time seems to pass more slowly for them than normal. Similar psychophysiological irregularities exist in alcoholics and psychopaths and there is evidence that alcoholism should also be regarded as a disinhibitory syndrome.

Gorenstein and Newman observed that lesions of the septum (or for that matter of the entire system composed of the medial septum, the hippocampus, and orbito-frontal cortex) produce a syndrome remarkably similar to the symptomatology of the disinhibition syndrome. They proposed that dysfunction of the septal/hippocampal/frontal system, viewed as a hypothetical construct rather than a physical injury could serve as a functional integrative research model across species for learning, motivational, and perceptual aspects of human disinhibitory psychopathology.

ALCOHOL ABUSE

In an earlier survey done in Cape Town on 500 randomly selected so-called Coloured people, it was found that 22% of Coloured men could be called excessive drinkers, and of these about a third were chronic addictive alcoholics. This group of chronic alcoholics constituted 4% of the population over the age of 20 in the Peninsula, and 85% were males, of whom only 5% were Malays. Sixty percent of the chronic alcoholics were also found to be suffering from psychiatric symptoms, mostly in the form of personality disorders, psychotic, and psychoneurotic symptom patterns (Gillis, Lewis, & Slabbert, 1965). These authors noted that as a result of this excessive frequency of heavy drinking, there is a high incidence of drunkenness associated with violence, transgressions of the law, and traffic accidents, and the casualty wards of all general hospitals in the Peninsula are scenes of carnage over weekends due to violence and injuries related to drinking. It was furthermore found that 11.8% of the population over the age of 20 were suffering from some psychiatric disturbance, yet only 1% of the population had gone for treatment.

It has been widely documented that a significant number of individuals with episodic dyscontrol problems are also alcohol or drug abusers (Fenwick, 1989; Monroe, 1981; Bach-y-Rita et al., 1971; Wood, Reimherr, Wender, & Johnson, 1976; Lacey & Evans, 1986; McCown, 1988), and as previously mentioned, alcoholism can be regarded as a disorder of impulse control according to the DSM-III, although there is no provision for its formal classification as such.

Alcohol abuse and dyscontrolled violence

In a review on the effects of alcohol on physical aggression in humans Taylor and Leonard (1983) concluded that alcohol indeed appears to be a potent causal antecedent of aggressive behaviour based on similar observations under several highly controlled conditions. The studies reviewed suggested that the cognitive disruption produced by alcohol might facilitate aggression in the presence of significant provocation by focusing attention on those instigative cues while at the same time reducing attention to incompatible inhibitory cues. They therefore proposed that the aggressive behaviour often displayed by intoxicated persons is an interactive effect of the pharmacological state produced by alcohol and the contextual cues in the drinking situation.

Several investigators have reported a significant relationship between alcohol intoxication and crime - especially violent crime. After reviewing the literature, Smith (1978) proposed that alcohol may acutally be implicated in the majority of violent crimes of passion, impulsive murder, assault, and rape, and that it also plays a role in robbery, crimes against property, vandalism, and arson. Gross (1972) reported that 50% of all murders, suicides and fatal motor vehicle accidents are perpetrated under the influence of alcohol, while Lang and Sibrel (1989) noted that in surveys of perceived causes of crime alcohol and/or drugs were invariably mentioned most frequently. Virkkunen (1974) observed from previous reports that alcohol had played a part in 30-60% of acts of criminal homicide in various countries, and from an investigation of 114 of such cases, found that 68% of the perpetrators, 66% of the victims, and 79% of either perpetrator or victim had been under the influence of alcohol at the time of the crime. Shupe (1954) tested the urine alcohol level of 882 persons arrested in Ohio during or immediately following the commission of a crime and found that over 75% of violent offenders were legally intoxicated (blood alcohol concentration greater than .10%). Wolfgang and Strohm (1956) examined the records of 588 homicide cases in Philadelphia for presence of alcohol intoxication as recorded by the police, and found that alcohol was a contributory factor in 64% of the cases. There was also a relationship to the method of killing - alcohol was present in 72% of the stabbings, 69% of the beatings, and 55% of the shootings.

Among the situational determinants of aggression, alcohol has been found to play a substantial role because of its widespread and often uncontrolled use. Psychological signs of alcohol intoxication include lability of mood, disinhibition of sexual and aggressive impulses, irritability, and talkativeness. Maladaptive behavioural effects often resulting from excessive intake of alcohol include fighting, impaired judgment, and failure to meet responsibilities. Whilst small doses tend to inhibit aggression, larger doses facilitate aggressive behaviour. One has to keep in mind, however, that most people, even many who may have a criminal tendency, do not commit crime when they are intoxicated.

Neuropsychiatric effects of alcohol

Alcoholic intoxication can be regarded as the most commonly occurring organic brain disorder, although on a temporary basis. A phenomenon that is frequently reported by alcoholics (and also occasionally by non-alcoholics) is amnesia (blackouts) for events that occurred while the person was fully alert but intoxicated (Kaplan & Sadock, 1981).

Various types of psychopathology are frequently found in alcoholic populations, such as poor self-control, depression, paranoid ideation, low self-esteem, aggressive feelings and behaviour, and poor reality testing (Kaplan & Sadock, 1981).

In a local study at the NIPR, alcohol was furthermore found to change the dominant EEG rhythm and cause epileptic-like discharges in certain subjects. Alcohol elicited EEG abnormalities in 52% of the subjects in the form of spike discharges and/or paroxysmal bursts of slowing, while only 4.8% of the records were abnormal before alcohol ingestion. The wave forms were suggestive of brief episodes of disturbed consciousness. These disturbances were not localised and it was proposed that they may possibly reflect changes in arousal level due to involvement of the reticular activating system (Nelson, 1974).

Gross (1972) quoted a study by Marinacci, who maintained that more than merely causing intoxication, alcohol facilitates temporal lobe epileptoid states in susceptible persons and demonstrated this in a group of subjects by activation with alcohol. This activation even sometimes brought about a rage reaction in the EEG laboratory. Gross concluded that alcohol produces a state in which the vulnerable person becomes violent more readily, whether on account of its intoxicating effects or by facilitating pre-existing brain disorder.

Idiosyncratic reaction to alcohol

Other investigators similarly found that the response to alcohol differs markedly from the accepted norm in some people, who characteristically manifest out-of-control aggressive behaviour, often after ingestion of relatively little alcohol (Zabow, 1986; Elliott, 1976; Fenwick, 1989; Monroe, 1981; Bach-y-Rita et al., 1971; Yaryura-Tobias, 1978).

Lishman (1989) described a "pathological reaction to alcohol" or "pathological intoxication" as irrational combative behaviour which may develop suddenly during alcoholic intoxication and in marked cases as "an outburst of uncontrollable rage and excitement leading to seriously destructive actions against other persons and property.... The behaviour is out of character for the individual concerned, the duration is short, and there is subsequently amnesia for the entire episode" (p. 509). While some authors maintained that this could occur following ingestion of relatively small amounts of alcohol (Bach-y-Rita, Lion, & Ervin, 1970; Kaplan & Sadock, 1981; Krynicki, 1978), This opinion, however, was not substantiated by the findings of a study done in 1976 by Maletzky (cited by Lishman, 1987) in which intravenous infusion of alcohol in men with a history of developing this condition obtained the expected reaction in 15 of 22 cases, but large amounts of alcohol were necessary.

In a description of what he labelled "episodic behavioural disorders", Monroe (1982) said that most of the disorders described as pathological intoxication would fit his definition of episodic dyscontrol.

Kaplan and Sadock (1981) mentioned that people who have suffered brain damage (especially in the form of trauma or encephalitis) have been found to lose tolerance for alcohol and exhibit the features of alcohol idiosyncratic intoxication after taking small amounts. Marked behavioural changes atypical of the person occur, usually involving belligerent, assaultive, or criminal behaviour, and the person seems to be out of contact with others during the episode.

Genetic studies of alcoholism

Familial and ethnic trends towards alcoholism have been found to exist - for example, it frequently occurs in the Irish and very seldom in Jews and Chinese. An inherited deficiency in an isoenzyme involved in the breakdown of alcohol in the liver has been found to cause a so-called "flushing response" in Orientals - that is, acute alcohol sensitivity symptoms similar to the reaction to Antabuse - which probably acts as an inborn deterrent to alcoholism (Grant, 1988; Wall, Gallen & Ehlers, 1993). Adoption studies suggest a strong possibility of a genetic component for the development of alcohol addiction (Cadoret, Cain, & Grove, 1980; Cloninger, 1987b), and Hill (1992) concluded that although there does not seem to be specific

genetic transmission of alcoholism in the strict Mendelian sense, an unusual constitutional predisposition or diathesis for developing alcoholism does seem to be under genetic control. Samson and Harris (1992) reviewed molecular studies that indicated that chronic use of alcohol may affect gene expression.

Although a heriditary link is obviously difficult to prove in humans, an inclination for alcohol has successfully been selectively bred in rats experimentally (McBride, Murphy, Lumeng & Li, 1990).

Further aetiological theories

Whereas evidence in support of hereditary factors thus exists, this does not mean that all cases of alcoholic families have a genetic origin, as sociocultural and situational factors also play an important role in the onset and maintenance of alcohol abuse (Hill, 1992), and many alcoholics have had a history of parental alcohol abuse (Lewis, Shanok, Grant, & Ritvo, 1983; Bach-y-Rita et al., 1971; Bach-y-Rita & Veno, 1974; Fenwick, 1989).

Monroe (1982) proposed that profound depression may underlie dyscontrol behaviour, presenting as periodic intense dysphoria, which compels the person to seek immediate relief, often by means of self-medication in the form of alcohol or drugs - which renders him even more susceptible to behaviour that is out of control.

DRUG ABUSE

In 1993 it was reported that Cape Town had gained the unenviable reputation as Mandrax capital of the world, with an estimated 95 percent of the total global consumption of this drug taking place in Cape Town, particularly on the Cape Flats. One reason for this situation has been suggested to be the widespread poverty and unemployment which entices many people to engage in drug trafficing as a means of living (Peacock, 1993).

Drug abuse and gang violence

Drug trafficing inevitably promotes a violent subculture and gang formation. Copeland (1989) reported that 56% of multiple homicides in Miami were suspected to be associated with the drug-trade scenario.

In Cape Town too, a unique culture of numerous well organised street gangs is active on the Cape Flats. Not only does gang membership provide a means of income in the form of drug peddling, but it also provides recreation and excitement in a deprived environment (Brand, 1993a).

Specific territories are allocated to vendors, which often leads to violence in the form of gang wars when one group violates the territory of another (Peacock, 1993). Intimidation is the order of the day, necessitating illegal carrying of weapons of all kinds including firearms. Inhabitants of a gang's territory are frequently bribed or threatened not to provide information about the gang's activities or to become gang members - often by threats in the form of harm to their children. Gang leaders and their patrons are sometimes in control of an extended criminal network involving shebeens, brothels and prostitution. Should a gang member be arrested for some form of crime, intimidation of witnesses often leads to the giving of false evidence, with the result that the offender cannot be proven guilty (Brand, 1993b). Gang members sometimes operate as professional 'hitmen' who are paid to kill, often in the form of revenge as part of the gang's reign of terror (Brand, 1993c).

Harrington (1972) attributed a possible explanation for cruel and brutal criminal acts sometimes committed by gangs to the current almost barbaric worship of performance and contempt for nonperformance, which can turn cruel when it comes across the ludicrous, defenceless and inept - such deficiencies being regarded as misdemeanours. He said that he has felt in himself, although nonviolently, several times a "giggling time-stopping cruelty" while smoking marijuana, and describes it as the kind of feeling that in bad company can produce gang rapes and torture deaths - as the victim's fate is paradoxically experienced as aesthetically appropriate for some reason or another. This may, controversially, suggest a possible connection between cannabis smoking and violence, although denied by the majority of authors dealing with this topic. Kaplan & Sadock (1981), for example, stated that only the unsophisticated persist to believe that cannabis induces violence and crime. Instead of leading to criminal behaviour, it tends to suppress it, partly due to the lethargy it induces.

Cannabis

Cannabis (locally commonly known as "dagga") is generally regarded as a hallucinogen, as it is more closely related to the hallucinogens than to any other drug, but compared to other hallucinogenic drugs it is weak, without great range, but easy to handle (Laurie, 1978). Many of the phenomena associated with LSD-type substances can be produced by cannabis.

Cannabinoids (the psychoactive ingredients of cannabis) have been shown to inhibit adenylyl cyclase activity in vitro and cyclic AMP production in rat brain. Binding sites have been located in the basal ganglia, hippocampus, cerebellum, striatum and cerebral cortex. These sites correspond with some of the observed pharmacological effects of the drug, e.g. cognitive impairment (hippocampus and cortex), ataxia, i.e. incoordinate movement (basal ganglia and cerebellum) and low toxicity (lack of receptors in the brain stem) (Abood & Martin, 1992).

Effects from smoking cannabis last for 2 - 3 hours and from ingestion 3 - 5 hours or longer, and its main psychoactive ingredient, delta-9-tetrahydrocannabinol (THC) is approximately three times more potent when smoked than when taken orally (Julien, 1981).

Although it has been found that the subjective effects of cannabis vary somewhat from person to person (Abood & Martin, 1992), it has generally been found that the intoxication

- increases sensitivity to external stimuli
- reveals details that would generally be overlooked
- makes colours seem more brilliant and richer
- produces synaesthesia (a secondary sensation accompanying an actual perception, e.g. when hearing a sound, experiencing a sensation of colour)
- evokes values in works of art that previously had little or no significance to the viewer
- enhances the appreciation of music
- may distort sense of time (ten minutes may feel like an hour)
- often brings about a splitting of consciousness (the smoker, while experiencing the high, is at the same time an objective observer of his own intoxication, e.g. he may have paranoid thoughts, yet at the same time have the ability to retain a degree of objectivity.) (Kaplan & Sadock, 1981).

Cannabis tends to produce sedation, does not dilate the pupils or heighten blood pressure, reflexes and body temperature (Kaplan & Sadock, 1981). High doses have been found to cause postural hypotension (Abood & Martin, 1992). It has been reported to cause a slightly decreased blood pressure and dilation of the blood vessels in the cornea, resulting in bloodshot eyes (which is also an effect of indulgence in alcohol). It significantly increases heart rate and may possibly have adverse effects on the heart, as it precipitates chest pain (angina pectoris) in persons with existing heart problems. Users may experience a feeling of hunger and especially a craving for sweets (Julien, 1981). Local biochemical studies of effects of cannabis use, suggested that it produced some defect in the utilisation of glucose (Ames, Note 2). Chronic smoking has been associated with bronchitis and asthma, suppression of immune responses and possibly a decreased level of plasma testosterone which has also been reported with the use of alcohol and other sedative-hypnotic drugs (Julien, 1981).

According to Lishman (1987), cannabis has been claimed to have an aphrodisiac effect, but this is not well substantiated. Boericke (1927) maintained that cannabis, apart from causing great fatigue, seems to affect especially the respiratory, urinary and sexual organs, producing sexual overexcitement. Kaplan and Sadock (1981), on the other hand, reported that there is little evidence that cannabis stimulates sexual desire or power, nor that it weakens sexual desire. Many users report that the high enhances the enjoyment of sexual intercourse.

Mild depressive symptoms following euphoria has been noticed as a typical transient effect of cannabis, with heavy users consistently reporting higher negative moods and lower positive moods than light users. It has also been suggested that it may precipitate relapse in patients with pre-existing depressive disorder (Thomas, 1993). Rarely, but especially among new users of marihuana, an acute depressive reaction occurs that resembles the reactive or neurotic type of depression (Kaplan & Sadock, 1981).

Cannabis possesses antiepileptic properties (Wada, J.A., Sato, & Corcoran, 1973) and was found to exert acute antiepileptic effects against kindled amygdaloid seizures (Corcoran, McCaughran, & Wada, 1973).

Although tolerance has been found to develop with heavy long-term use, physical dependence does not seem to ensue, although some form of psychological dependence or craving is possible. However, the number of individuals who require professional assistance in order to control their abuse of cannabis is relatively small (Abood & Martin, 1992).

The excessive long-term use of cannabis has been reported to lead to significant deterioration of cognitive functions, such as reaction time, concept formation, learning, perception, memory, motor coordination and attention, which seems to be reversible with discontinuation of the substance (Mendhiratta, Varma, Dang, Malhotra, Das, & Nehra, 1988; Abood & Martin, 1992).

Chronic heavy use has also been found to induce insidious personality change in the form of the so-called "amotivational syndrome" (Furman, 1989; Lishman, 1987). Long-term users of the potent types of cannabis are generally passive, nonproductive, idle, listless, and totally lack ambition, but mostly one cannot be certain which came first - the habitual use of the drug on the one hand, or the depression, anxiety, personality disorder, or evidently unbearable life situation on the other (Kaplan & Sadock, 1981).

In his study of psychopaths, Harrington (1972) maintained that cannabis abuse (like LSD, but to a more limited degree) brings about lasting psychopathic characteristics and values, e.g. recklessness, and indifference to time, duty, assignments, responsibility, and any kind of campaign. In contrast to the alcoholic who comes down with a hangover and guilt feelings and thereafter recognises authority again, to the cannabis abuser "authority becomes ridiculous, pompous, and irrelevant - and after the high ... disrespect for this-worldly values will remain" (p. 261). Harrington observed that although most rebels and dropouts are by no means clinically psychopathic, cannabis or hallucinogen abuse brings about the substitution of middle-class values by psychopathic values in these individuals - especially with regard to denial of time and responsibility. This is an interesting observation in the light of the possibility discussed earlier, that psychopathy may be the result of failure of an adaptation mechanism due to a pathological variation in neurophysiology. These noxious substances may bring about an alteration in the biochemical systems resembling that of the psychopath, which then manifests as psychopathic behaviour.

Lishman (1987) cited studies that indicated that some heavy long-term users showed behavioural changes such as increased aggressiveness, restlessness, anxiety, suspiciousness or irritability, whilst others were depressed, morose and withdrawn. They presented with complaints such as headaches, impairment of recent memory, episodic amnesia, poor concentration and loss of efficiency at work.

Taylor and Leonard (1983) reviewed studies on cannabis in relation to aggression. They reported that there is evidence that high doses of THC inhibit aggression, and that cannabis does not usually induce violent, aggressive or sexually aggressive behaviour. They made the point that one therefore cannot conclude that increased aggression is an inevitable result of a state of substance intoxication in general.

Small doses of cannabis have been reported to have little impact on aggression, and larger doses tend to inhibit aggressive behaviour (Kaplan & Sadock, 1981). It has experimentally been found to produce a decline of aggression in monkeys (Mechoulam & Edery, cited by Ames, Note 2), and Ames found that it also had a tranquillising effect on young people who were suffering from the episodic dyscontrol syndrome. The release of inhibitions produces fantasy and verbal expressions, rather than behavioural expression. Ames made the controversial suggestion that the criminal activities of habitual drug users are not due to the use of cannabis as such, but rather as a result of prohibition of the drug which forces them to seek black market sources of supply and thereby come into contact with the criminal element in society. In contrast to this argument, cannabis use has often been said to lead to the use of hard drugs. This may be especially true in this country, where the smoking of crushed Mandrax tablets together with cannabis is the most common form of hard drug abuse.

Mandrax

As mentioned, Cape Town was recently reported to have gained the unenviable reputation as Mandrax capital of the world, with an estimated 95% of the world's consumption of this substance taking place here (Peacock, 1993). An earlier report estimated that at least 80% of all Mandrax produced was consumed in South Africa (Haffajee, Stober & Owens, 1991). The fact that Cape Town was also found to have the highest murder rate in the world (Braun, 1990), certainly provokes the thought that a possible link may exist between these high rates of

both drug abuse and violence - especially in view of the observation that one of the characteristic features generally associated with drug addiction is unusual irritability and outbursts of temper (Barton, 1975).

The prohibited drug, Mandrax (a combination of 250 mg methaqualone and 25 mg diphenhydramine), depresses the central nervous system (CNS) and is classed as a sedative-hypnotic drug. Mandrax used to be the trade name of Roussel Laboratories for the sleeping pill that was originally marketed as a "safe," non-addictive alternative for the barbiturates, but which turned out to be as highly addictive.

Methaqualone was first synthesised in India in 1955 and widely marketed in Europe and Japan as a sleeping tablet. In the USA it was first manufactured in 1965 under the trade name Quaalude. In view of its popularity, other companies also started marketing it under trade names such as Sopor, Optimil, Parest, Somnofac, Melsedrin and Mandrax. By 1972 it had become one of the most widely abused drugs in the USA because it was so easily obtainable, and was known as "love drug", "heroin for lovers", "Dr Jekyll and Mr Hyde", "sopers", "sopes", "mandrakes", "quacks", and "ludes". "Luding out" referred to the common practice of taking the drug with alcohol, which produced many more adverse effects than either drug alone (Carroll & Gallo, 1985). Mandrax used to be the only legally manufactured drug combination that included methaqualone (ibid.), and consisted of methaqualone hydrochloride and a small quantity of the sedative antihistamine, diphenhydramine - one of the favoured hypnotics among heroin users. As a drug of abuse, methaqualone seemed to be especially popular in the form of Mandrax, possibly because Mandrax seems to induce a less drowsy, more contented and dreamy state than most other CNS depressants, and in combination with alcohol it may produce transient brief periods of vivid hallucinosis (Ban & Amin, 1979).

Evidence of methaqualone abuse and its addictive potential eventually led countries all over the world to ban the drug in the early 1980s (Carroll & Gallo, 1985). The drug is still, however, illegally produced as so-called bootleg methaqualone - mostly in India, Pakistan, China, Colombia and to a lesser extent in Africa (Haffajee, Stober & Owens, 1991; Carroll & Gallo, 1985). These illegal substances have often been found to contain not only methaqualone, but also substit-

utes such as antihistamines, analgesics, anaesthetics, barbiturates, antianxiety drugs, decongestants, diuretics (Carroll & Gallo, 1985), and fillers - substances such as sugar, talcum powder, bicarbonate of soda, and flour - used to dilute the product and increase profits (Haffajee et al., 1991). In 1989 a substance sold in Cape Town as Mandrax was found to contain methaqualone (40 mg) and a benzodiazepine (130 mg) which produced the following syndrome of intoxication:

> (i) An initial 'rush' (euphoria, hallucinations or suicidal thoughts) and a syncopal attack with a feeling of lower limb paralysis; (ii) disorientation with purposeless wandering on the return of motor function; and (iii) a final stage of physical or verbal aggression. The duration is 1-4 days and the patient is amnesic for all or part of this period. (Wilson, Steinegger & Parkin, 1989, p. 696)

Costing only about two and a half cents to manufacture in India, the tablets are sold on the street for R10 to R50 each, and local street names are: "buttons", "Mx", "pille", "wit", "whites", "Vims", "Germans", "lizards", "Knoppies", "Mandies", "bandits", "originals", "the article", "the boss", "Barry White", "Lee Marvin", "Russians", "Ewings", "genuines", "golfsticks", "Beiruts", "magwheels", "loss of memory", "pressouts", and "capsules", depending upon their origin, quality, inscriptions and locations in which they are sold (Haffajee et al., 1991).

Although Mandrax abuse has been rife all over the world, it is apparently only in India and South Africa where the tablets are crushed, mixed with cannabis, and smoked together in a pipe or broken-off bottle neck as a "white pipe", resulting in characteristic brownish-yellow stains on the palms of the hands of regular users. The combustion of the drug and the combination of it with cannabis gives a more potent effect, also because by being smoked, it gains direct access to the brain without bypassing the gastro-intestinal tract in which case a lower concentration would eventually reach the brain.

A local report described the effects of smoking a "white pipe" as producing "a rather gruesome kick far more intense than that produced by either mandrax or dagga alone, in which the user retches, coughs, drools and convulses (Haffajee et al., 1991, p. 6). Once the initial rush has subsided, the high may last as long as eight to ten hours,

compared with a high from cannabis of three to five hours. In the same report, a user described the high as follows: "It makes you feel so goofed. But at the same time you see everything around you so clearly, and your mind is working so fast. You have answers to every question" (ibid.). The Mandrax high makes the user feel relaxed, peaceful, calm and happy - worries vanish and everything feels perfect. Some people, however, feel irritable, confused, and become aggressive (Rogers, 1990a).

Someone under the influence of Mandrax will usually have red, glazed or puffy eyes as a result of the cannabis mixed with the Mandrax. Side-effects of local use of Mandrax have been noted to include weight loss, dry mouth, slurred or mumbled speech, stumbling or staggering gait, stomach pain, nausea, lightheadedness, rash, sleeplessness, internal bleeding, kidney problems (Rogers, 1990a; Life Line, 1985, Note 3), and impaired driving ability (Julien, 1981). Adverse consequences that commonly accompany the high are: "headaches, a hacking cough from lung irritation, and severe stomach damage leading to loss of appetite and vomiting" (Haffajee et al., 1991, p. 6). Chronic use furthermore depresses the immune system and users become vulnerable to "opportunistic" diseases like pneumonia (ibid.).

Carroll and Gallo (1985, p.32) recorded the following short-term behavioural effects of methaqualone experienced by nonregular or nontolerant users, compiled by the Addiction Research Foundation of Canada:

LOW DOSE (75 mg)	MODERATE DOSE (150-300 mg)	HIGH DOSE (over 300 mg)
Calmness	Euphoria	General numbness
Relaxation	Increased sociability	Weakness
Dizziness	Tingling or numbness throughout the body	Fear of "losing one's mind"
Tingling	Self confidence	Incoordination
Numbness of extremities	Sexual arousal	Agitation
Drowsiness		Panic
Restlessness		
Anxiety		
Burning		

In addition to its sedative-hypnotic properties (i.e. sedating, tranquillising and sleep-inducing, methaqualone also has an anticonvulsant action.

Although methaqualone is not a barbiturate, it is structurally and functionally related to the barbiturates (Carroll & Gallo, 1985), and pharmacological effects, side effects and toxicity are reported to be analogous to those of the barbiturates (Julien, 1981). Hypnotics and barbiturates have effects similar to alcohol, and opposite to the stimulants, e.g. caffeine, amphetamine and cocaine. The effect of the hypnotics is that they move the underlying personality towards extraversion, while stimulants cause a shift towards introversion, directing attention inwards towards thoughts and feelings of the self, rather than outwards to the environment. According to Eysenck, the difference between an introvert and an extravert is based upon the quantity of 'inhibition' their nervous systems generate. Any stimulus or activity generates inhibition. In this sense, the extravert generates a lot of inhibition; he is easily bored, he constantly needs new stimuli, and therefore appears more outgoing than the introvert who has low inhibition and is therefore satisfied longer with the same stimulus (Laurie, 1978).

The following are further effects of barbiturates:

- Whilst a person tends to be sensible, restrained, skilled at his job and shows reduced sexuality on opiates, the same person becomes obstinate, aggressive, apt to masturbate in public, and full of Irish excuses for their stumbling gait and confused speech when under the influence of barbiturates.
- Twice as many car accidents as non-users.
- Addicts tend to dope themselves until they are totally intoxicated.

Chronic users

- undergo marked social and emotional deterioration;
- become unable to work or care for themselves adequately;
- are often rejected by their families and friends;
- lose their jobs;
- may commit crimes and not remember it afterwards;
- appear to be influenced by their basic personality and their prevailing mood as a reflection of their behaviour;

- frequently lose emotional control and addicts are likely to fight over minor matters;
- may develop paranoid ideas and in this state are somewhat dangerous
- with a tendency to depression, tend to become more depressed;
- often exhibit self-injurious acts as a form of stimulation-seeking behaviour, or maybe - in a withdrawal state - as a desperate way to obtain drugs necessary for, e.g. surgical repairs. This may take the form of the swallowing of glass or other foreign objects, wrist slashing, or other forms of self-mutilation (Laurie, 1978).

For habitual users of Mandrax tolerance can build up rapidly. They will find that they need to use larger quantities of the drug in order to get the same effect, and the increased use causes the physical side-effects to become much more pronounced (Haffajee et al. 1991).

Mandrax causes severe psychological addiction, with the result that the person wants its effects most of the time and craves the drug so badly that he starts focusing all his activities around it, and may drop out of school or stop going to work. The formidable addictive power of the drug is apparent from the following description by a "white pipe" user of between 10 to 20 tablets a day: "It changes your priorities. Not your friends, your money, your furniture, nothing is more important than getting your hands on some more" (Haffajee et al., 1991, p. 7).

Mandrax is an expensive habit for the heavy habitual user to support - at R25 each, 10 to 20 tablets per day would cost R250 to R500 daily, i.e. R7 500 to R15 000 per month! In desperation for a "fix", addicts thus often resort to battering their wives to give them money, selling almost all their household goods, stealing from family members, or other illegal ways like housebreaking and robbery. Becoming a Mandrax dealer is another way of "earning" a regular supply of the drug.

Physical addiction also occurs, because when the person stops taking the drug, he gets withdrawal symptoms which may set in a few days after cessation and last several days. Such symptoms may include headaches, restlessness, irritability, disorientation, insomnia, nervousness, anxiety, loss of appetite and weight and disturbed sensation in the form of tingling or numbness (Rogers, 1990a; Life Line, 1985, Note 3).

Methaqualone has a controversial reputation of having aphrodisiac qualities, i.e. increasing sexual desire. The reputation that it improves sexual performance is apparently one of the reasons for its use on the street as a "love drug". On the one side of the controversy, Carroll and Gallo (1985) argued that the idea that it enhances sexual performance and increases sexual desire has not been proved. Although the drug may lower inhibitions and increase sexual desire, these authors alleged that it diminishes the ability to peform sexually, and Julien (1981) maintained that since, on a pharmacological basis, Mandrax is similar to the barbiturates in its effects, it should actually be an <u>an</u>aphrodisiac. He maintained that any effects of this nature are largely influenced by set, setting and expectations.

Ostrenga (1973) reported that a methaqualone high produces a sensual and somewhat euphoric state. Inhibitions disappear; more candid, fluent communication creates a feeling of intimacy; and probably as a result of these effects, users have attributed aphrodisiacal properties to the drug.

Claus, Kling and Bolander (1980 & 1981), however, demonstrated that methaqualone, indeed has aphrodisiac potency in monkeys - which refutes the argument by other authors that increased sexual activity occurs as a result of expectations or set. In the 1980 study they administered methaqualone to an adult male, an adolescent male and a mid-ranking female, who formed part of a social group of monkeys with five other females and two infants. The drug trials were alternated with saline control studies. Affiliative activities such as grooming or huddling increased under the influence of methaqualone. The drug had a biphasic effect,.leading to more passive behaviours like the aforementioned in the first 80-100 minutes postinjection, followed by increased aggressive behaviour in the female, while the males started to either masturbate or autofellate. This behaviour had not been observed before during baseline observations, nor during the saline trials, but consistently occurred during the drug studies. After about two hours the social status and behaviour of the monkeys returned to predrug baseline levels. In the 1981 study they conducted five experiments in which methaqualone was administered to three monkeys caged together: an adult but naive male, who had been caged alone for infancy, and an adult and subadult female, both with extensive social

experience. Saline control studies were again carried out in between. Affiliative behaviour increased from experiment to experiment in all the monkeys. Under the influence of methaqualone, the naive male attempted to copulate. He succeeded by the fourth drug trial, and simultaneously established his dominance. During the saline trials, however, the behaviour of all the animals returned essentially to those observed during baseline studies. The authors concluded that methaqualone, in fact, did have aphrodisiac potency, best measured by the time the male was observed to have an erection under the influence of the drug, compared to no erection during the saline trials or the baseline studies.

SIMULTANEOUS USE OF ALCOHOL AND DRUGS

Concern has been expressed about the behavioural effects resulting from the combined use of alcohol and drugs, and it has been well documented that the effects of cannabis and alcohol on e.g. driving ability are additive (Julien, 1981).

Several studies have reported that it is dangerous to use methaqualone with alcohol, because the two substances act synergistically (have an additive effect) (Ostrenga, 1973; Tilstone & Reavy, 1978; Roden, Harvey, & Mitchard, 1977). This could increase the risk of death as a result of overdose. Roden et al. (1977) furthermore reported that alcohol decreases the elimination rate of methaqualone from the body, even when taken two or three days after the drug.

Kaplan and Sadock (1981) reported that when taking alcohol with drugs like tranquillisers, sedatives, or hypnotics that have additive effects, it produces a reaction similar to alcohol idiosyncratic intoxication, with abnormal behaviour that would not occur with alcohol alone. As Mandrax is a hypnotic, it therefore seems likely that the synergistic effect of the simultaneous use of alcohol and Mandrax may facilitate this syndrome of aggressive, assaultive, or criminal behaviour.

Research on the combined effect of alcohol, cannabis and Mandrax seems to be non-existent, as nothing could be located.

CLINICAL FACTORS ASSOCIATED WITH DYSCONTROLLED VIOLENCE

Lack of impulse control and habitual violence are types of behaviour often associated with criminal offences. Various authors reported a significantly high incidence of the following variables in association with impulsive violence:

ORGANIC DEFECTS

Organic defects occur much more commonly in patients with behavioural disorders than in the general population. This has been demonstrated in studies of violence in criminals or juvenile delinquents, the episodic behaviour disorders (including the dyscontrol syndrome), antisocial personality disorder, borderline personality disorder, as well as self-directed violence in the form of self-mutilating behaviour or suicide attempts (Bach-y-Rita et al., 1971; Coccaro, 1989; Elliott, 1976, 1982; Lacey & Evans, 1986; Linnoila, Virkkunen, Scheinin, Nuutila, Rimon, & Goodwin, 1983; Monroe, 1981; Ounsted, Lindsay & Norman, 1966; Osuna & Luna, 1989; Plutchik and Van Praag, 1989; Shoham, Askenasy, Rahav, Chard, & Addi, 1989; Spellacy, 1977; Tunks, 1977; Virkkunen, De Jong, Bartko, & Linnoila, 1989b).

HISTORY OF BIRTH TRAUMA OR HYPOXIA

Mednick, Brennan and Kandel (1988) found that and pre- and perinatal complications can play a causal role in criminal violence.

In the assessment of individuals with behaviour disorder the possibility of an underlying organic defect that stems from gestation or birth complications is often neglected. The birth process, even under well controlled conditions, is an exhausting, traumatic event for the fetus and complications during delivery or pregnancy may cause the fetus or newborn to suffer a decreased supply of oxygen (hypoxia). Although any structure in the body is susceptible to hypoxic damage, the most vulnerable organ is the brain. After delivery, severe infection of the airways or respiratory distress of any origin may also lead to hypoxic brain damage. Hypoxic exposure of the mature fetus and newborn, as in the adult, causes damage to the surface layers of the cerebral cortex.

The hippocampus is resistant to hypoxic damage in the fetus and newborn, but is easily damaged by hypoxia in the adult. Damage to the frontal cortex affects intellect, with consequent mental retardation, distortion of mental processing, or organic psychopathy (Towbin, 1989).

HEAD INJURY

Considerable evidence of a higher frequency of brain injury in violent offenders was found by Mednick et al. (1988).

A study of 424 patients who had sustained minor head truama (unconscious for <20 minutes; Glasgow Coma Scale score 13-15) revealed that many of these individuals may, in fact, have suffered organic brain damage as a result of a seemingly insignificant head injury at a frequency much more significant than was assumed in the past (Rimel, Giordani, Barth, Boll & Jane, 1981). These patients typically experienced problems in attention, concentration, memory and judgment; 79% complained of persistent headaches; 59% had memory problems; and 34% were still unemployed three months after the trauma. Alcohol use was found to be a very significant contributing factor to these head injuries, as alcohol was present in 43% of these patients at the time of the injury, and a surprising 31% of all patients had been hospitalised previously for head injury. Rimel et al. concluded that their observations supported the statement made by Sir Charles Symonds that "It is questionable whether the effects of concussion, however slight, are ever completely reversible" (p. 227).

OTHER PATHOLOGICAL FEATURES

Various authors found or cited evidence of several other pathological features associated with violent disordered behaviour:

Clinical/neurological signs

- "Soft" neurological signs (Zabow, 1986; Bach-y-Rita et al., 1971; Elliott, 1976).
- EEG abnormalities (Shoham et al., 1989; Elliott, 1982; Nelson, 1974; Bach-y-Rita et al., 1971).
- Hypoglycaemia (Virkkunen, Nuutila, Goodwin & Linnoila, 1987; Virkkunen, De Jong, Bartko, Goodwin & Linnoila, 1989a; Elliott, 1976).
- Broken bones (Bach-y-Rita & Veno, 1974).

Psychiatric features

- Depression (Bach-y-Rita et al., 1971; Frazier, 1974; Plutchik & Van Praag, 1989).
- Suicide attempts (Bach-y-Rita et al., 1971; Elliott, 1976; Lion, Bach-y-Rita & Ervin, 1972; Lewis, Shanok, Grant, & Ritvo, 1983; Fenwick, 1989).
- Self-mutilation (Bach-y-Rita & Veno, 1974; Shoham, et al., 1989).
- Anxiety (Apter, Van Praag, Plutchik, Sevy, Korn & Brown, 1990).
- Anger (Apter et al., 1990).
- Irritability (Coccaro, 1989).
- Sexual difficulties (Bach-y-Rita et al., 1970 & 1971; Bach-y-Rita & Veno, 1974; Frazier, 1974).

Antisocial manifestations

- Social maladjustment demonstrated by work and family instability (Fenwick, 1989).
- History of parental violence (Lion et al., 1972; Bach-y-Rita et al., 1971; Fenwick, 1989; Monroe, 1981; Lewis et al., 1983; Frazier, 1974).
- Pyromania / Firesetting (Bach-y-Rita et al., 1971; Bach-y-Rita & Veno, 1974; Lion et al., 1972; Hellman & Blackman, 1966).

• Cruelty as a child	(Bach-y-Rita et al., 1971; Bach-y-Rita & Veno, 1974; Felthous & Kellert, 1987; Lion et al., 1972; Hellman & Blackman, 1966).
• Dangerous driving of a motor car	(Elliott, 1976; Lion et al., 1972; Monroe, 1981; Fenwick, 1989).
• Frequent arrests/previous indictable offences	(Bach-y-Rita et al., 1971; Bach-y-Rita & Veno, 1974; Fenwick, 1989; Plutchik & Van Praag, 1989; Sayed, Lewis & Brittain, 1969).

MINIMAL BRAIN DYSFUNCTION

Although most children who suffer from hyperactivity or learning disabilities do not develop behaviour disorders, a childhood history of the controversial syndrome loosely defined as minimal brain dysfunction (MBD) or attention deficit disorder in childhood has often been found to exist in persons who exhibit violent, dysfunctional behaviour, alcohol or drug abuse, frequent arrests, traffic violations, and suicide attempts (Andrulonis et al., quoted in Fenwick, 1989). The following are examples of such findings in terms of certain elements of MBD:

• Childhood hyperactivity	(Ounsted et al., 1966; Bach-y-Rita et al., 1971, Elliott, 1976, Satterfield, Hoppe & Schell, 1982; Fenwick, 1989; Lewis, 1990).
• School failure / Learning disabilities	(Elliott, 1982; Fenwick, 1989; Lewis, 1990; Slavin, 1978).
• Enuresis after age of 5	(Bach-y-Rita et al., 1971; Lion et al. 1972; Hellman & Blackman, 1966).

Wender (cited in Wood et al., 1976) hypothesised that the relationship between MBD and later maladaptive behaviour might be explained on the basis of an abnormality of monoamine metabolism which could manifest in the following way:

> Two primary physiological defects underlie and generate many of the symptoms... These are (1) an abnormality in arousal that produces increased activity and an inability to focus attention, concentrate, or inhibit irrelevant responses, and (2) a diminished capacity for positive and negative affect, the subjective aspect of which is diminished experience of both pleasure and pain, and the behavioural manifestations of which are a decreased response to both positive and negative reinforcement... From these primary deficits a number of secondary psychological and behavioural abnormalities might be generated. The decreased pleasure and pain sensitivity might cause greater stimuli-seeking and pleasure-seeking, a decrease in sensitivity to first external and then internal reinforcement, which in turn can be associated with impulsivity, disobedience in childhood, and rule breaking in adulthood. The lack of sensitivity to others' demands, together with the affective lability, would - and do - produce impairment in interpersonal relationships. Academic performance and job performance suffer because of inattentiveness, distractibility, inability to tolerate frustration and comply with burdensome demands.... Abortive compensatory mechanisms generate further pathology and change the patient's diagnostic label: if the individual acts out excessively, he is labeled a sociopath; if he self-medicates, albeit effectively, with ethanol or illicit drugs, he is apt to be termed an alcoholic or drug abuser (p. 1459).

Wender thus postulated that a complex interaction of biological, psychological, and socio-cultural factors contributes to the development of maladaptive behaviour.

NEUROBIOLOGY OF DYSCONTROLLED/HABITUAL VIOLENCE

Historically, the focus of classical neuropsychology has been on structural localisation of focal lesions of sudden onset. Conditions which are diffuse and of gradual onset - commonly found in psychiatric settings - have only recently become an area of interest to neuropsychologists. This new emphasis implies the increasing recognition that a disease which is structurally or biochemically diffuse may present with functionally focal symptomatology, and conversely, evidence of a focal dysfunction does not necessarily imply a corresponding structural or biochemical focus (Goldberg, 1986).

Although it is important to know the specific types of abnormalities that lesions in certain areas of the brain can produce, Gorenstein and Newman (1980) proposed that focusing on the behavioural effects rather than the anatomical localisation of lesions, is more relevant to advancing our understanding of impulse dyscontrol in humans.

The neurobiologic substrate of dyscontrolled violent behaviour has been investigated from various perspectives across several disciplines, including neuroanatomic studies of patients with known brain damage, neurophysiological investigations, biochemical research on neurotransmitter and neuroendocrine substances, genetic studies, neuropsychological investigations, as well as pharmacological response to treatment. On the basis of these findings, several researchers have proposed a link between criminality, violence and impulse dyscontrol (Nell, 1990a; Van den Worm & Wissing, 1990; Shoham, Askenasy, Rahav, Chard, Addi, & Addad, 1988; Shoham et al., 1989; Heilbrun, 1984; Goldwater, 1981; Coccaro, 1989; Coccaro, Siever, Klar, Maurer, Cochrane, Cooper, Mohs, & Davis, 1989; Ullman, 1988; Virkkunen, Nuutila, Goodwin, & Linnoila, 1987; Linnoila et al., 1983).

The following overview will highlight findings from various fields of research with regard to impulse dyscontrol and violence.

GENETIC STUDIES

In two independent studies on mice in different laboratories it was found that different sublines could be clearly distinguished on the basis of their fighting behaviour and that the descendants showed a definite genetic basis for their behaviour which seemed to be inherited as a recessive characteristic as a result of a single major gene. Further confirming the genetic basis for aggressive strains, was the finding that when newborn mouse pups of one genotype were raised among litters of the opposite genotype, their aggressive behaviour in adulthood reflected their genetic makeup and not their environmental experience. In addition, this research revealed a significant association of high levels of fighting behaviour with high levels of cyclic adenosine monophosphate (cAMP) in the brain. Cyclic AMP participates in the activities of many hormones, including catecholamines, ACTH, and vasopressin, and the author proposed that this correlation between cAMP and fighting behaviour suggests that cAMP might be a second messenger mediating the effects of central neurotransmitters on aggressive behaviour (Ciaranello, 1977).

Plutchik and Van Praag (1989) cited studies on behavioural genetics which confirmed that aggression has been demonstrated to be heritable in mice and in dogs, and as far as human studies were concerned, there were indications that many personality traits such as assertiveness, extroversion and dominance are heritable. They mentioned that although unconfirmed, three human studies have suggested a genetic component to aggressive behaviour.

In recent twin and adoption studies by Mednick et al., (1988), the influence of heritable factors in the aetiology of criminality was confirmed, but this relationship was only significant with regard to property offences, and the data did not support a genetic predisposition to violence. Cloninger and Gottesman (1987) reported similar findings from the literature - one study in particular, found a 78% heritability rate for property offenders vs. 50% for a liability to crimes against persons. Another adoption study (Moffitt, 1987) similarly found significant results for nonviolent criminality and a nonsignificant elevation for rates of violence. Parental drug and alcohol abuse, and personality disorder was strongly associated with sons' later criminal involvement. Mednick, Gabrielli & Hutchings

(1987) studied all nonfamilial adoptions in Denmark from 1924 to 1947 and noted a relationship between criminal convictions in biological parents and their adopted-away children which was particularly strong in the case of chronic offenders.

The evidence regarding a genetic component in human violence remains inconclusive. Although twin and adoption studies are the most reliable to distinguish purely genetic from potential environmental influences, twins and adoptions comprise a small percentage of the total population, so it would be a difficult task to find a fairly large number who have committed crimes - or even more specifically violent crimes. Several of these studies have been conducted in Scandinavia, because they have comprehensive records with follow-up information. Cultural differences are known to exist with regard to inclination for violence, and since Sweden has been noted to have a relatively non-violent population (Elliott, 1993), Scandinavia may not be a particularly good choice for the study of a genetic component in violent crime.

Studies which did find a significant relationship between violence in biological parents and offspring, e.g. Lewis, Shanok, Grant and Ritvo (1983), however, do not seem to attach equal weight to the potential influences of genetics and environment, but seem to attribute positive findings almost exclusively to environmental factors. In the light of the abovementioned research on mice, where environment had no influence on aggressive behaviour, these findings should perhaps be reviewed from the point of view of that genetic factors may at least have an equal influence.

FRONTAL LOBE SYNDROME

The frontal lobes play an important role in learning and in the development of impulsive, aggressive and antisocial behaviour, as they perform a critical function in the anticipation, regulation, and inhibition of behaviour. The criminological literature confirms that there is a similarity between the syndrome observed in association with anterior (frontal and temporal) brain abnormalities and the behavioural and emotional disturbances underlying certain types of criminality and dyscontrolled violent tendencies (Elliott, 1978; Fishbein & Thatcher, 1986; Gorenstein, 1982; Gorenstein & Newman,

1980; Kandel & Freed, 1989; Lishman, 1968; Lueger & Gill, 1990; Pontius & Ruttiger, 1976; Pontius & Yudowitz, 1980).

Some of these behavioural similarities include:

- Failure to inhibit inappropriate responses.
- Impaired cognitive flexibility.
- Low frustration tolerance, extreme irritability, and a low threshold for anger or aggression.
- Perseveration in the application of a preferred mode of responding, particularly in situations which require a shift in response strategies. This impairs problem-solving and complex learning abilities.
- Blunted feelings.
- Hyperactivity and restlessness.
- Hyperreactivity to environmental stimuli, resulting in distractibility.
- Inability to select and execute plans, especially long-term.
- Impaired social behaviour and personality deviation.
- Altered sexual behaviour.

(Kolb & Whishaw, 1985; Lezak, 1983; Lueger & Gill, 1990; Luria, 1973; Nell, 1990b; Stuss & Benson, 1984)

Impaired associative learning is also exhibited, e.g., inability to be trained to respond consistently with the right hand to a red light and with the left hand to a green light. This inability to regulate behaviour by external stimuli, can render behaviour inflexible and disorganised (Lezak, 1983).

Two types of personality change associated with frontal lobe disturbance have been described by Blumer and Benson (1975, cited in Kelly and Kirshner, 1986):

- Pseudodepression (most likely after left frontal lobe lesions), manifesting as outward apathy and indifference, loss of initiative, reduced sexual interest, little overt emotion, and little or no verbal output.
- Pseudopsychopathic (most likely after right frontal lobe damage), with irritable, impulsive and immature behaviour, lack of tact and restraint, coarse language, promiscuous sexual behaviour or changes in sexual libido, increased motor activity, a general lack of social graces, and sometimes incontinence of urine.

Luria (1973) linked dyscontrolled violent behaviour to the basal (orbital) zones of the frontal lobes:

> A lesion of these zones leads ... to definite signs of generalized disinhibition and gross changes in affective processes ... in the form of lack of self-control, violent emotional outbursts and gross changes in character (p. 223).

The prefrontal cortex provides the highest control of affective behaviour and is able to effect control of basic emotional behaviour by means of its close connections with the limbic system. Lesions in the prefrontal area therefore usually produce changes in personality and social behaviour and also interfere with the planning and execution of complex behavioural programs (Lezak, 1983).

As the highest level of integration of all modalities of internal and external stimuli takes place in the frontal lobes, this area also has a complex and widespread range of interconnections with numerous other brain structures:

> Experimental studies in the rhesus monkey have shown that the prefrontal area receives an abundance of afferent connections from each sensory association region of the cortex, either by direct linkage or via the dorsomedial thalamic nuclei. Subcortical afferent connections to the frontal regions arise from the dorsomedial and intralaminar nuclei of the thalamus, hypothalamus, hippocampus, amygdala, septum, and midbrain tegmentum. Through these systems the frontal lobes presumably receive neural information regarding both the external environment and the internal milieu of the individual. Efferent corticocortical connections project mainly to the anterior temporal, inferior parietal, and limbic cortical areas. Extensive subcortical efferent connections extend from the frontal lobes to the hypothalamus, septum, amygdala, hippocampus, dorsomedial and intralaminar nuclei of the thalamus, midbrain tegmentum, striatum, and subthalamus. The strong bidirectional association with limbic and reticular activating system structures implies a major role for the frontal lobes in the modulation of arousal, motivation, and affect. Furthermore, different cortical regions within the prefrontal area have distinctly different afferent and efferent connections. (Kelly et al., 1986, p. 103)

This would therefore explain why lesions in different areas of the frontal lobes result in a diverse, puzzling range of behavioural deviations. A breakdown anywhere in the connection systems can furthermore also affect the effective functioning of the organism.

Goldberg (1986) observed that brain conditions which may be diffuse in structural/biochemical terms are more likely to have the functional appearance of a selective frontal lobe syndrome than any other focal syndrome on account of factors outlined in several arguments:

- The phylo- and ontogenetically youngest cortical structures involving the most complex and evolutionary recent cognitive functions are the most vulnerable to functional disruption in the presence of diffuse disease.

- The prefrontal cortex, with its uniquely rich set of afferent and efferent projections interconnecting with virtually every other functional system in the brain, is the most likely to become disordered, as its function relies heavily on input from various neuroanatomically remote areas of the brain, and diffuse or remote disturbances would thus have a cumulative effect on anterior brain function.

- The most important contribution of the prefrontal cortex is towards the least overlearned behaviours which require control and selection of cognitive operations, planning, attention and decision-making. Since generalised cognitive breakdown is known to affect the least routinised and least overlearned functions first, the functions controlled by the prefrontal lobes are most vulnerable to disruption.

TEMPORAL LOBES: THE LIMBIC SYSTEM

Clinical and empirical evidence indicate that explosive rage often results from disorders affecting the limbic system (Elliott, 1978).

The limbic system is the phylogenetically older, more primitive part of the forebrain. It acquired its name because it not only forms a bordering zone (limbus) between the diencephalon and telencephalon

(i.e. the posterior and anterior parts of the forebrain in embryonic development), but also fulfils an intermediate function between the emotive and cognitive aspects of consciousness (Wilkinson, 1986). It consists of a number of structures and extends across midbrain areas of the temporal lobes and the subcortical forebrain. The limbic system controls autonomic functions, expression of emotions, feelings, arousal, "fright, fight or flight" responses, and motivation (Janicki, Note 4). It is also responsible for sexual responses, the neural control of visceral functions and chemical homeostasis, and contains so-called "pleasure centres". A number of limbic structures (the amygdala, hippocampus, hypothalamus, cingulate gyrus, cingulum, septum pellucidum and septal area) are responsible for the control of aggression in conjunction with related portions of the thalamus, basal ganglia, and orbital regions of the frontal lobes and midbrain. The limbic system contains both excitatory and inhibitory mechanisms for aggression (Lezak, 1983).

Shoham et al. (1988) cited several animal and human studies exhibiting anatomical evidence of limbic involvement in violent behaviour, which support the opinion that the limbic system plays a role in impulsive violence.

On the basis of previous studies, Nell (1990a, p.239) noted that "electrophysiological and phenomenological evidence overwhelmingly supports the view that limbic activation contributes to the dyscontrol phenomenon". He suggested that the hypothesis that dyscontrol is mediated by the limbic system merits consideration, and speculated that neurotransmitter systems may play a role in this process.

Trimble (1981) cited several previous studies as evidence for the role of the limbic system in aggressive, sexual and motivational behaviour, autonomic changes, exaggerated responses to painful stimuli, defence reactions, and impairment of normal inhibitory responses to punishment. He also noted that the limbic system, and the amygdala in particular, is the area where seizures are most easily kindled, and consequent neuronal changes which develop appear to be persistent.

A temporal lobe which chronically generates abnormal discharges, may produce abnormalities in the biochemistry or the electrophysiology of the brain which may lead to abnormal behaviour (Kolb & Whishaw, 1985).

CEREBELLAR INVOLVEMENT

Although involvement of the cerebellum in the control of violent behaviour is a relatively new concept in the clinical sphere since clinicians do not ordinarily associate subtentorial lesions with mental and emotional disorders, this factor has been a topic of interest to neuroscientists for some time (Elliott, 1992). In a review of this topic, Elliott cited a study done in 1937 where such symptoms occurred in 47% of 110 cases of cerebellar and other subtentorial tumours, and said that the usual tendency was to interpret these symptoms as reactions to fear or incapacity. He also described experiments in which sham rage could both be inhibited and elicited by weak electrical stimulation of the cerebellar cortex in animal studies, which stimulated attempts to control both seizures and extreme violence in man in this way.

Two reports of successful control by using a pacemaker to stimulate the anterior lobe of the cerebellum are cited by Elliott (1992). In the one study, violent aggressive behaviour in schizophrenics was effectively suppressed, and in another, seizures and rage attacks were similarly successfully arrested. Elliott further mentioned that by making use of magnetic resonance imaging and positron emission tomography, it has been demonstrated that in humans the cerebellum plays a role in the learning process, in judgment of the passage of time, in the cognitive processing of verbal material, and also possibly in the learning of motor skills. According to Elliott, these findings are provocative, as many adults with episodic dyscontrol have a history of problems in learning simple motor skills and/or a lifelong history of clumsiness.

Some of the aforementioned cerebellar functions may also play a role in characteristic deficiencies of psychopaths (e.g. inability to learn from experience (Barton, 1975; Cleckley, 1982), or a profoundly disturbed time sense (Hare & Cox, 1978; Harrington, 1972)), and delinquents (e.g. inferior performance on tests requiring verbal skills (Binder, 1988)). Specific learning disabilities such as dyslexia and other verbal difficulties, e.g. dysarthria, minor degrees of aphasia and other disorders of language have also been found in individuals suffering from the dyscontrol syndrome (Elliott, 1982).

It should, of course be kept in mind that dysfunctions that have classically been associated with injury to a specific brain area, may, in the absence of structural pathology, still present in a similar way if there is some defect in the neural transmission system connecting that area with other structures involved in a specific function.

NEUROPHYSIOLOGY OF IMPULSE CONTROL IN ANTISOCIAL BEHAVIOUR

As a result of technological progress and new developments in neurophysiological recording techniques, knowledge of the neurophysiological mechanisms underlying many pathological conditions has increased substantially in the past two decades. This has rekindled the search for a physiological explanation for syndromes of dyscontrol or disinhibition and psychopathy in particular.

Dysfunctional impulse control involves a state of cortical excitement with autonomic nervous system and bodily changes, which constitutes an optimal condition for transforming aggression into violent behaviour. Adams (1982, cited in Shoham et al., 1988) proposed that there are four components to impulsiveness: a provocative stimulus, a feeling response, visceral changes, and irrational outbursts. Since the impulsive action is not logically or proportionately related to the triggering factor (which sometimes seems to be totally absent), the person impulsively "overreacts". During this period of dyscontrol which may last for minutes, hours or weeks, the individual is incapable of logically evaluating and interpreting his behaviour and actions, and may also manifest cognitive incoherence (Shoham et al., 1988).

Electrocortical activity: EEG studies

A substantial number of investigations of organic dysfunction in criminals and psychopaths focused on EEG findings:

Williams (1969) found that about two-thirds of habitually aggressive criminals had abnormal EEGs, with the abnormalities occurring notably more often in the anterior, effector part of the brain, and more specifically involving the anterior temporal and lateral frontal areas. He suggested that this slow-wave activity may reflect some form of underlying cortical or subcortical dysfunction, e.g., of the limbic

system, indicating low cortical arousal with a resultant proneness to becoming drowsy during the EEG recording. There was evidence in a number of other studies too of a substantial percentage of criminals displaying EEG abnormalities (Sayed, Lewis, & Brittain, 1969; Nelson & Murdoch, cited in Nelson, 1974)).

Hill and Pond (quoted by Gross, 1972) found there were 18 epileptics among 100 people on trial for murder - more than 30 times the incidence in the general population. Gross also quoted several other studies with significant EEG differences in murderers.

Hare and Cox (1978) reported that fairly consistent EEG findings in psychopaths have accumulated over the years. The most frequent finding was excessive slow-wave activity in the theta band, which has been interpreted in several ways, one of which is the opinion that the adult psychopath's EEG reflects cortical immaturity, possibly related to delayed cortical maturation, because this slow-wave pattern is typical of normal children (Jutai, 1989; Surwillo, quoted in Fishbein & Thatcher, 1986).

In a review of studies of brain-wave activity in psychopaths, Syndulko (1978), however, criticised much of the research in this area. He concluded that it has yet to be firmly established that psychopaths are characterised by amounts of slow-wave activity that could be considered abnormal.

Weller (1987) reported that in explosively violent and unpredictable individuals, EEG abnormalities often occur especially in the temporal area in the form of either spike discharges or non-specific slow-wave activity. He found that in violent offenders who were not habitually aggressive, however, the percentage of EEG abnormalities decreased from 65% to 24%.

Shoham et al. (1988) agreed with these findings after reviewing previous studies, concluding that EEG slowing towards the theta range, mainly over the temporal lobes, characterises violent prisoners. They also suggested that this pattern is related to stimulus hunger, a characteristic of impulsive violent subjects. They concluded that the generally accepted opinion today is that an epileptic EEG record does not necessarily imply aggressive behaviour, but that there is a

specific type of temporal lobe epilepsy originating in the amygdalo-hippocampic region which is closely related to aggression and impulsive violence.

Zabow (1986) reported that in a previous study of 202 homicide defendants, he found that 15.7% were epileptic and 8.9% had abnormal EEGs. He, however, emphasised that although there is a high incidence of epileptics in the criminal population, there is abundant evidence from the literature that there is little connection between aggressive criminal behaviour and epilepsy in the interictal period (i.e. between epileptic attacks). He furthermore stated that dangerously violent behaviour during epileptic automatisms or postictal confusional states is very rare, and that epileptics should not automatically be associated with dangerousness or criminality, because it might attach a negative stigma to epileptics - and certainly not all epileptics have psychopathic or violent tendencies.

Although the EEG has been recognised as a valuable diagnostic tool in fields like neurology and neurosurgery, it has not proved to be as effective as a research tool in the behavioural sciences, such as neuropsychology (Nelson, 1974). Interpretation of the significance of EEG findings is complicated on account of several potential limitations:

- Different studies use different recording techniques with variable sensitivy to abnormalities. Some may have done simple baseline recordings only, while others may in addition have used dissimilar EEG activation techniques, e.g., hyperventilation, photic stimulation, sleep recordings, or drug-induced activation (e.g. using alpha chloralose).

- In many studies EEG recordings were obtained as part of routine medical or psychiatric procedures, with the result that experimental control, quantification of the data, and diagnosis of the patients are often inadequate (Hare & Cox, 1978).

- The EEG can merely be regarded as a potential indicator of disturbed neurophysiology, and a normal EEG record cannot be regarded as definitive evidence of absence of brain dysfunction.

- Interpretation of the EEG record involves a degree of subjectivity and different clinicians often give dissimilar interpretations of the same record.

- Furthermore, the common method of using surface electrodes for EEG recordings, can only pick up electrical activity from the outer centimetre or so of the surface of the brain (Gross, 1972). Studies using both surface and depth electrodes in e.g., the deeper lying limbic structures have proved that depth electrodes can reflect EEG abnormalities while simultaneous surface tracings remain normal. Bach-y-Rita et al. (1971), for example, found a high incidence of abnormal EEGs by performing simultaneous depth and surface EEG recordings on patients with explosive violent behaviour. They frequently observed that if seizural activity occurred deep in the temporal lobe, this abnormality was usually not detectable at surface recording sites.

- An EEG in the waking state is insufficient, as most abnormalities appear during sleep.

- Another source of confusion is the observation that when treating behaviour disorders with anti-epileptic medication (e.g., phenobarbital and diphenylhydantoin), not all people find benefit. It is then concluded that EEG abnormalities are not significant. But phenobarbital controls primarily grand mal manifestations, and diphenylhydantoin is often less effective than other anticonvulsants in the case of subconvulsive disorders, and medication often has to be carefully tailored to a specific person's needs. Thus, a wrong conclusion may be drawn about the significance of EEG abnormalities (Gross, 1972).

In the light of the above as well as for practical reasons such as unavailability of EEG facilities, EEG investigations were not carried out in the present study.

Electrodermal activity

Poor inhibitory control has been proposed as a model of processes underlying antisocial behaviour (Waid & Orne, 1982; Elliott, 1978). In studies of anticipatory autonomic responses in conditioning models, psychopaths have consistently been found to give relatively small electrodermal responses in conflict situations, such as anticipation of an aversive stimulus (Forth & Hare, 1989). Hare (1968) suggested that psychopaths may be underresponsive, both sympathetically and parasympathetically, in terms of the range of autonomic activity they are capable of.

Levander, Schalling, Lidberg, Bartfai, and Lidberg (1980) found that criminals scoring high on impulsivity, had longer mean electrodermal recovery rates, and suggested that recovery time is related to the speed of reduction in autonomic arousal after a successful avoidance response, with slower recovery resulting in a weaker reinforcement via a slower fear reduction and consequently less effective avoidance conditioning.

Waid & Orne (1982) suggested that a disturbance of the physiological processes underlying the electrodermal response (EDR) may play a role in the development of antisocial behaviour through a detrimental effect on the inhibition of impulses. Psychopaths might consequently be unable to inhibit a dominant impulse. This theory was confirmed by the results of their study, as antisocial subjects both demonstrated differentially lower electrodermal responses on a response conflict task similar to the Stroop interference task, and made more errors in this task.

Schalling (1978) suggested that in psychopaths the frontal cortex seems to exert reduced inhibitory control over autonomic and motor systems, as a result of low cortical arousal and high reticular thresholds. Arousal can vary along a continuum from coma or deep sleep to wild excitement and may be manifested physiologically in EEG, autonomic, and electromyographic changes (Mawson & Mawson, 1977).

Mawson and Mawson, however, alleged that psychopaths display a faster rate and a greater magnitude of change in physiological and behavioural activity than normal people. Based on evidence from the literature reviewed, they hypothesised that psychopaths do not have

a uniformly low level of CNS and autonomic arousal and are not uniformly underreactive in all situations, but would be more likely to exhibit greater variability in CNS and autonomic arousal. They rejected the concept of a unitary arousal system, and proposed that there would more likely be at least two systems of arousal- two mutually inhibitory neurotransmitter systems which would individually regulate a pattern of diffuse sympathetic- and parasympathetic-like responses.

Gray's model of three arousal systems

Fowles (1980) reviewed the work of Gray at Oxford University in 1975, who proposed a model of three arousal systems explaining the clinical features of psychopathy in terms of psychophysiological processes. Gray's theory postulates a behavioral activation system (BAS), a behavioral inhibition system (BIS), and a non-specific arousal system receiving excitatory inputs from both the BAS and the BIS.

The BIS is viewed as an anxiety-related arousal system which is responsible for the inhibition (as opposed to activation) of behaviour in response to aversive conditioned stimuli which signal either response-contingent punishment (passive avoidance) or the absence of expected response-contingent reward, i.e. frustrative non-reward (extinction). Pharmacological substances which appear clinically to reduce anxiety (e.g. alcohol, barbiturates, and minor tranquillisers) have been found to disinhibit passive avoidance responses in a conditioned approach-avoidance conflict situation, and also produce resistance to extinction in response to omission of conditioned reward (frustrative non-reward). These anti-anxiety drugs, however, do not affect escape learning or one-way active avoidance (e.g. where an animal's response is to go to a place where it has never been shocked). Such drugs therefore reduce or inhibit the effectiveness of the BIS. These drug-related findings lend further support to the suggested realm of function of the BIS, as Fowles pointed out that the BIS similarly does not have an important effect on active avoidance, unless it involves a conflict with passive avoidance. He emphasised the point that the BIS is not responsible for avoidance per se, but only for passive avoidance in response to conditioned punishment stimuli.

The BAS, on the other hand, initiates behaviour in response to positive incentives, such as conditioned stimuli for reward, and can be viewed as an appetitive, reward-seeking system that facilitates approach behaviour.

The third component of the model is a non-specific arousal system, which Gray associates with the reticular activating system. Arousal effects are assumed when an increase in behavioural or response intensity occurs which cannot be attributed to an increase in incentive. Both the BIS and the BAS provide excitatory inputs to this general system of arousal.

Fowles suggested that the operation of these systems is reflected by the anticipatory autonomic responses of subjects in conditioning and quasi-conditioning situations - the anticipatory heart rate acceleration being an index of incentive-related activation (as opposed to somatic activity per se) of the BAS, while skin conductance or electrodermal activity reflects that of the BIS.

Fowles proposed that certain clinical aspects of psychopathy can be interpreted as a direct manifestation of a weak or deficient BIS. As a result, psychopaths exhibit normal approach behaviour, heart rate, and active avoidance, but suffer from poor passive avoidance and extinction, with absence of anxiety and reduced electrodermal activity in response to threats of punishment or nonreward. Inability to learn from negative experience, probably on the basis of dysfunction of the BIS, is a typical cognitive defect in psychopathy (Barton, 1975; Cleckley, 1982) and in the impulse dyscontrol syndrome (Björvell, Edman, Rossner, & Schalling, 1985, cited in Sohlberg, Norring, Holmgren, & Rosmark, 1989). Psychopaths moreover often exhibit strong stimulation- or reward-seeking behaviour, which will appear to be impulsive (Fowles, 1980).

Trasler (1978) similarly proposed that the lack of internalised inhibition of socially prohibited behaviour (which is characteristic of primary psychopaths) may be due to a defect in the physiological processes upon which internally mediated inhibitory responses apparently rely. In substantiation of this theory, he cited the findings of Gray that certain drugs, e.g. sodium amylobarbitone, produce profound, temporary, and reversible interference with passive avoidance

responses, but without impairment of other learned responses. He nevertheless proposed that psychopathic behaviour may not necessarily be the result of physiological defects alone. Whereas some psychopaths may not have developed internalised inhibitions because they are physiologically unable to do so - however favourable the circumstances - others may not have had sufficient exposure to adequate social training, and yet another group may not have been subjected to sufficient training, but would not have been able to benefit from it in any case. Trasler further suggested that these factors should be interpreted as existing in terms of continua rather than as categories of extremes.

Also drawing upon Gray's BIS/BAS theory, Fenwick (1989) suggested that in man, the BIS mediates not only anxiety but also impulse control. He proposed that a relationship exists between changes in brain catecholamines, disordered impulse control and episodic violent behaviour, on the basis that the BIS is a neurotransmitter system which controls activity in the hippocampus and also projects to the frontal and septal regions of the forebrain. In several experiments on various populations Fenwick demonstrated that changes in cortical excitability (measured by the difference between the contingent negative variation "go/no go" amplitudes) correlated with poor impulse control.

Based upon their review of the psychophysiological literature on psychopathy, Mawson and Mawson (1977) proposed that this syndrome might be the manifestation of a specific biochemical disturbance characterised by abnormal oscillations in neurotransmitter functioning, autonomic activity, and behaviour.

NEUROCHEMISTRY OF DYSCONTROL AND VIOLENCE

As early as 1915, Cannon suggested that central neurochemical processes may constitute the neural substrates for states of mood and emotions, such as anxiety, fear, and rage (Redmond, Katz, Maas, Swann, Casper, & Cavis, 1986). Probably partly as a result of the lack of success of social and behaviouristic treatment of violent behaviour, but no doubt also due to scientific progress in the field of biochemistry, considerable attention has in the last twenty years been focused on the role of monoamines such as serotonin, noradrenaline and

dopamine in behaviour disorders. Results of research on neurotransmitters, especially serotonin, predominantly support the hypothesis of a common underlying biochemical disturbance contributing to aggression dysregulation in both outwardly and self-directed violent behaviour.

Trimble (1981) observed that three of the neurotransmitters, i.e., serotonin, noradrenaline and dopamine, are concentrated mainly within the brainstem and limbic system, and emphasised their central role in the regulation of emotion and behaviour. He noted an interesting finding, namely that kindling of dopamine systems leads not to convulsions, but to marked behaviour changes (e.g. fear reactions, increased aggressive behaviour and loss of affection), which can be inhibited by dopamine receptor antagonistic drugs. (Kindling signifies a process in which repeated sub-threshold stimulation to certain areas of the brain leads to increasing behavioural and seizural responses which eventually may occur spontaneously (Post, Uhde, Putnam, Ballenger, & Berettini, 1982; Trimble, 1981).)

Serotonin, a central nervous system inhibitor, has been demonstrated to modulate mood (Montgomery & Fineberg, 1989), aggression, avoidance learning, attention, activity level, self-stimulation, sexual behaviour, pain, sleep, temperature, water consumption and appetite (Mandell & Knapp, 1979).

Reis (1974) postulated that serotonin is predominantly inhibitory to several modes of aggressive behaviour. Plutchik and Van Praag (1989) proposed a model of interaction between emotional and neurobiological excitatory and inhibitory systems and suggested that low serotonin levels would be associated with increases in behaviour facilitated by the excitatory system (sexual, social, and aggressive), whereas high levels of serotonin would tend to inhibit such activities.

A review of research over the last two decades on the role of central neurotransmitter function in the regulation of behaviour, has provided increasing support for the theory that an important behavioural correlate of central serotonin system dysfunction is impulsive aggressive behaviour (Coccaro, 1989; Linnoila et al., 1983), either directed towards others, e.g. assault or murder (Virkkunen et al., 1989a; Lidberg, Tuck, Åsberg, Scalia-Tomba, & Bertilsson, 1985), the self, e.g. suicidal behaviour (Åsberg, Träskman, & Thorén, 1976; Brown,

Ebert, Goyer, Jimerson, Klein, Bunney, & Goodwin, 1982; Lidberg et al., 1985; Roy, De Jong, & Linnoila, 1989; Virkkunen et al., 1989b), and self-mutilation/borderline personality disorder (Brown et al., 1982), or towards property, e.g. arson (Virkkunen et al., 1987).

In addition to inverse correlations between levels of CSF 5-HIAA and life history of aggression and suicide attempt, Brown et al. (1982) also found a strong negative correlation between CSF 5-HIAA concentrations and the psychopathic deviate scale of the MMPI.

Impulse dyscontrol has been suggested as the common underlying dysfunction connecting low CSF levels of the principal serotonin metabolite, 5-hydroxyindoleacetic acid (5-HIAA), with violent and suicidal tendencies (Linnoila et al., 1983; Lidberg et al., 1985). Virkkunen et al. (1987, 1989b) concluded that since impulsive fire-setting is an extreme example of impulse control disorder, the very low levels of CSF 5-HIAA in their group of arsonists are compatible with the hypothesis that diminished CNS serotonin turnover is primarily associated with poor impulse control. Plutchik and Van Praag (1989) furthermore demonstrated that impulsivity correlated significantly with both violence and suicide risk on psychometric measures.

Positive results indicating low serotonin levels have also been found in studies of another disorder of impulse control, i.e. alcohol abuse (Ballenger, Goodwin, Major, & Brown, 1979; Bailly, Vignau, Lauth, Racadot, Beuscart, Servant, & Parquet, 1990). Linnoila, De Jong, & Virkkunen (1989) furthermore found that violent offenders and impulsive arsonists with alcoholic fathers had lower mean CSF 5-HIAA levels than subjects without alcoholic fathers.

Certain studies found that similar monoamine disturbances to those observed in behaviour disorders, occur in dysregulated mood states, e.g. depressive disorders. Two opposing hypotheses developed with regard to the latter. The traditional hypothesis postulated that the evidence of reduced monoamine metabolites found in depression is the result of diminished monoamine metabolism as well as function. An alternative hypothesis, however, proposed that monoaminergic hyperactivity played a role in the pathogenesis of depression, as "decreased metabolism might also be secondary to increased monoaminergic function (e.g. as a result of hypersensitive postsynaptic

monoamine receptors).... Further research led to the conclusion that reduced functional activity is probably confined to the β-adrenergic system, while the functional activity of the α-adrenergic and the serotoninergic system increases" (Van Praag, 1982, p.1263). Although Van Praag favoured the traditional hypothesis, he cited studies which lend support to both the traditional and the alternative hypotheses.

Redmond et al. (1986) investigated the relationships between certain behavioural measures postulated to be associated with noradrenaline, dopamine and serotonin activity in the brain by means of levels of the main metabolites of these amines in cerebrospinal fluid (CSF), i.e. depressed mood, anxiety, agitation, anger, rage, and hostility. The most significant finding from this study was that depressed subjects with increased anxiety, agitation, somatisation, and sleep disturbance manifested meaningfully elevated CSF concentrations of the principal noradrenaline metabolite, 3-methoxy-4-hydroxyphenylglycol (MHPG). They concluded that this is consistent with the inverse or alternative monoamine hypothesis which suggests that tricyclic antidepressants achieve their effects by down-regulating or attenuating noradrenaline function rather than enhancing it.

Several reports of low CSF levels of the serotonin metabolite, 5-HIAA, in endogenous (vital) depression have been cited by Van Praag (1977), although he noted that virtually no evidence of decreased 5-HIAA was found in the group of personal depressions.

After reviewing existing evidence of disturbed serotonin metabolism in affective disorders and aggression disorders, Van Praag (1986) proposed that disturbances in serotonergic regulation may be a common factor giving rise to both mood and aggression dysregulation, which would provide a biological explanation for the clinical observation that there is often a close association between these disorders.

A further psychopathological dimension that has recently been linked to serotonergic function, is anxiety. CSF 5-HIAA levels of 43 children with primary obsessive-compulsive disorder (OCD) - classified in the DSM-III as an anxiety disorder - correlated negatively with one of eight measures of severity of obsessive-compulsive disorder, and positively with three of seven measures of improvement after treatment with clomipramine, a serotonin potentiator (Swedo, Leonard, Kruesi,

Rettew, Listwak, Berrettini, Stipetic, Hamburger, Gold, Potter, & Rappoport, 1992). A serotonin reuptake blocker, fluoxetine (Prozac), has recently been found to reduce explosive outbursts of rage in 13 of 18 Vietnam War veterans with the anxiety disorder diagnosis of post-traumatic stress disorder (Shay, 1992). Van Praag, Kahn, Asnis, Wetzler, Brown, Bleich, and Korn (1987) cited evidence from several placebo-controlled studies that found the potent serotonin reuptake inhibitor, clomipramine (Anafranil) to be effective in the treatment of OCD. Several other studies have also intimated a role for serotonin in anxiety regulation (Kahn, Van Praag, Wetzler, Asnis, & Barr, 1988; Ratey, Sovner, Parks, & Rogentine, 1991; Van Praag, 1991).

Abnormalities of serotonin metabolism have thus been reported to be related to a variety of psychopathological dimensions such as aggression dysregulation, impulse dyscontrol, depressed mood, suicidal tendencies, anxiety, and alcoholism. Consequently, researchers set out to investigate whether there are interrelationships between these characteristics. Apter, Van Praag, Plutchik, Sevy, Korn and Brown (1990) studied 60 psychiatric inpatients by means of psychometric measures of these variables, finding that scores on all of these measures tended to be significantly correlated with one another, most highly between suicide risk and trait anxiety.

Berglund (1984) cited evidence that the frequency of suicide in alcoholics is considerably higher than in the general population. In a prospective study of 1312 alcoholics, alcoholics who later committed suicide (16% of a total of 537 deaths) furthermore had a higher rate of depressive and dysphoric symptoms, were more brittle and sensitive than others, and had a greater incidence of peptic ulcer.

A study of a non-violent and a violent psychiatric group found significant interrelationships in both groups between suicide risk and variables such as violence risk, anger, fear, anxiety, lack of impulse control, suspiciousness, and rebelliousness, whilst violent and non-violent patients differed in the correlation between suicide risk and depression. Non-violent (but not violent) patients had a high correlation between suicide risk and sadness (Apter, Kotler, Sevy, Plutchik, Brown, Foster, Hillbrand, Korn, & Van Praag, 1991).

A further study of this nature also generally revealed significant intercorrelations between impulsivity, anxiety, and depressed mood in relation to suicidal and violent behaviour (Apter, Plutchik, & Van Praag, 1993). Most notably impulsivity and anxiety showed a strong correlation with suicide risk, while violence risk correlated positively with angry and resentful mood, and negatively with trait anxiety. These authors concluded by speculating that a serotonin disturbance may underlie all or some of these traits, e.g. disordered impulse control, which may render the person vulnerable to aggression, suicidality, and anxiety.

PHARMACOLOGICAL STUDIES

Since the majority of people are unaware of or resistant to biological approaches to violence and criminality, persons who have aggressive outbursts and injure others are still often considered to have a moral or legal, rather than a medical, problem which requires punishment rather than treatment.

The rationale for using medication to inhibit uncontrollable violence and behaviour disorders rests by implication on the hypothesis that these conditions have an underlying neurological or biochemical abnormality. Psychotherapeutic treatment alone has seldom been found to be effective in a criminal population: it only produces "criminals with insight - but criminals nonetheless" (Yochelson, quoted in Cloninger, 1987c, p. 331). Although earlier assumptions of structural pathology in such populations proved to be incorrect, findings from several of the abovementioned fields of research, provide substantial evidence of functional brain abnormality. The practical significance lies in the possibility of treating these disorders by medication. If an aggressive person's underlying disturbance can be stabilised by means of pharmacological treatment, he is more likely to benefit from e.g. milieu, behavioural, or psychotherapy, as there is clearly a relationship between intact neural function and ability to learn.

The development of pharmacological compounds specifically for the treatment of violent, disordered behaviour has, until recently, not received the attention it deserves, probably partly on account of earlier scepticism with regard to the role of biological factors in

the aetiology of aggression and partly for the reason that research on aggressive populations is regarded as extremely difficult. Most of the compounds which have been found to decrease violent behaviour were either discovered accidentally or by trial and error (Ratey & Leveroni, 1993). There is still no scientific basis for selection of any particular agent above others, as there is not enough data to suggest which violent patients will respond to a particular type of antiaggressive medication (Eichelman, 1993).

Several pharmacological agents from a wide variety of drug groups such as the neuroleptics, anticonvulsants, lithium, beta blockers, central nervous stimulants, serotonergic agents (Lion, 1993), antidepressants (Ratey & Gordon, 1993), anxiolytic, and anxiogenic compounds (e.g. yohimbine (Kemble & Rawleigh, 1991)) have been found to reduce violent and aggressive behaviour.

- Wood, Reimherr, Wender, and Johnson (1976), incidentally discovered that treatment with methylphenidate (Ritalin) for the "minimal brain dysfunction" syndrome in adults, terminated child abuse problems in two of the participants in their study.

- Bond, Mandos, and Kurtz (1989) reported that the benzodiazepine derivative, midazolam (Dormicum) provided dramatic control of acute and refractory agression and violence, and was well tolerated without complications by three mental retardates.

- Apart from its use as an anticonvulsant agent, carbamazepine (Tegretol) was also found to be effective in patients with disordered impulse control, affective disorders, chronic alcoholism, and anxiety disorders. Its behavioural controlling effects have been hypothesised to be due to a limbic anti-kindling effect (Neppe, 1985). Cowdry and Gardner (1988) reported significant improvement in 16 patients with borderline personality disorder and prominent behavioural dyscontrol on short-term trials of carbamazepine and the antidepressant tranylcypromine (Parnate).

- Several reports of beneficial effects of another antidepressant, imipramine (Tofranil), on disordered antisocial behaviour have been cited by Cloninger (1987c).

- Sheard (1988) reviewed a number of studies, including a randomised double-blind crossover study which generally found that the beta blocker propranolol (Inderal) had a positive effect on the reduction of aggressive behaviour, while Yudofsky, Williams, and Gorman (1981) successfully treated socially disabling outbursts of rage and violent behaviour in four brain damaged patients with propranolol.

- Lena (1979) and Cloninger (1987c) reviewed several studies where lithium had successfully decreased aggressive behaviour. In a study of 61 hospitalised, treatment-resistant, aggressive children with conduct disorder, Campbell, Small, Green, Jennings, Perry, Bennett, and Anderson (1984) found that behavioural symptoms were significantly decreased by both lithium and haloperidol (Serenace), although the latter more often produced untoward side-effects.

- Serotonin reuptake inhibitors have also been effective in the treatment of dyscontrolled aggression. Ratey and Gordon (1993) cited a number of studies which reported improvement in disorded behaviour in personality disordered patients treated with fluoxetine (Prozac).

- The serenics, a recently developed new class of serotonin-1A agonists, seem particularly promising as specific antiaggressive agents for certain diagnostic groups of patients (Lion, 1993). In animal studies the serenics have been found to decrease offensive aggression while leaving defensive behaviour intact. Eltoprazine does not cause sedation or muscle relaxation, and does not interfere with the social interest and motor capacities of the animals (Olivier & Mos, cited in Ratey & Gordon, 1993). Ratey and Gordon also reviewed several studies where buspirone (Buspar) had positive effects on disruptive behaviour of demented patients, developmentally disabled persons, and brain injured patients, and reduction in premenstrual aggression and irritability by low doses of buspirone was reported by Colella, Ratey and Glaser (1992).

Psychiatry has only recently started to address the need for the development of a pharmacological protocol for the treatment of violence (Ratey and Leveroni, 1993). These authors advocated an integrative systemic approach to the treatment of violence and suggested

that the selection of medication for the treatment of aggression should be based on a multidimensional model of psychopathology along four axes, i.e. cognition, attention, arousal, and affect. However, Eichelman (1993) and Elliott (1993) pointed out that no experimental data or neurotransmitter studies were offered in support of the theory that impairment of these four dimensions are related to impulsive aggression, and Eichelman suggested that impulse dyscontrol may be much more closely related to biological abnormalities such as low CSF 5-HIAA. He nevertheless agreed with the idea of making an attempt to define psychological correlates of aggression with which pharmacological or other treatment outcomes can be associated by means of empirical investigation. Merikangas (1993) supported the idea that treatment should be directed towards underlying psychophysiological components of the disordered behaviour rather than merely nonspecific sedation as a kind of "chemical straitjacket".

Cloninger (1987c) also recognised the need for a selection strategy for pharmacological treatment of antisocial behaviour. He developed a hypothetical decision tree for subclassification of antisocial behaviour syndromes, along with a tabular presentation of tentative recommendations for choice of therapeutic drugs. He divided the target symptoms for treatment into four major types of phenomena: aggression; deficits in operant conditioning and social learning; deficits in attention and impulse control; and EEG abnormalities. The different neuroregulatory roles played by serotonin, dopamine, noradrenaline, adrenaline, and acetylcholine in three different types of aggression (i.e. affective, sexual, and predatory) were analysed next. Drug effects on operant conditioning were then reviewed and summarised. Drug effects on attention deficits, impulse control, and different types of EEG abnormality were also considered, and all these dimensions were finally integrated in terms of drugs of choice and contraindicated drugs for seven antisocial subtypes. Cloninger's development of this system is certainly impressive, and more scientifically based than the approach of Ratey and Leveroni (1993).

Since both kindling/epileptic phenomena and reduced monoamine activity have been implicated in some forms of dyscontrolled rage, the following experimental animal study from the epileptic literature is an example of a possible way in which a pharmacological protocol for aggressive disorders might also be developed. Nakamura, Mine and

Yamada (1990) reported that decreased inhibitory neurotransmission in the CNS may produce a relative excess of excitatory neurotransmitters as well as a concomitant reduction in the electroconvulsive threshold. They compared effects of different anticonvulsants in various drug-induced states of neurotransmitter depletion, and demonstrated that the efficacy of these compounds depends on distinct patterns of neurotransmitter activity. For example, an analogue of thyrotropin releasing hormone, DN-1417, raised the electroconvulsive threshold only when the activity of serotonin and dopamine was decreased in the brain.

In spite of the current limitations in the treatment of disordered aggression by pharmacological agents, there is certainly evidence that it holds much promise for the future, and I support the opinion expressed by Mattes (1986), that it is important that researchers and funding sources begin to see dyscontrolled aggression as a medical problem worthy of scientific investigation.

NEUROPSYCHOLOGICAL STUDIES OF HABITUAL CRIMINALITY AND VIOLENCE

Several researchers have studied habitual criminality and violence in terms of impulse control and brain function. Various neuropsychological studies successfully discriminated violent from non-violent persons and psychopaths from non-psychopaths on the basis of some form of cognitive dysfunction. A review of previous literature in this field was, however, complicated by the fact that researchers had held different viewpoints of impulsivity and had used dissimilar subject groups. Whereas some studied differences in impulse control between violent and non-violent criminals or delinquents, others concentrated on psychopathic or non-psychopathic subjects from either criminal or diverse non-criminal populations.

Sreenivasan, Van Vort, Kirkish and Eth (1992) studied 50 consecutive involuntarily committed violent psychiatric patients. They considered frontal brain dysfunction, testosterone level and psychopathy as potentially disinhibiting factors that could discriminate between high and low levels of violence. They found that psychopathy was the best predictor for high/low violence, with tests of abstract reasoning and testosterone levels contributing 10% of the variance, although not reaching statistical significance. There was also a high incidence of head trauma in these subjects.

Roy, Mandelzys, Marceau and Lane (1980) cited research done inter alia by Yeudall and by Berman with impressive findings with respect to neuropsychological deficits among forensic, and in particular violent and aggressive patients. In one study, Yeudall found abnormal neuropsychological profiles in 90% of a group of aggressive psychopaths, with greater dysfunction of the left hemisphere. When a control group was compared with homicide, rape and physical assault groups on neuropsychological variables, correct classifications of 100%, 96.4% and 97.9% were obtained. In another study on 98 violent offenders and 79 controls, Yeudall correctly identified 84.7% and 87.3% respectively on discriminant analysis. Berman administered the complete Halstead-Reitan battery to 45 delinquent murderers, and found that the five most discriminating variables correctly classified 87% of the murderers and 78% of the controls. Roy et al. concluded that it appears that about 75-95 percent of violent offenders can be distinguished on the basis of neuropsychological profiles.

Spellacy (1977) compared 40 violent and 40 non-violent prisoners on a 31-variable neuropsychological test battery and the MMPI. Results showed that subjects could be classified correctly as violent or non-violent with 83% accuracy by use of the neuropsychological test battery alone, while the MMPI on its own correctly classified 71%. Spellacy found that results were consistent with the hypothesis that organic impairment contributes to the impulse dyscontrol and associated violent behaviour exhibited by some delinquent adolescents. Spellacy (1978) then did an identical study on 40 violent and 40 non-violent adolescent males with similar results. The test battery correctly classified 95% and the MMPI 79% of the subjects. The test battery indicated differences between the groups on cognitive, language, perceptual, and psychomotor abilities.

Gorenstein (1982) cited evidence of functional similarities between the behaviour of organisms with lesions of the septum, hippocampus and frontal cortex and the behaviour of humans with disorders of impulse control. He therefore hypothesised that individuals with psychopathic personality features are characterised by the relative failure to modulate dominant cognitive sets, and hence would perform more poorly on tasks tapping the frontal lobe functions of cognitive flexibility and perseveration. Subjects were 43 male hospital patients, 23 having treatment for substance abuse, 13 for psychological complaints, and 7 for both substance abuse and psychological complaints. Twenty patients were assigned to a psychopathic group and 23 to a psychiatric control group. As a normal control group 18 college students were used. Results revealed that relative to controls, psychopaths' performance was similar to that of frontal lesion patients on measures related to frontal dysfunction. Perseverative errors on the Wisconsin Card Sorting Test (WCST), errors on the Sequential Matching Memory Task (SMMT), and greater number of Necker Cube reversals distinguished the psychopathic group from controls. A significant interaction effect on the Stroop Colour-Word Interference Test was found, based on the greater interference effect exhibited by the two psychiatric groups relative to college students. Contrary to prediction, neither the comparison between psychopaths and controls on the interference task, nor on number of words generated in an anagram task of verbal ability, were significant.

This study by Gorenstein (1982) was criticised by Hare (1984), who argued that Gorenstein's diagnostic procedures were inadequate and his results confounded by group differences in age, education, general ability, and substance abuse. Hare therefore administered the WCST, the Necker Cube and SMMT to 46 prisoners divided into low- (n=16), medium- (n=16), and high-psychopathy groups (n=14) on the basis of the 22-item checklist for psychopathy developed by himself. Analysis of variance results did not reveal any differences between the groups. Hare suggested that effects of substance abuse may provide an alternative explanation for the frontal lobe deficits found in Gorenstein's psychopaths. Hare's study can, however, be criticised because no normal control group was included.

Hoffman, Hall, and Bartsch (1987) attempted a replication of Gorenstein's (1982) study to examine the relative effects of psychopathic personality and alcoholism on several measures of frontal lobe impairment. Volunteers from an alcohol dependence treatment centre were classified for level of psychopathy according to Gorenstein's (1982) method, as well as for level of alcoholism. The following subject groups were derived: 24 high alcohol, psychopath; 10 low alcohol, psychopath; 12 high alcohol, non-psychopath; 35 low alcohol, non-psychopath. Tests administered were the Trail-making Test, WISC-R Mazes, SMMT, Necker Cube, the Interference Memory Task (IMT), and the WCST. Overall significance was found for Trails A (F = 4,74, p < .0017), and Trails B (F = 3,25, p < .011). An inspection of means indicated that Trails performance was poorer in groups who were high in alcoholism, low on psychopathy, older, and less intelligent. None of the other measures were significantly related to the independent measures. Tarter and Parsons (1971, cited in Heaton, 1981), however, found that alcoholics performed significantly worse than two control groups on the WCST. This finding is interesting, as alcoholism *per se* is regarded as a disorder of impulse control according to the DSM-III.

In response to the controversy raised by these studies of frontal lobe deficits in psychopaths, Devonshire, Howard and Sellars (1988) compared 8 "primary" psychopaths, 9 "secondary" psychopaths from a mentally abnormal offender population, and 10 normal controls. Psychopaths performed significantly worse than normal controls on all measures of Nelson's shorter modification of the WCST (Nelson, in Devonshire, Howard, & Sellars, 1988), i.e., total errors, categories

achieved, and perseverative errors, while "secondary" psychopaths performed worse than "primary" psychopaths on all measures, achieving significantly fewer categories and making more total errors.

A further study to test the hypothesis that behaviour disorders may be attributable to frontal disinhibition was undertaken by Lueger and Gill (1990). They compared 21 conduct disordered adolescents with 20 matched normal controls on the WCST, SMMT, Kaufman Assessment Battery for Children Hand Movements Test, Trail-making Test, and Auditory Verbal Learning Test (AVLT). Significant differences were found between the two groups (conduct disorder subjects performing worse) on WCST perseverative responses ($p < .01$); WCST perseverative errors ($p < .01$); SMMT errors ($p < .01$); number of correctly reproduced hand movements ($p < .01$); and number of words recalled on trial 5 of the AVLT ($p < .01$). Discriminant function analysis, loading on three variables - WCST perseverative errors, SMMT errors, and Hand Movements - correctly classified 81% conduct disorder subjects and 90% control subjects, with an overall hit rate of 85.37%. The authors concluded that the findings seem to support a neurobehavioural explanation of antisocial behaviour as a product of cerebral disinhiition.

Newman (1979) investigated a septal-lesion model of psychopathy, suggesting that this deficit may be dependent on an exaggerated tendency to make a "dominant" or rewarded response. Three groups of juvenile delinquents were classified as psychopaths, neurotic psychopaths, and non-psychopaths, and tested on three separate discrimination tasks as well as a card playing task. Results confirmed the following hypotheses: (a) psychopaths would exhibit an exaggerated tendency to make a rewarded response (perseverate), (b) the tendency of psychopaths to perseverate would result in poorer response inhibition and passive avoidance than controls, and (c) perseveration would be reduced by providing subjects with concrete "external" feedback.

Newman, Patterson, and Kosson (1987) conducted a further study in order to assess response perseveration in psychopaths, involving incentives in the form of monetary rewards and punishments. Subjects were selected from inmates at a minimum security prison and classified as psychopaths and non-psychopaths according to Hare's (1984) 22-item checklist. Assessment was done by means of a computerised card playing task. Whereas controls had little difficulty in noticing the steady

increases in the probability of punishment and adjusting their responding accordingly, psychopaths failed to alter their dominant response set for reward, and the majority of the psychopaths did not quit playing the entire deck of cards, despite losing money on 19 of the last 20 trials. The authors regarded the results as providing unambiguous evidence of response perseveration in psychopaths.

Goldwater (1981) investigated the differences between 20 psychopathic delinquents, 20 non-psychopathic delinquents and 20 normal controls on measures of cognitive impulsivity and neurological impairment. The test battery comprised the MFFT, several tests from the Halstead-Reitan neuropsychological test battery, and the WISC-R. Results revealed that the psychopathic delinquents performed significantly worse on measures of language abilities, and delinquents in general manifested greater cognitive impulsivity and overall neurological impairment than controls. The author concluded that the results seem to indicate that neuropsychological deficits and cognitive impulsivity may contribute to maladaptive delinquent behaviour.

Yeudall, Fromm-Auch, and Davies (1982) administered the Halstead-Reitan battery and 12 additional neuropsychological tests to 99 juvenile delinquents and 47 normal adolescents. Results revealed a greater percentage of abnormal profiles within the delinquent than the non-delinquent group (84% vs. 11%). Another significant finding was that these deficits were indicative of anterior dysfunction which was greater in the non-dominant than the dominant hemisphere. These measures did not, however, distinguish violent from non-violent delinquents. Yeudall et al. cited other studies investigating persistent criminal (i.e. Yeudall, 1977), and juvenile delinquent populations (Pontius, 1972, 1973, and Pontius et al., 1976) which consistently showed primarily anterior (frontotemporal) brain dysfunction as demonstrated on neuropsychological profiles.

These findings are in accordance with Lishman's (1968) observations in an examination of brain damaged patients for psychiatric sequelae, that behavioural and criminal disorders, as well as sexual disturbances were exclusively associated with frontal damage. According to Luria (1973), the functional system for programming, regulation and verification of actions is situated in the anterior regions of the brain. This suggests that these delinquent subjects may have problems

in planning their actions as well as in perceiving the consequences of their actions. Pontius and Ruttiger (1976), in a study on delinquents, suggested that these subjects may have an inability to appropriately change an action once started in order to achieve the original goal. Hence, this disability may underlie or even play a major role in these behaviour disorders.

Bryant, Scott, Golden, and Tori (1984) administered the Luria-Nebraska battery to 110 prisoners, examining the relationship between neuropsychological functioning, learning disability, and violent behaviour. It was found that violent offenders were inclined to have serious neuropsychological deficits, and inmates classified as brain damaged had a significantly higher rate of violent criminal activity than the group without brain damage.

The IES Arrow-Dot test has been successfully used to distinguish aggressive from non-aggressive subjects. Roback (1965) compared IES Arrow-Dot scores of 52 aggressive psychiatric patients who had to be placed in a maximum security cottage because their behaviour had created a management problem, with a control group of 52 patients who did not display aggressive or problem behaviour. The aggressive patients had significantly higher Arrow-Dot I-scores (indicating uncontrolled impulsive behaviour), and lower E-scores (indicating weak ego/realistic functioning) than the control group. These findings imply a greater lack of ego strength and concomitant diminished impulse control in the aggressive group to the point where impulses are expressed more freely, with minimal concern for reality testing.

McCormick, Klappauf, Schnobrich, and Harvey (1971) administered the IES Arrow-Dot test and the MMPI to 24 behaviour disordered adolescents in a psychiatric hospital. The average MMPI profile presented a typical picture of the behaviour disordered adolescent, with the highest scales being Sc and Pd which are the typical high points among delinquents and school dropouts, reflecting the rebellious, alienated, schizoid character of these adolescents. Furthermore, the MMPI profile was significantly elevated above the normal range, demonstrating the severity of disturbance of the group. Arrow-Dot scores were also found to present the typical picture of the disturbed adolescent, reflecting lack of impulse control and defective ego-functioning. The Arrow-Dot I-score (impulsiveness) was moderately and positively correlated with

the MMPI Pd (psychopathic deviate) scale. The authors mentioned that this correlation is in keeping with the finding that impulsiveness is one of the prime traits of psychopathic character disorders.

In a study of 30 institutionalised delinquents and 30 non-delinquent adolescent boys, Mangold (1966) found that the IES Arrow-Dot test significantly differentiated the two groups, with delinquents gaining higher I-scores (reflecting poor impulse control) ($p < .01$) and lower E-scores (ego function) ($p < .01$) than non-delinquent controls.

An examination by Saunders, Reppucci, and Sarata (1973) of impulsivity in delinquents rendered negative results. Two studies were done - the first compared delinquents and high school boys on two self-report measures and the MFFT, finding a strong correlation between the two self-report inventories, the Barratt and Hirschfield Scales, but a weak correlation between the MFFT and the Barratt Scale only. None of these measures revealed the delinquents to be more impulsive than controls. The second study compared two groups of delinquents divided into "runners" and "non-runners" on the basis of runaway records, using the Barratt Scale, the MFFT and the IES Arrow-Dot test. It was found that the MFFT and the Arrow-Dot test were significantly correlated, but the previously found correlation between the Barratt Scale and the MFFT failed to replicate.

In a recent local study (Kalisky, 1993) the Barratt Impulsivity Scale and Zuckerman's Sensation-Seeking Scale were administered to 22 violent and 27 non-violent male schizophrenics committed to the forensic psychiatry unit at Valkenberg Hospital in Cape Town. Subjects were classified according to their index charge and exclusion criteria were a history of head injury, organic brain syndrome, and any medical or neurological condition that might contribute to an altered mental state. The violent group was found to have significantly more paranoid delusions than the non-violent group, but neither pattern of substance abuse, nor the two scales differentiated between the groups, except that non-violent schizophrenics scored higher on the thrill and adventure subscale of the Sensation-Seeking Scale.

Krynicki (1978) investigated seven repetitively assaultive, behaviour disordered adolescents, eight non-assaultive behaviour disordered adolescents, and six organic brain syndrome (OBS) patients on a series

of neuropsychological measures and an EEG. The hypothesis that the assaultive group would be more similar to the OBS group than to the non-assaultive group was confirmed. Several variables distinguished the former two groups from the latter: 1) abnormal EEG (characterised by paroxysmal activity in the frontal area), 2) degree of establishment of hand dominance (Edinburgh Inventory), 3) perseveration errors on Luria's Graphic Alternating Sequences Test, and 4) verbal short term memory (Milner technique). It was concluded that neuropsychological assessment can reveal organic features important in understanding repetitively violent behaviour.

Osuna and Luna (1989) compared the performance of 144 juvenile delinquents and a control group of 218 schoolchildren on the Attention-Perception Test and the Gibson Spiral Maze Test. Delinquents were found to be significantly more impaired on both tests. On the basis of certain performace variables, the authors conclude that impulsiveness and attention-perception deficit can be said to distinguish different patterns of criminal behaviour. They suggested that:

> It would seem logical for persons whose ability to perceive and integrate reality is limited, to experience difficulties in adapting to their environment. Impulsiveness would further lead them to commit acts which they would not otherwise perform had they stopped to reflect upon the likely consequences of their behavior (p. 1239).

Ullman (1988) administered a full neuropsychological battery to a subject population of assaultive vs. non-assaultive offenders. Assaultives (as well as a subgroup of sexual assaulters) were found to be significantly more impaired on focused auditory attention and expressive speech tasks. Ullman suggested that future research examine the broader independent variable of "impulse control disorder" in relation to neuropsychological dysfunction.

Monroe (1978) conducted a comprehensive study of brain dysfunction in aggressive recidivist criminals. The Monroe Dyscontrol Scale (a self-rating scale of impulsive behaviour) and EEG activity (as a measure of central nervous system stability) were used to distinguish four groups. From a total sample of 93, the following distribution was derived and tentatively labeled as follows:

Group 1 (n = 26) - high impulsivity, high central nervous system (CNS) instability, "epileptoid" dyscontrol (i.e. due to "faulty equipment"). Monroe described this as an intermittent dysfunction of neuronal mechanisms due to hyperexcitability of neurons, probably most often localised in the limbic system because of its low seizural threshold. He speculated that the mechanism is a focal ictal activity in subcortical areas of the brain, without typical epilepsy, but associated with intermittent behavioural disturbances.

Group 2 (n = 27) - high impulsivity, low CNS instability, "hysteroid" dyscontrol.

Group 3 (n = 12) - low impulsivity, high CNS instability, "inadequate" psychopath.

Group 4 (n = 28) - low impulsivity, low CNS instability, "pure" psychopath.

Groups 1 and 2 were found to suggest more severe pathology and also had consistently higher scores on the MMPI psychotic scales (Pa, Pt, Sc, and Ma). Group 1 had the most distinctly different profile among the four groups and could be considered extremely dangerous.

Psychometric measures used were: Bender (Standard and BIP), Memory for Design, MMPI, WAIS, Auditory Discrimination Task, MFFT, Holtzman Inkblot, Porteus Maze, Slow writing, Time estimation, and Draw-a-line. Psychometrics found to correlate with both the Monroe Dyscontrol Scale and the Overt Violence Subscale were MMPI L, F, K, Hs, Hy, Pa, Sc, Ma, Si; Holtzman Abstract; and Draw-a-line, while those correlated with only the Monroe Dyscontrol Scale are MMPI D, Mf, Pt; Bender BIP; and WAIS Arithmetic subtest. A further interesting correlation was between the Dyscontrol Scale and alpha chloralose-activated theta frequency count on EEG during the five-minute periods, pre-, during, and post-hyperventilation. (Ictal phenomena in the limbic area can be demonstrated by activation procedures using alpha chloralose.) The author concluded that the most significant finding was that the concept of episodic dyscontrol with an "epileptoid" mechanism could be established in almost 30% of the sample population. Identification of this "epileptoid" group of criminals has a further implication, in that it would be possible to design a drug regimen that raises seizural threshold, particularly in the limbic system, which in turn could reduce or eliminate dyscontrol acts.

Tarter, Hegedus, Alterman and Katz-Garris (1983) examined 31 juvenile violent, 28 nonviolent and 14 sexual offenders referred for forensic evaluation on a battery of tests, but failed to find strongly significant differences between the groups. This study, however, differed in their selection of subjects from other studies, as they had previously screened and excluded from the investigation all adolescents with a history of brain trauma, EEG or neurological abnormalities, or psychosis. It would have been interesting to know how many had to be excluded, but this figure was not reported.

Another study (Hart, Forth, & Hare, 1990) failed to find significant differences between volunteer groups of criminals rated as high, moderate and low scorers on Hare's Checklist for Psychopathy, on tests which were partly administered to screen subjects for taking part in another study which required good reading and intellectual ability. Tests used were the Trail-making Test, Visual Retention Test, Auditory-Verbal Learning Test, Visual Organisation Test, Controlled Word Association Test, WAIS-R Vocabulary and Block Design subtests, and the Reading subtest of the Wide Range Achievement Test. Apart from a tendency for high scorers on psychopathy to have higher scores than other subjects on Part B of the Trail-making Test, none of the other measures differed significantly.

Shapiro (1977) investigated the construct of cognitive impulsivity in a group of delinquents and a normal control group by means of the MFFT, but found no significant difference.

In spite of the inconsistent operational definitions with regard to assignment of subjects and the variety of measures utilised in the neuropsychological research reviewed, the overall positive results seem to indicate the possible existence of a neurological dysfunction in dyscontrolled, abnormally violent, problem behaviour, which can be elicited by means of neuropsychological testing.

RATIONALE FOR ADOPTING THE PRESENT RESEARCH DESIGN, AND AIMS OF STUDY

From the literature reviewed, especially with reference to the BIS/BAS theory and studies of neurotransmitter disorders in relation to dyscontrolled, violent behaviour, there is evidence that some kind of inhibitory dysfunction on a neuronal level may underlie disorders of both outwardly and self-directed aggression.

The most convincing results thus far have suggested that a disturbance in the metabolism of serotonin, an inhibitory neurotransmitter, may underlie a variety of regulatory dysfunctions across diagnostic categories, which often manifest functionally in the form of aggression dysregulation.

In view of the high rate of violent crime (especially murder) in Cape Town, the aim of the study was to investigate the possible relationship between violent crime and disordered impulse control or other neurobiological factors which may render habitually violent criminals more vulnerable to aggression dysregulation. Although biochemical investigation of neurotransmitter levels was a tempting prospect, a less invasive and more economical approach had to be adopted in view of the exploratory nature of the project.

Impulsive, undercontrolled behaviour has been measured by means of various self-report dyscontrol or "impulsivity" scales; it has also been shown to manifest as defective performance in response to various kinds of restrictions, for example, on certain neuropsychological tests of executive/self-control functions. For the purpose of this study it was therefore elected to use a self-report dyscontrol scale in order to investigate if there might be tendency amongst a local sample of violent criminals to exhibit impulse control problems, and furthermore, to find out whether this can also be demonstrated by means of selected neuropsychological measures. It is hypothesised that impulse dyscontrol will occur more frequently amongst violent than non-violent criminals as indicated by higher scores on the Monroe Dyscontrol Scale and that the neuropsychological tests would also demonstrate this difference functionally.

Should a serotonin-based inhibitory dysfunction occur more frequently in violent criminals, one could expect these people to exhibit some

features from the cluster of clinical/psychopathological characteristics which have consistently been demonstrated to correlate with this biochemical deficiency (e.g. impulse dyscontrol, aggression dysregulation, depression, suicide attempts, irritability, anxiety and alcohol abuse). The presence of these allegedly related clinical factors as well as other psychopathological dimensions such as aggressive tendencies, substance use, and family history will be investigated by means of private, structured clinical interviews with each prisoner. It is expected that in contrast to the non-violent group, more members of the violent group will exhibit aggressive tendencies; high alcohol use; clinical factors such as past head injuries, depression, and suicide attempts; as well as a positive family history for suicide, psychiatric problems, alcohol abuse, and violent family members.

It is also hypothesised that there will be significant interrelationships between the cluster of variables allegedly related to serotonin dysfunction, i.e. impulse dyscontrol, aggression dysregulation, depression, suicide attempts, irritability, anxiety and alcohol abuse. Significant intercorrelations, especially in relation to dyscontrol measures, would not only tend to support the possible presence of this dyscontrol syndrome in the present sample, but will lend further credence to previous findings with regard to interrelationships between the functional manifestations of this neurobiological syndrome of dysregulation.

Prisoners' perceptions of the reasons for their own (current) offences as well as for crime in general will also be investigated.

METHOD

SUBJECTS

Selection criteria:

- Male prisoners from the so-called "coloured" or Asian population.
- Age 24 to approximately 45 years.
- Minimum education: passed Standard 4.

- Violent Group:
  - Currently convicted of violent crime (robbery excluded because of the economic motive), e.g. murder, attempted murder, assault, culpable homicide, rape.
  - History of at least two but preferably more convictions for violent crimes.

- Non-Violent Group:
  - Currently convicted of non-violent (usually economic) offence e.g., theft, housebreaking, fraud - excluding robbery which has a violent component.
  - History of several convictions of economic offences.
  - No criminal record of convictions of violent offences.
  - No history on file of violent tendencies or wife/child battery.

Subjects were 50 violent and 50 non-violent criminals from Pollsmoor and Brandvlei Prisons in the Western Cape. Subject selection was based primarily on information obtained from the prison records. According to the SAP 62 form in his file, the person had to have been found guilty in court of the crimes as outlined above, and currently serving a sentence on account of such convictions. Primary criteria for inclusion was that the person must be male, Afrikaans-speaking, non-psychotic, and from the so-called "coloured" or Asian community, as the majority of offenders in the Western Cape prisons are from this population. A uniform group was preferred to avoid language difficulties and possible intercultural variations on e.g. neuropsychological tests.

Although education and age mismatch between groups is often controlled for by means of statistical methods (e.g. analysis of covariance or partial correlation) (e.g. Braun & Richer, 1993), this approach has

been criticised for yielding unreliable results (Grant, 1987; Parsons & Prigatano, 1978). Subjects were therefore matched pairwise on age (within 3 to 4 years) and education level. Socioeconomic level was not formally controlled, since this variable has been found to be closely related to education (Parsons & Prigatano, 1978)

Age range for the total sample was 24 to 47 (mean 32.6, sd 6.0, median 32); for the violent group the range was from 24 to 45 (mean 32.5, sd 6.2, median 32); and for the non-violent group the range was from 24 to 47 (mean 32.7, sd 5.8, median 33). Difference between the groups was not significant (t (98) = .03, p < .87). Criminological research has shown that much delinquency is transient or temporary in nature, with the highest incidence of criminal convictions being in the late teens, and with frequency of convictions beginning to fall off fairly sharply in the early twenties. This potentially confounding factor was addressed by not selecting subjects younger than 24 years old.

Education level for the total sample as well as for both subgroups ranged from Stds. 1 to 10 (mean 5.3, sd 1.8, median 5) and there was no difference between the groups (t (98) = 0, p < 1.00). The targeted minimum education level was a Standard 4 pass. This was achieved in 90% of the sample. Exceptions were made in five cases in each group because of extreme difficulty with pair-matching and in order to obtain a normal distribution for education level: three were included in each group with Std. 3, one in each group with Std. 2, and one in each group with Std. 1. The education level criterion complicated the selection of subjects considerably. In the older files, created before computerisation of the prison records, education levels were usually recorded. Although this was sometimes inaccurate, it did at least help to indicate whether the person had any degree of literacy. However, the new computer system which was implemented during 1992 apparently does not make provision for capturing education level. (This will undoubtedly present serious difficulty in future research as well.)

IQ range on Raven's Progressive Matrices for the total sample was from below 66 (the lowest limit according to Peck's (1970) conversion of raw scores) to 126 (mean 92.8, sd 16.5, median 96); for the violent group the range was from below 66 to 126 (mean 91.9, sd 18.2, median 93); and for the non-violent group the range was from below 66 to 125 (mean 93.6, sd 14.8, median 97). Difference between the groups was not

significant (t (98) = -1.77, p = .08). As the translated version of the QT has not been standardised, these results are merely an estimate of verbal intelligence to examine differences between groups. For the total sample the QT IQ ranged from 45 to 120 (mean 85.9, sd 12.0, median 87); for the violent group the range was from 45 to 120 (mean 86.9, sd 13.9, median 89); and for the non-violent group the range was from 62 to 104 (mean 84.9, sd 9.8, median 84). Difference between the groups was not significant (t (98) = -1.18, p = .24). Average of the Ravens and QT for the total sample ranged from $\leq$ 55.5 to 114.5 (mean 89.4, sd 11.5, median 91); for the violent group the range was from $\leq$ 55.5 to 112.5 (mean 89.4, sd 13.1, median 92); and for the non-violent group the range was from $\leq$ 64 to 114.5 (mean 89.3, sd 9.8, median 96). Difference between the groups was not significant (t (98) = 0.05, p < .96).

An interesting observation regarding intellectual performance was that according to the Raven's test, 18% of the subjects fell in the mental retardation category (IQ 69 or below) - constituting 24% within the violent group and 12% within the non-violent group. According to the QT, 8% of the total sample fell within this category - 8% in each group, while on the average IQ figures, this improved to 6% of the total sample - constituting 10% within the violent group and 2% within the non-violent group. (As numerous prisoners had to be rejected as potential subjects on account of total illiteracy, an even greater percentage of prisoners may possibly fall into the category of mental retardation. One can only speculate about the legal implications, should this be the case.)

Based on criminal records from the prison files, the violent group was selected for a reasonably long history of violent crimes. In the case of murderers, exceptions with regard to length of violent history were sometimes made, especially if the murder was of a particularly brutal nature, but all subjects had at least two violent convictions.

Total number of convictions per person for the total sample ranged from 2 to 25 (mean 9.6, sd 4.9, median 8.5); for the violent group the range was from 2 to 25 (mean 10.4, sd 5.6, median 9); and for the non-violent group the range was from 3 to 16 (mean 8.7, sd 3.9, median 8). Difference between the groups was not significant (t (98) = 2.62, p < .08).

NEUROPSYCHOLOGICAL TESTS AND OTHER ASSESSMENT MEASURES

Rationale for selection of neuropsychological tests

The assumption of this study is that the classical use of neuropsychological measures merely to localise pathology in certain areas in the brain does not take into account possible dysfunction of the intricate neural transmission systems interconnecting different areas in the central nervous system, and thus does not necessarily explain behavioural phenomena in complex functional disorders with no detectable structural pathology. Therefore, in this study the purpose of neuropsychological testing is not primarily to localise dysfunction in specific areas in the brain, but to elicit and demonstrate impaired function - i.e., a disorder of impulse control as reflected by specific types of cognitive or motor dysfunction.

The cluster of characteristics typically associated with dyscontrolled violent behaviour is marked by inflexible, perseverative cognitive functioning and inadequate cognitive controls. The ability to maintain, switch, and stop sequences of complex behaviour in an orderly and integrated way is necessary for effective self-directed and self-controlled behaviour. This function can be subsumed under the broader category of control or executive functions as described in the neuropsychological literature (Lezak, 1983; Mesulam, 1985).

The ability to regulate one's own behaviour can be assessed by measures that test mental flexibility and the capacity to shift a course of thought or action to meet the varying needs of the moment (Lezak, 1983). Impaired capacity for flexibility in behaviour may present as an inability to shift perceptual organisation, train of thought, or ongoing behaviour according to the demands of the situation, and can be demonstrated along perceptual, cognitive, and response dimensions:

Perceptual inflexibility, presenting as

- Defective scanning.
- Difficulty with or inability to change perceptual set.

Conceptual inflexibility, as demonstrated by

- Concrete or rigid approaches to understanding and problem solving.

- Stimulus-bound behaviour, i.e. inability to dissociate responses or avert attention from whatever is in the perceptual field.

Inflexibility of response, manifesting as

- Perseverative, stereotyped, non-adaptive behaviour.
- Difficulties in controlling and modulating motor action (Lezak, 1983).

These deficits imply an inability to shift behaviour readily to adapt to changing demands on the person, and have been demonstrated particularly in association with frontal lobe lesions (Luria, 1973).

Inhibitory dysfunction can thus be elicited by means of neuropsychological examination for e.g., cognitive or motor perseveration, inhibition of the dominant response set, or inability to shift the conceptual set (Mesulam, 1985; Lezak, 1983). In his comprehensive guidelines for assessment of mental functions, Mesulam (1985) listed the Stroop Colour-Word Interference Test, the Trail-making Test, and Luria's Graphic Alternating Sequences Test as measures of response inhibition.

However, from the available experimental literature, there did not seem to be any particular measure of impulse control which could claim widespread acceptance as such among researchers. Tests used for the assessment of impulse control in this study, had therefore seldom originally been developed with that specific purpose in mind. In accordance with the operational definition of impulse control/inhibitory function (defined earlier in the section "Impulsivity: A multidimensional construct"), the test battery was mainly selected on the basis of descriptions by authorities such as Lezak (1983) and Mesulam (1985) of theoretical neuropsychological principles underlying the functions tapped by these measures.

Dyscontrol measures used in previous studies were taken into consideration, but additional factors that played a role in the selection process were:

- applicability to a so-called "Coloured" population of low to moderate educational level,
- reported validity and reliability (where avaiable),
- speed and ease of administration of the test procedure, and
- local availability of test material.

Questionnaires and test instructions were translated into Afrikaans where necessary, as the subjects were all Afrikaans-speaking.

Significant intercorrelations between measures would contribute towards confirming convergent validity of the tests selected.

List of assessment measures

The following tests and questionnaires were utilised in this study and administered in the following order to each subject:

Individual Administration

- Draw-a-circle task (DAC)
- Draw-a-line slowly task (DAL)
- Trail-making Test (TMT)
- IES Arrow-Dot Test (IES)
- Wisconsin Card Sorting Test (WCST)
- Stroop Colour-Word Interference Test
- Monroe Dyscontrol Scale
- Alcohol/Drug Questionnaire
- Clinical/biographical questionnaire, incorporating the
- MMPI Lie Scale

Group Administration (on a different day)

- Luria's Graphic Alternating Sequences Test (GAST)
- Quick Test (verbal intelligence) (QTIQ)
- Raven's Standard Progressive Matrices

A brief description and rationale for selection of each test follows.

Draw-a-circle task (DAC)

Subjects were asked to trace a circle measuring 7.5 cm. in diameter, drawn on white A4-sized cardboard and covered by a sheet of tracing paper (thin typing copy paper), without lifting their pencil (DAC-1). After completion, they were asked to trace a second identical circle (on the same card), but this time to do it as slowly as possible (DAC-2). Each circle had a small line at the top, with the words "BEGIN" and "STOP" demarcating the starting and finishing point for the tracing. Time was recorded in seconds and it was assumed that subjects who have impulse control problems would manifest a smaller difference between times taken for the two tasks (DAC-2 minus DAC-1).

Circle tracing inhibition tasks have been used as measures of impulse control in various studies (Bachorowski & Newman, 1990; Sutker, Moan & Allain, 1983; Siegman, 1962 & 1961). Siegman (1961) reported that several studies found considerable construct validity for such a task as a measure of impulse control.

Bachorowski and Newman (1990) reported that when the words "GO" and "STOP" were used to demarcate the starting and finishing point for a circle tracing task, subjects rated as impulsive on the Eysenck Personality Questionnaire traced faster than non-impulsives. A similar type of test for writing speed successfully discriminated between light and heavy drug-using delinquents (Andrew and Bentley, 1978). Sutker et al. (1983), however, did not find a significant difference between psychopathic and non-psychopathic prisoners, but no distinction between violent and non-violent was made.

Draw-a-line task (DAL)

Subjects were asked to draw a line from left to right in a 23 cm. X 3 cm. rectangle without crossing the top and bottom boundaries and then to repeat the process in a second identical rectangle as slowly as possible. The number of seconds taken to complete each trial was recorded. Time taken on the first task (DAL-1) was subtracted from time on the second task (DAL-2) and this difference was used as a measure of impulse control. Difficulty in controlling impulses is reflected by a relatively small (or even negative) difference, since instructions emphasise the need for slow effort on the second trial.

Rohrbeck and Twentyman (1986) reported a previous study which found test-retest reliability to be .77 for this test. Rohrbeck and Twentyman used this test successfully to discriminate between maltreating and nonabusive mothers - the control group of nonabusive mothers were able to inhibit motor activity to a greater extent.

Trail-making Test (TMT) (see Appendix B)

The Trail-making Test (from the Halstead-Reitan battery) can be regarded as a measure of response inhibition, resistance to interference, ability to shift the mental set, perseverative tendency, perseverance, and motor control (Mesulam, 1985). Pontius (1972) states that the TMT Part B tests the ability of "switching the principle of action of an ongoing activity, an essential factor leading to unethical

action" (p. 299). On Part A, the subject must draw a line without lifting the pencil, to connect consecutively in numerical order a series of randomly arranged numbers (i.e., 1-2-3, etc.). On Part B, numbers are interspersed with letters, and the task is to sequentially connect numbers and letters in alternating sequence (i.e., 1-A-2-B-3--C-4, etc.). The testee is thus required to inhibit the previously acquired mental set of connecting numbers only. Lezak (1983) reported high reliability for Part A ($\underline{W}$ = .78) and somewhat lower for Part B ($\underline{W}$ = .67). Part B in particular has been identified as an indicator of disturbance of frontal lobe executive function. When the subject makes a mistake, it is pointed out to him and he has to correct it. Scores are time taken for each part, so the higher the score, the worse the performance.

Hart, Forth, and Hare (1990) reported that of a sample of 90 criminals divided into three groups of high, moderate and low psychopathy, inmates in the high psychopathy group tended to have higher scores on Part B of the TMT. Pontius and Yudowitz (1980) found that 33 percent of a sample of 30 criminals demonstrated significantly more errors on part B of the TMT. Hoffmann, Hall, and Bartsch (1987) studied 81 males with diagnoses of alcohol dependence or abuse, divided into four groups: 35 low alcohol, non-psychopath; 10 low alcohol, psychopath; 12 high alcohol, non-psychopath; 24 high alcohol, psychopath. Performance on the TMT was poorer in groups who were high in alcoholism amd low on psychopathy. Since alcoholism is regarded as a disorder of impulse control, this finding is not irrelevant. Andrew and Bentley (1978) similarly found that Part B significantly discriminated between light and heavy drug using delinquents ($\underline{p}$ < .001). No normal controls were included. Yeudall et al. (1982) found that on Part B of the TMT delinquent subjects had a mean time of 73.4 vs. 41,8 seconds for non-delinquents. This seems to be a significant difference, although the authors did not report whether individual tests in their battery reached a significance level. This test, however, did enter the first variable on factor analysis.

<u>IES Arrow-Dot Test</u> (see Appendix B)

The IES Test (Dombrose & Slobin, 1957) was originally constructed within a psychoanalytic framework to measure the relative strengths of impulses, ego, and superego. The Arrow-Dot subtest has become the most widely used measure of impulsiveness from the IES Test. It is a

perceptual-motor task consisting of 20 relatively simple graphic problems. An objective scoring system is employed which categorises the responses as being Impulse, Ego, or Superego oriented. The subject is required to draw a line from the tip of an arrow to a dot, using the shortest possible path, yet violating no heavy solid lines. Each violation of this restriction increases the subject's impulsivity score, while inappropriately long and roundabout routes score on superego (Dombrose & Slobin, 1958).

The test rests on the rationale that in his everyday behaviour, the impulse-ridden individual will often ignore or violate intervening barriers in order to achieve gratification and satisfy impulses without taking into account the demands of reality or concerns of morality. The I-score is thus a measure of uncontrolled impulsive behaviour, with a high I-score indicating an abundance of impulsive behaviour which has escaped the control of both the ego and superego. According to Lezak (1983), persons who have problems with self-control (frontal lesions) tend to exhibit "rule-breaking" behaviour, i.e. an inability to follow instructions, so in a way, both the I- and the S-scores in this test may be regarded as measures of this type of defect.

Several studies investigating the reliability and validity of the IES Test confirmed that the Arrow-Dot subtest yielded the best predicted results. Herron (1966) reported combined results of a number of validation studies, revealing that the Arrow-Dot Test was 86% successful in discriminating between subject groups. The following tabular summary further indicates the ability of the test's Impulsivity score to distinguish subject groups. The study by McCormick et al. (1971) found a positive correlation between the Impulsiveness score and the MMPI Psychopathic Deviate score, but no correlation with IQ. Rankin and Wikoff (1964) similarly found no correlation with IQ. Saunders et al. (1973) found a significant positive correlation between the Impulsivity score and the Matching Familiar Figures Test, which has been used in studies of impulse control. Gudjonsson (1979) found that scores for a cross-cultural Icelandic population were consistent with the USA norms.

The following table summarises findings of previous studies on the use of the IES Arrow-Dot test in behaviour-disordered/violent/criminal populations:

Author	Subjects	Tests Used	Findings
Rankin & Wikoff (1964)	57 reformatory inmates 64 college students	IES Arrow-Dot Test Beta Intelligence Test	Low correlations between Arrow-Dot scores and Beta IQ scores indicate that the Arrow-Dot test is relatively independent of intelligence. Impulse score significantly higher in delinquent inmates
McCormick et al. (1971)	24 behaviour disordered drug abusing adolescents in a psychiatric hospital	IES Arrow-Dot Test Wechsler IQ MMPI	Arrow-Dot Impulse score was moderately and positively correlated with the MMPI Pd scale, but not with IQ
Roback (1965)	52 aggressive maximum security psychiatric patients 52 non-aggressive psychiatric patients without problem behaviour	IES Arrow-Dot Test	Aggressive patients had significantly higher impulsiveness scores and lower ego/realistic function scores
Saunders et al. (1973)	Delinquent "runners" and "non-runners" on the basis of runaway records	IES Arrow-Dot Test Barratt Scale (Impulsivity) Matching Familiar Figures Test	No difference, but significant positive correlation between Arrow-Dot Impulse score and Matching Familiar Figures Test
Mangold (1966)	30 institutionalised delinquents 30 non-delinquent adolescents	IES Arrow-Dot Test	Delinquents exhibited significantly poorer impulse control and lower ego function
Gudjonsson (1979)	Cross-cultural Icelandic population: 12 criminal recidivists 12 police officers 12 clergymen	IES Arrow-Dot Test	Significant differences for Impulse scores, with offenders having highest and clergymen having lowest scores. Icelandic mean scores statistically consistent with the USA norms
Goldberg & Meltzer (1974)	Two groups of drug addicts: 20 in a therapeutic drug community 20 in a methadone maintenance program Compared with means for neurotics from norms, and means for delinquents from Rankin & Wikoff's (1964) study	IES Arrow-Dot Test	Both groups of drug addicts' Impulse scores were significantly higher than those of both delinquents and neurotics

Wisconsin Card Sorting Test (WCST)

This widely used test was originally designed as an objective technique for measuring "abstract behaviour" and "shift of set" which would yield quantitative measures (Berg, 1948; Grant & Berg, 1948). The current version of the test (Heaton, 1981) has gained increased popularity as a clinical neuropsychological instrument. Unlike other tests of abstract behaviour, it can provide objective measures of overall success (categories completed; total errors), as well as of particular sources of difficulty, e.g., with conceptual shift, perseveration, inefficient learning across several trials, failure to maintain set, and inefficient initial conceptualisation. Mesulam (1985) mentions that patients who cannot inhibit interfering response tendencies perform quite poorly on the WCST. The WCST has proved to be particularly sensitive to frontal disturbance (Heaton, 1981). Malmo (1974) reported a specific sensitivity to dorsolateral frontal pathology. In a study of brain lesions, Robinson, Heaton, Lehman, and Stilson (1980) concluded that "the WCST is a clinically useful tool for discriminating frontal from non-frontal lesions, and a better single discriminant than any test currently in the Halstead-Reitan Battery (p. 605).

The WCST consists of four stimulus cards and two identical decks of 64 response cards on which are printed one to four symbols (circle, triangle, star, or cross) in red, blue, green, or yellow. The testee is required to sort the response cards one at a time in association with one of the four stimulus cards and has to deduce the sorting principle (either colour, form, or number) from the examiner's response to each placement (i.e., "right" or "wrong"). After ten consecutively correct responses, the examiner changes the sorting principle without warning. As scoring of e.g. perseverative responses is quite complicated, a computer program was written to do the scoring of the WCST.

The following tabular summary indicates WCST results from previous studies on violent or psychopathic populations:

Author	Subjects	Tests Used	Findings
Roy, Mandelzys, Marceau, & Lane (1980)	Recidivist violent attempted rapist (case report)	WCST Halstead Category Test Neuropsychological battery	Almost totally unable to perform WCST. No difficulty on Category Test. Neuropsychological tests showed rather severe anterior brain dysfunction lateralised to the dominant hemisphere.
Gorenstein (1982)	23 patients treated for substance abuse 13 patients treated for psychological complaints 7 patients treated for both the above These 43 Ss divided into 20 psychopaths 23 psychiatric controls plus 18 normal students	WCST Sequential Matching Memory Task (SMMT) Necker Cube Reversals Stroop Colour-Word Interference Test Word generation task	Psychopaths performed similar to patients with frontal lesions: - more WCST perseverative errors - more SMMT errors - more Necker cube reversals distinguished psychopaths from controls Significant interaction effect on Stroop test relative to students.
Hare (1984)	46 prisoners divided into: 16 low psychopathy 16 medium psychopathy and 14 high psychopathy groups by Hare's Checklist for Psychopathy	WCST SMMT Necker Cube Reversals	No differences
Hoffman et al. (1987)	Alcoholics from treatment centre: 24 high alcohol psychopath 10 low alcohol, psychopath 12 high alc. nonpsychopath 35 low alc., nonpsychopath	Trail-making Test WISC-R Mazes WCST SMMT Necker Cube Reversals Interference Memory Task	Trail-making performance poorer in high alcoholism, low psychopathy, older, less intelligent groups
Lueger & Gill (1990)	21 conduct disordered adolescents 20 normal controls	WCST SMMT Kaufman Hand Movements Test Trail-making Test Auditory Verbal Learning Test	Conduct disordered group performed more poorly on: - WCST perseverative responses - WCST perseverative errors - SMMT errors - No. of correct hand movements - No. of words recalled on AVLT trial 5. WCST perseverative errors, SMMT errors and Hand Movements correctly classified 81% conduct disordered and 90% controls, overall hit rate 85%
Newman et al. (1987)	Minimum security prisoners classified as psychopaths or non-psychopaths on Hare's Checklist for Psychopathy	Computerised card playing task involving monetary rewards and punishments	Unambiguous evidence of response perseveration in psychopaths

Newman (1979)	Three groups of juvenile delinquents: - Psychopaths - Neurotic psychopaths - Non-psychopaths	A card playing task 3 separate discrimination tasks	Psychopaths had exaggerated tendency to make a rewarded response (perseverate). This tendency to perseverate resulted in poorer response inhibition and passive avoidance than controls. Perseveration could be reduced by providing concrete "external" feedback.

Stroop Colour-Word Interference Test

This test was originally developed by Stroop (1935) to investigate interference or inhibition. It assesses susceptibility to interference and the ability to inhibit a compelling impulse to respond in a habituated manner when so instructed, i.e., the ability to shift one's perceptual set to conform to changing demands (Lezak, 1983). This has often been found to present problems in persons with frontal lobe dysfunction (Mesulam, 1985). Subjects are required to perform three tasks. From the first card, they have to read as quickly as possible 100 colour words (RED, GREEN, and BLUE) printed in black ink in five columns of 20 words each, arranged in random sequence. On the second card, they have to name the colour of 100 blocks of XXXX's printed in a similar arrangement in red, green, or blue ink. This constitutes the first level of interference, as words are read quite automatically, whereas naming colours requires considerably more concentration (MacLeod, 1991). On the third card (the second interference task), subjects are presented with 100 words (RED, GREEN, and BLUE) printed in red, green, or blue ink, but not matching the colour spelt by the letters. They have to name the colour of the ink, ignoring the word it spells. Subjects are not stopped to correct errors. Time taken to complete each task and number of errors are recorded; the higher the scores, the poorer the performance.

Spreen and Strauss (1991) reported reliabilities of .90, .83 and .91 for the first, second, and third Stroop tasks respectively. In a comprehensive review, Jensen and Rohwer (1966) cite evidence that the Stroop test did not yield significant racial differences and that Stroop scores are only marginally related to intelligence.

Heilbrun (1982) found that on a cognitive-control variable as measured by the Stroop test and a mirror-tracing task, low-IQ psychopathic criminals demonstrated the poorest impulse control. On a similar

behavioural index of impulsivity derived from combined error scores on the Stroop test and a mirror-tracing task, Heilbrun and Heilbrun (1977) found that black criminals who had committed violent crimes showed poorer self-control than white violent criminals ($p < 0.01$). Gorenstein (1982) found a significant interaction effect on the Stroop test for 20 psychopaths and 23 psychiatric patients relative to a normal control group.

Waid and Orne (1982) examined a model which contends that poorly socialised behaviour develops in part as a result of diminished physiological reactions that make it more difficult to inhibit dominant responses in conflict situations. Results substantially confirmed this theory, as more errors on a response-conflict task modeled on the Stroop test ($p < .05$) and reduced electrodermal responses to this task ($p < .025$) were found among low-socialised subjects. The authors suggested that further research will need to determine whether these electrodermal and performance measures will generalise to more ecologically representative social behaviours in relation to undersocialised behaviour patterns.

Monroe Dyscontrol Scale

Monroe (1978), one of the pioneers in the identification and investigation of the dyscontrol syndrome, developed a self-rating scale to identify this syndrome in particular. It was intended to measure not merely impulsiveness as a common personality trait, nor was it designed to purely reflect violent behaviour (although the two are often associated), but rather as an indicator of impulse dyscontrol as a dysfunctional concept. According to Monroe, episodic dyscontrol is motivated by profound feelings of rage, fear, or displeasure which are acted out as serious antisocial acts with no or limited foresight, and out of context for the situation.

Plutchik, Climent & Ervin (1976, cited in Monroe, 1978) selected 18 statements from Monroe's original scale developed in 1970, to study 11 different subject groups. They concluded that this dyscontrol scale measures something different from pure violence, although it is often associated with violence. They then analysed each of 7 of these groups using separate intercorrelational matrices. The following variables were significantly correlated with the Monroe Dyscontrol Scale, giving number of groups in which correlations occurred, and mean correlation.

Variable	No. of Groups	Mean Correlation
Feelings about Violence Scale	7	.61
MMPI Schizophrenia Scale	7	.42
Total number of problems (health, job, social, etc.)	5	.58
Number of emotional problems	5	.56
Number of behaviour problems (truancy, drugs, etc.)	5	.53
Number of sexual problems	4	.62
Number of social problems	4	.57
History of family violence	4	.56
MMPI Psychopathic Deviate Scale	4	.52
Number of health problems	4	.46
MMPI Lie Scale	3	-.40
FAS Sex Drive Scale	3	.53
Social Deviance Index	3	.46
M-D Depression Scale	2	.58
History of family disease	2	.53

(Plutchik, Climent & Ervin, 1976, cited in Monroe, 1978, p. 97)

The questionnaire consists of 18 items, with four Likert scale response options (never, rarely, sometimes, often) for each item.

A 5-item subscale reflecting the admission of overt violent acts proved to be relatively powerful, showing 49 significant correlations at the .05 level from 250 psychiatric and psychometric variables. This subscale was also found to have clinically significant correlations with prison infraction ratings, antisocial behaviour during childhood, the MMPI Episodic Scale, history of head injury, suspicion of epilepsy, "short fuse", CNS toxicity, and depression. It was negatively correlated with motor retardation and lack of emotion.

On the basis of his extensive study, Monroe concluded that the Monroe Dyscontrol Scale is an adequate measure of the dyscontrol syndrome, which seems to be weighted in favour of what he calls an "epileptoid" mechanism (intermittent hyperexcitability of neurons in subcortical brain areas), probably localised in the limbic system because of its low seizural threshold. He considered that certain variables found to correlate with the scale (such as prodromal restlessness, insomnia, psychosomatic concerns and hypochondriasis) suggest a possible autonomic instability of an ictal or preictal nature. Furthermore, impulsive behaviour in his sample of incarcerates was not only regarded as severe and aggressive, but was also associated with anger and a lack of premeditation with regard to the acts themselves. A correlation was also found with poor academic achievement and depression.

From Monroe's (1978) study, the following are some of the variables that correlated with the Monroe Dyscontrol Scale (pp. 98-100):

Variable	Dyscontrol Scale Corr. Coeff p≤.05	Overt Viol. Subscale Correl. Coeff p≤.05
Predict epileptoid mechanism (positive relation to primitive aggressive acts)	.34	.33
Belligerence-negativism	.27	.35
Agitation-excitement	.32	.29
Dyscontrol Behaviour:		
• Severity	.19	.20
• Lack of premeditation	.27	
• Aggressive affect	.35	.36
• Prodromal anger	.18	.28
• Prodromal restlessness	.18	
• Prodromal depression	.21	
Depression	.26	.20
Poor academic achievement	.20	
Amnesia, fugue, dissociative state	.22	
Insomnia	.22	.24
Theta frequency counts on EEG	.23	
Draw-a-line task	-.35	-.20
Neurologic examination:		
• History of head injury		.22
• CNS toxicity		.23
• Short fuse		.25
Antisocial psychiatric rating		.21
Antisocial traits in childhood		.24
Number of previous antisocial acts		.20
Number of previous institutionalisations		.23
Infraction rating (baseline)		.25
Adolescent sexual adjustment		.21
Impulsiveness (MMPI Episodic scale)		.32
Inhibited		-.19
Blames others		.19

As a self-report measure of impulse dyscontrol, the Monroe Dyscontrol Scale was therefore selected in preference to other scales reviewed, as it seemed more particularly aimed at the dysfunctional aspect of impulse control which is the issue under investigation in this study, rather than "impulsivity" as a variation in normal personality style. The scale was translated into Afrikaans (see Appendix B), and where necessary, concepts were explained in more detail during interviews.

Alcohol and drug questionnaire (see Appendix B)
A questionnaire was designed to investigate the pattern of use of alcohol, cannabis and Mandrax - both on their own and in various combinations. One section investigated misdemeanours committed under influence of these substances, while another part inquired into subjective effects of these substances (results of these sections will appear in a subsequent report).

Clinical/biographical questionnaire (see Appendix B)
As a structured guide to interviews, a series of questions were constructed to investigate certain biographical and clinical details, aggressive tendencies, and family history of pertinent aspects.

MMPI Lie Scale
Since lying is generally considered to be characteristic of a psychopathic or criminal population, the MMPI Lie Scale questions were translated into Afrikaans and interspersed with items on the clinical/biographical questionnaire as an indication of the truthfulness of responses. Items 60 and 255 were omitted, as they were not applicable to this particular population. (See Appendix B, Clinical/biographical questionnaire, questions 6, 10, 11, 12, 14, 17, 23, 29, 30, 33, 35, 39 and 45.)

Luria's Graphic Alternating Sequences Test (GAST) (see Appendix B)
This test was independently designed by Luria (1973) for clinical use, and is a measure of response inflexibility and perseverative behaviour which is typical of frontal lobe dysfunction. The subject is asked to copy and maintain alternating patterns of letters (e.g. m n m n m n in script) or a sequence of geometric figures (e.g. square, triangle, square, etc.). It has been found that of the common geometric figures, circles are least likely, squares more likely, and triangles most likely to be perseverated (Lezak, 1983).

Five graphic sequences were horizontally arranged on an A4 sheet and presented to small groups of six subjects. They were requested to carry on repeating the sequences to the end of the page. Erasers were not provided to correct mistakes.

Quick Test (verbal intelligence) (QTIQ)

The Quick Test (Ammons & Ammons, 1962) was designed for quick screening of verbal-perceptual intelligence, similar to the widely-used Full-Range Picture Vocabulary Test. It also resembles the vocabulary test in the latest version of the SSAIS. A page with four line drawings is presented to the subject, who has to indicate which of the four pictures best illustrates the meaning of each of 50 words. Administration takes about ten minutes only, and it can be used from two year olds to adults. An answer sheet was prepared for Form 1 of the test to facilitate group administration (see Appendix B), and the test was administered in small groups of six. In the original version, words were arranged in ascending order of difficulty and testing was stopped after six consecutive passes and six consecutive failures. For the purpose of this study, subjects were required to complete all 50 words, as they were not necessarily arranged in order of difficulty. Subjects were urged not to guess if they did not know the meaning of a word, and were told that certain words were deliberately extremely difficult, so they were not expected to know all the words.

Although no standardisation was done on this adapted form of the test, it was regarded as an adequate, quick verbal measure to control for significant differences between subjects groups or to establish whether there are trends for the neuropsychological tests used to depend on verbal ability.

Significant correlations between the original Quick Test and the WAIS have been reported (Ogilvie, 1965; Davis & Dizzonne, 1970), while similar findings were obtained on a negro population (Stewart, Cole, & Williams, 1967).

Raven's Standard Progressive Matrices

This well-known, culture fair test (Raven, 1956) was administered to small groups of six subjects at a time as a measure of nonverbal intelligence. Reliability has been reported to be in the range of .7 to .9 (Lezak, 1983), and Peck's (1970) scoring system was used to convert raw scores to percentiles and percentiles to IQ.

PROCEDURE

Consent for undertaking the research project was obtained from the Department of Correctional Services.

Subjects were first interviewed in privacy at the prison on an individual basis. The nature and aim of the study was explained to the person. I stressed that I was not working for Correctional Services or the police, that all information would be strictly confidential and that results would only be reported in group context. It was explained that the aim of the project was to gather information which may help us to understand why some people have a tendency to commit crime, in order to develop improved methods to help to prevent them from committing crime and landing in prison repeatedly. Their willingness to be truthful was emphasised as a prerequisite for taking part in the study and they were then asked if they would be willing to participate. The men were generally keen to take part in the study and only three people declined. A form was then signed by the experimenter to ensure the subject of confidentiality and each participant signed a section on the same form declaring that they consent to take part in the study and that they would be truthful in their responses.

As the ability to distinguish between colours was required in both the WCST and the Stroop test, subjects were first asked to name four coloured squares in red, blue, green and yellow.

Administration of the test battery for assessment of impulse control was then started with the simplest tests in order to set the person at ease (see order of administration given above in "List of assessment measures"). The WCST was deliberately administered before the Stroop, so that a mind set of "colour", created by the Stroop, would not influence WCST responses. Including the initial explanation and the dyscontrol scale, which was completed by the subjects themselves, administration of the first seven measures took about 40 minutes. Thereafter the substance use history and clinical details were elicited in interview format, bringing total time for the individual interview to at least two hours per person. The Graphic Alternating Sequences Test and two measures of intellectual ability were administered on another day in small groups of six, which also took about two hours. Subjects were rewarded with sweets after both sessions.

STATISTICAL ANALYSIS

Data analysis was done on the University of Cape Town's mainframe VAX computer using the SAS/STAT package, and data capturing, simple statistics, and matched-pairs *t*-tests by means of Lotus-123 on PC.

Continuous data such as test scores were analysed by means of normal probability plots, boxplots, stem-leaf plots, and correlations. Two-tailed *t*-test comparisons were done between subject categories as described below. Where data did not seem to satisfactorily fit a normal distribution, data transformation was done according to methods suggested by Afifi and Clark (1990). Analysis after transformation, however, yielded essentially the same results as before, proving that the statistical procedures were sufficiently robust to handle untransformed data. Untransformed data were therefore used, as results can be presented in terms of easily interpretable units.

Categorical data (e.g. clinical variables and certain continuous variables transformed into binary format (e.g. high/low)) were compared for differences between groups (as described below) by means of contingency tables and chi-square tests.

Regression procedures were applied in terms of multivariate analysis, but procedures tried thus far within the time available, proved unsatisfactory to select a model of variables which would best predict group membership, as a variable which was highly correlated with another, but which is not necessarily a measures of the same construct (e.g. the classical height/weight example), tended to be excluded or assigned a minimal weight on account of colinearity. It was therefore felt that the importance of such variables were unfairly obscured or diminished. Should a more satisfactory procedure be found, results will appear in a subsequent report.

RESEARCH DESIGN

The project was regarded as a pilot study which should be extended, improved or followed-up later by e.g. utilisation of non-criminal controls, larger populations, and more refined measures and techniques in order to further investigate and corroborate significant findings.

In view of the exploratory nature of the study, _t_-test and chi-square comparisons (for continuous and categorical variables respectively) were made in order to find out whether certain dependent variables are particularly characteristic of a specific category. Correlations between continuous variables such as test scores were done by means of Pearson's _r_.

Interrelationships between psychopathological features which other studies have found to be correlated with a disturbance in serotonin metabolism (e.g. impulse dyscontrol, aggression dysregulation, depression, suicide attempts, irritability, anxiety and substance abuse), were examined by means of chi-square tests.

Since the number of subjects was large enough, _post hoc_ comparisons were made between certain subcategories to find out whether any of the variables under investigation are particularly characteristic of e.g. murderers, rapists, high dyscontrol, depressives, anxious men, and the group with a high number of features from the five-symptom cluster. Where applicable, comparisons were also made within violent and non-violent groups between these categories, e.g. to explore differences between depressed violent subjects and non-depressed violent men.

Subjects' opinions of causes of crime (questions 48 and 50 of the biographical questionnaire) were not suitable for statistical analysis, as subjects were allowed to give multiple responses. These results were analysed descriptively.

The weakness of a research design with multiple independent correlational analyses is the likelihood of making Type I errors, i.e. that some relationships may be identified as significant that are due to chance alone. However, in view of the exploratory nature of the study, this situation was preferable to the probability of making more Type II errors. The significance level was set at .05.

Subject categories

The following subject categories were compared:

- Violent (n = 50) versus non-violent group (n = 50).

- Murderers (n = 30) versus non-murderers (n = 70, i.e. includes non-violent subjects). This category, referred to as "murderers", includes convictions for attempted murder.

- Rapists (n = 22) versus non-rapists (n = 78, i.e. includes non-violent subjects). This category, referred to as "rapists", includes convictions for other sexual crimes of a violent nature, e.g. sodomy, attempted rape, and indecent assault.

- Dyscontrol - subjects who gained high scores (n = 51) on the Monroe Dyscontrol Scale (30 or more out of a potential maximum of 54) were compared to "low dyscontrol" subjects (n = 49) with scores of less than 30.

- Depression - subjects who reported a tendency to become depressed (n = 42) were compared to non-depressives (n = 58).

- Anxiety - subjects who reported a tendency towards anxiety (n = 42) were compared to the 58 non-anxious men.

- Five-symptom cluster - subjects with a high number (3 to 5) of features from the cluster of five symptoms hypothetically related on the basis of a common biological substrate (also see p. 100).

Variable categories and description of variables

Within each of the above subgroups, the following variables were compared by means of chi-square tests for nominal or ordinal categories and on t-tests for continuous variables. Where applicable, question numbers between brackets refer to the source of the variable on the biographical questionnaire (see Appendix B). Variables were categorised as follows in order to facilitate the presentation of results:

Dyscontrol and aggressive tendencies:

- Monroe Dyscontrol Scale score (a dichotomous variable was also created, i.e. high = 30 or more, low = 29 or below)
- Monroe Overt Violence score (a dichotomous variable was also created, i.e. high = 7 or more, low = 6 or below)
- Gets cross quickly including under influence of substances (q. 13)
- Gets cross quickly only under influence of alcohol/drugs (q. 13)
- Aggressive by nature including under influence of substances (q.38)
- Aggressive by nature only under influence of alcohol/drugs (q. 38)
- Irritable (q. 21)
- Has often/sometimes become so angry or aggressive that he has hit/hurt someone or broken things (acted out anger) (q. 16)
- Bully as child (used to hurt other children or animals) (q. 28)

Substance use:

Substance use variables were derived from the substance use questionnaire by means of complicated calculations of actual days each substance was used based on the multiple reported frequencies of use for different life periods - excluding times spent in prison for use of alcohol and alcohol and drugs combined, as well as for drug use if the person indicated that he did not use a particular drug in prison. It was found that while hardly anyone had ever gained access to alcohol in prison, the majority still managed to obtain drugs while in prison (though apparently more readily at some prisons than at others). So although these figures give some indication of seriousness or frequency of substance use, they would tend to be more reliable for drugs than for alcohol, as someone who might have abused alcohol on a daily basis yet had relative infrequent access to it on account of frequent or long imprisonment, may gain a relatively low score.

As age would obviously influence these figures, it was partialled out for correlations (Pearson's R), but with the limited statistical/computer assistance obtainable within the restricted time available for data analysis, this could not be accomplished for the purpose of t-test and chi-square comparisons. Results presented for substance use are therefore based on partial correlations. The following variables were derived, with binary categories (based on medians) which were sometimes used e.g. for chi-square comparisons, given in brackets:

- Alcohol history (high ≥ 1113; low < 1113 days)
- Cannabis history (high ≥ 2295; low < 2295 days)
- Alcohol plus cannabis combined (high ≥ 84; low/no < 84)
- Mandrax plus cannabis combined (yes ≥ 14; low/no < 14)
- Alcohol plus Mandrax plus cannabis (yes ≥ 1; no = 0)

Clinical variables:

- Head injuries
  (As this turned out to be difficult to assess along criteria such as length of loss of consciousness or retrograde or postgrade amnesia since many subjects could not remember such details, evaluation of whether a head injury was sufficiently serious to have possibly caused a degree of brain damage, was based on clinical judgment of the interviewer, and should not be interpreted as conclusive evidence of actual brain injury (q. 19))
- Depression (q. 22)
- Suicide attempt(s) (q. 24)
- Anxiety (q. 25)
- Insomnia (q. 26)
- 5-symptom cluster (variable created by adding 1 for the presence of each of 5 variables, speculatively related to serotonin function: high Monroe dyscontrol score (≥ 30), irritability, depression, suicide attempt(s), anxiety - thus having a possible range of 0 to 5. A dichotomous variable was also created: high 3-5; low 0-2).
- Headaches (q. 21)
- Blackouts (q. 21)
- Epilepsy (q. 21)
- Chronic tiredness (q. 21)
- High blood pressure (q. 21)
- Serious past illnesses (q. 18)
- Allergy (q. 21)
- Frequently had enuresis (q. 27)
- MMPI Lie Scale (6, 10, 11, 12, 14, 17, 23, 29, 30, 33, 35, 39, 45)
- Frequency of sexual activity per month (q. 48)

Family history:

- Family suicide attempt(s) (q. 24)
- Family psychiatric history (q. 42)
- Violent family member(s) (q. 43)
- Family members been in prison (q. 43)
- Family members abuse alcohol (q. 44)
- Family members abuse drugs (q. 44)

Crime-related variables:

- Prison security classification
  (This is a weighted figure calculated at the prisons on the basis of criminal history to rate each criminal as a maximum or medium security risk. A score of 420 or above qualifies a prisoner for maximum security custody.)
- Age at first imprisonment (q. 37)
- Total number of crimes (extracted from prison files)
- Number of violent crimes (extracted from prison files)
- Committed crime/lied to get money for alcohol or drugs (q. 40)
  (yes = often/sometimes; no = never/once or twice)

Test results:

Results of the neuropsychological tests described previously. Results of the self-report Monroe scale are not presented with these test results, but under the heading "dyscontrol and aggressive tendencies".

RESULTS

Contrary to the expectation that untruthfulness would be characteristic of a prisoner population, there was a general trend towards low or normal scores on the MMPI Lie Scale: only 5% of subjects had a marked elevation, 9% had a moderate elevation, 29% had normal scores, and 57% obtained low scores. The findings can therefore probably generally be regarded as valid. The only significant group difference with regard to the MMPI Lie Scale was that the high dyscontrol group gained notably lower scores, while a similar but nonsignificant trend existed for anxious men.

The variable referred to as "five-symptom cluster" in the clinical variable sections, represents a combined index of five psychopathological dimensions hypothetically related on the basis that they may have a common neurochemical substrate, since previous studies have found associations between such features and low CSF levels of the serotonin metabolite, 5-HIAA (as discussed in the section "Neurobiology of dyscontrol and violence"). A score of one was added to this variable for the presence of each of the following five variables: high impulse dyscontrol (a score of 30 or more on the Monroe Dyscontrol Scale, as the median was 29), and a history of irritability, depression, suicide attempt(s), and anxiety. The score could thus range from 0 to 5, and for chi-square comparisons this was dichotomised into a high score of 3 to 5, and a low score of 0 to 2.

Several differences were found on marital status. Within the following subgroups significantly fewer men were married or had cohabiting relationships: the violent group, high dyscontrol group, murderers, depressives, and the group with 3 to 5 features from the five-symptom cluster, while rapists showed a similar, but nonsignificant trend.

There were no differences between subgroups with regard to intellectual performance, apart from the group of rapists who gained significantly higher scores on Raven's IQ, both in comparison to the rest of the sample ($p < .05$) and the other violent offenders ($p < .01$). Means on the Raven's test for violent and non-violent groups were 91,9 and 93,6 respectively, and on the QT (verbal intelligence) respective means were 86,9 and 84,9.

Further results are presented as follows:

- Violent versus non-violent group
  - Dyscontrol and aggressive tendencies
  - Neuropsychological test results
  - Clinical variables
  - Family history
  - Crime-related variables
  - Substance use
  - Summary profile of group

- Murderers
- Rapists / Sexual offenders
- Dyscontrol (subjects with high scores on Monroe Dyscontrol Scale)
- Depression (subjects who reported a tendency to become depressed)
- Anxiety (subjects who reported a tendency to become anxious)
  (These five subject categories are discussed in terms of the same subheadings as for the violent and non-violent groups)
- Five-symptom cluster
- Interrelationships between variables hypothetically related to serotonin dysfunction
- Bullies in childhood
- Confessions of dishomesty or crime in order to obtain substances
- Perceived "benefits" of substance use
- Prisoners' opinions of causes of crime
- Memory lapses during substance intoxication
- Tabular summary of prominent findings and trends across all subgroups

Several combined tables of results are presented in Appendix A:

- Table 30 presents a global indication of significant differences and trends on _t_-tests for continuous variables.
- Table 31 shows significant correlations between continuous variables.
- Table 32 (Dyscontrol and aggressive tendencies), Table 33 (Clinical variables) and Table 34 (Family history) enable comparison of the following subgroups at a glance by means of chi-square tests: violent vs. non-violent, habitually violent offenders (i.e. ≥7 violent crimes), murderers, rapists, high scorers on dyscontrol, the group reporting depression, as well as offenders with seven or more economic crimes.

VIOLENT VERSUS NON-VIOLENT GROUP (n: 50 violent, 50 non-violent)

As the violent and non-violent groups were pair-matched on age and education level, t-test results for both independent samples and matched pairs are presented in the tables in this section. There was generally close correspondence between these values.

Compared to the non-violent group, significantly more violent offenders were not in a marital or cohabiting relationship ($p < .05$). They were either divorced or never married.

Dyscontrol and aggressive tendencies

As hypothesised, violent offenders reported significantly more indications of dyscontrol and more aggressive tendencies than the non-violent group.

Table 1 shows the following significant differences: t-tests show that the violent group gained higher scores both on the Monroe Dyscontrol Scale (mean 30.7 vs. 25.0 for the non-violent group out of a maximum of 54; $p < .001$) and its Overt Violence Subscale (mean 8.9 for violent men vs. 5.1 for non-violent men out of a maximum of 15; $p < .001$). For the purpose of chi-square tests, these variables were dichotomised: subjects with a score of 30 or more (out of a maximum of 54) on the Monroe Dyscontrol Scale were rated as high dyscontrol, and subjects with a score of 7 or more (out of a maximum of 15) on the Overt Violence Subscale were rated as high overt violence. In comparison with 38% of the non-violent men, 64% of the violent prisoners gained high scores on the Monroe Dyscontrol Scale ($p < .01$), and compared to 30% from the non-violent sample, 74% of the violent group had high scores on overt violence ($p < .001$).

The following significant differences were also obtained on chi-square tests: more violent subjects indicated that they get cross quickly (including under the influence of alcohol or drugs) (72% vs. 28% of the non-violent subjects; $p < .001$), are aggressive by nature (including under the influence of alcohol or drugs) (38% vs. 8%; $p < .001$), and have often/sometimes become so angry or aggressive that they have hit someone or broken things, i.e. acted out anger (84% vs. 50%; $p < .001$).

Table 1 VIOLENT VS. NON-VIOLENT GROUP: DYSCONTROL AND AGGRESSIVE TENDENCIES

AGGRESSIVE TENDENCIES	INDEP. SAMPLES t	Prob.>t	MATCHED PAIRS t	Prob.>t	GROUP	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	AGGR. VAR. CATEGORIES
Monroe Dyscontrol Scale	3.282	.001***	2.865	<.01**	Viol:	30.7	8.4	28.3-33.1	64%	6.763	.009**	High/Low
					NonV:	25.0	8.9	22.5-27.5	38%			
Monroe Overt Violence Scale	5.489	<.001***	5.014	<.001***	Viol:	8.9	3.5	7.9-9.9	74%	19.391	<.001***	High/Low
					NonV:	5.1	3.4	4.1-6.1	30%			
Gets Cross Quickly Incl. Under Infl. Alc/Drugs					Viol:				72%	19.360	<.001***	Yes/No
					NonV:				28%			
Gets Cross Quickly Only Under Infl. Alc/Drugs					Viol:				20%	-4.762	.029*	Yes/No
					NonV:				40%			
Aggressive by Nature Incl. Under Infl. Alc/Drugs					Viol:				38%	12.705	<.001***	Yes/No
					NonV:				8%			
Aggressive by Nature Only Under Infl. Alc/Drugs					Viol:				44%	0.041	.840	Yes/No
					NonV:				42%			
Irritable					Viol:				66%	7.853	.005**	Yes/No
					NonV:				38%			
Has Become Aggressive and Hit Someone/Broken Things					Viol:				84%	13.071	<.001***	Yes/No
					NonV:				50%			
Bully as Child (Hurt Children/Animals)					Viol:				40%	8.574	.003**	Yes/No
					NonV:				14%			

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

Note. Violent group $n = 50$, non-violent group $n = 50$.
[a] Minus sign indicates negative relationship (from Somers' D statistic).

More prisoners from the violent group acknowledged experiencing problems with irritability (66% vs. 38%; $p < .01$) and having had an inclination to hurt other children or animals when they were children (i.e. "bullies") (40% vs. 14%; $p < .01$).

Fewer violent than non-violent subjects reported that they tend to get cross quickly only when under the influence of alcohol or drugs (20% vs. 40%; $p < .05$).

Neuropsychological test results

Apart from the highly significant results of the Monroe Dyscontrol Scale and Overt Violence Subscale presented above (Table 1), the test battery mostly yielded insignificant results, contrary to expectation.

Table 2 VIOLENT VS. NON-VIOLENT GROUP: TEST RESULTS

TESTS	INDEP. SAMPLES		MATCHED PAIRS		GROUP	MEAN	S.D.	CONFIDENCE INTERVAL
	t	Prob.>t	t	Prob.>t				
DAC (difference) (seconds)	1.215[a]	.228	1.411	N.S.	Viol:	15.1	12.8	11.5-18.7
					NonV:	12.5	8.4	10.1-14.9
DAL (difference) (seconds)	1.606[a]	.112	1.603	N.S.	Viol:	11.8	8.5	9.4-14.2
					NonV:	9.4	5.7	7.8-11.2
Stroop-1 (seconds)	0.356	.723	0.409	N.S.	Viol:	56.1	12.4	52.6-59.6
					NonV:	55.3	8.9	52.8-57.8
Stroop-2 (seconds)	-1.286	.201	-1.276	N.S.	Viol:	75.3	15.9	70.8-79.8
					NonV:	79.3	15.7	74.8-83.8
Stroop-3 (seconds)	-0.272	.786	-0.269	N.S.	Viol:	140.6	30.4	132-149
					NonV:	142.3	31.6	133-151
TMT-A (seconds)	2.202	.030*	2.397	<.05*	Viol:	50.1	16.4	45.4-54.8
					NonV:	43.2	14.7	39.0-47.3
TMT-B (seconds)	0.205	.838	0.218	N.S.	Viol:	153.9	82.6	130-177
					NonV:	150.3	90.9	124-176
IES Arrow-Dot Impulse	-1.021	.310	-0.467	N.S.	Viol:	4.23	2.72	3.5-5.0
					NonV:	4.85	3.32	3.9-5.8
IES Arrow-Dot Ego	-1.111	.269	-1.020	N.S.	Viol:	13.64	5.41	12.1-15.1
					NonV:	14.81	5.12	13.4-16.3
IES Arrow-Dot Superego	1.889	.062	1.955	N.S.	Viol:	4.79	4.28	3.6-6.0
					NonV:	3.34	3.33	2.4-4.3
WCST Categories Achieved	-0.281	.779	-0.332	N.S.	Viol:	3.04	1.87	2.5-3.6
					NonV:	3.14	1.67	2.7-3.6
WCST Perseverative Responses	0.771[a]	.443	0.735	N.S.	Viol:	48.0	34.5	38.2-57.8
					NonV:	43.3	25.3	36.1-50.5
GAST Errors	-0.544	.588	-0.520	N.S.	Viol:	1.72	2.10	1.1-2.3
					NonV:	1.98	2.65	1.2-2.7
Raven's IQ	-0.531	.596	-0.597	N.S.	Viol:	91.9	18.2	86.7-97.1
					NonV:	93.6	14.8	89.4-97.8
QT Verbal IQ	0.834[a]	.407	0.960	N.S.	Viol:	86.9	13.9	82.9-90.9
					NonV:	84.9	9.8	82.1-87.7

* $p < .05$
N.S. Nonsignificant.

[a] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.).
Note. Violent group n = 50, non-violent n = 50.

From Table 2 it can be seen that the only other significant discriminator is part A of the Trail-making Test (longer mean completion time for the violent group of 50.1 vs. 43.2 seconds for the non-violent group; $p < .05$).

Table 31 in Appendix A, however, shows that apart from the DAC, DAL, and GAST, the selection of tests generally showed adequate intercorrelation.

Clinical variables

Among the clinical variables there is a highly significant difference on history of suicide attempts, with 28% of the violent group having a positive history vs. 6% of the non-violent group ($p = .003$) (see Table 3). Corresponding with this high incidence of suicide attempts, there is likewise a greater tendency towards depression among violent subjects (50% vs. 34%), although this difference is not statistically meaningful.

Table 3 VIOLENT VS. NON-VIOLENT GROUP: CLINICAL VARIABLES

CLINICAL VARIABLES	INDEP. SAMPLES t	INDEP. SAMPLES Prob.>t	MATCHED PAIRS t	MATCHED PAIRS Prob.>t	GROUP	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CLIN. VAR. CATEGORIES
Head Injuries	2.621	.010**	2.111	<.05*	Viol:	1.26	1.01	0.97-1.55	80%	4.762	.029*	Yes/No
					NonV:	0.78	0.82	0.55-1.01	60%			
Depression					Viol:				50%	2.627	.105	Yes/No
					NonV:				34%			
Suicide Attempts	3.032[c]	.003**			Viol:	0.28	0.45	0.15-0.41	28%	8.575	.003**	Yes/No
					NonV:	0.06	0.24	-0.01-0.13	6%			
Anxiety					Viol:				54%	0.360	.548	Yes/No
					NonV:				48%			
Insomnia					Viol:				40%	-0.271	.873	Yes/Only in jail/No
					NonV:				40%			
5-Symptom Cluster[d]	3.246	.002**			Viol:	2.62	1.59	2.2-3.1	54%	6.986	.008**	3-5/0-2
					NonV:	1.64	1.43	1.2-2.1	28%			
Headaches					Viol:				60%	4.000	.046*	Yes/No
					NonV:				40%			
Blackouts					Viol:				46%	5.319	.021*	Yes/No
					NonV:				24%			
Epilepsy					Viol:				8%	1.895[b]	.169	Yes/No
					NonV:				2%			
Chronic Tiredness					Viol:				32%	-1.528	.216	Yes/No
					NonV:				44%			
High Blood Pressure					Viol:				20%	2.990	.084	Yes/No
					NonV:				8%			
Serious Past Illness(es)					Viol:				24%	-4.560	.035*	Yes/No
					NonV:				44%			
Allergy					Viol:				22%	-0.056	.812	Yes/No
					NonV:				24%			
Frequently Had Enuresis					Viol:				18%	0.071	.790	Yes/No
					NonV:				16%			
MMPI Lie Scale										-2.860[b]	.414	Marked/ Mod /Normal/Low
Frequency of Sexual Intercourse / Month	0.811[c]	.420	0.530	N.S.	Viol:	21.5	28.4	13.4-29.6		-2.081	.556	2-8 / 9-13 14-30/ 31+
					NonV:	17.5	18.8	12.2-22.9				

** $p < .01$
* $p < .05$
N.S. Nonsignificant.

Note. Violent group n = 50, non-violent n = 50.
[a] Minus sign indicates negative relationship (from Somers' D statistic).
[b] Some cells have expected frequencies less than 5; Chi-square may not be valid.
[c] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.).
[d] High dyscontrol score, irritable, depression, suicide attempt, anxiety.

A further highly significant difference is that compared to 28% of non-violent subjects, 54% of the violent prisoners exhibited a greater number of the five psychopathological dimensions which have been hypothesised to have a common underlying biological factor in the form of diminished serotonin metabolism, i.e. a history of depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol (x^2 (1) = 6.986, p = .008; t (98) = 3.246, p = .002).

Other clinical variables reaching statistical significance are the following: the violent group described having had a greater number of head injuries per person (mean 1.26 for violent subjects vs. 0.78 for non-violent subjects (p = .01)); more violent subjects reported having suffered head injuries (80% vs. 60%; p < .05), blackouts (46% vs. 24%; p < .05), and getting bad headaches (60% vs. 40%; p < .05), but fewer violent men had had serious illnesses (24% vs. 44%; p < .05).

Family history

On account of missing data the number of respondents vary for the family history variables, as subjects often gave a "don't know" reply especially with regard to suicide attempts by family members.

Table 4 VIOLENT VS. NON-VIOLENT GROUP: FAMILY HISTORY

VARIABLES	GROUP	n[a]	% YES	CHI-SQUARE	PROB.	FAM. HIST. CATEGORIES
Family Suicide Attempts	Viol:	14	36%	3.324[b]	.068	Yes/No
	NonV:	26	12%			
Family Psychiatric Hist.	Viol:	40	53%	1.676	.195	Yes/No
	NonV:	49	39%			
Violent Family Members	Viol:	47	60%	7.690	.006**	Yes/No
	NonV:	48	31%			
Family Been in Prison	Viol:	48	75%	7.432	.006**	Yes/No
	NonV:	48	48%			
Family Abuse Alcohol	Viol:	49	88%	3.199	.074	Yes/No
	NonV:	49	73%			
Family Abuse Drugs	Viol:	47	57%	0.276	.600	Yes/No
	NonV:	48	52%			

[a] n varies on account of missing values.
[b] Some expected frequencies < 5; Chi-square may not be valid.
** p < .01

From Table 4 it can be seen that two of the family history variables are significant (both at p < .01), i.e. 60% of the violent group reported having violent family members (vs. 31% of the non-violent

group), and 75% of the violent group have family members who had been or are in prison (vs. 48% of the non-violent group). Just falling short of statistical significance are the following: in agreement with the tendency for violent men to have attempted suicide, 36% of the 14 violent subjects who were able to respond (36 did not know), have family members who had tried to commit suicide (vs. 12% of the 25 non-violent responders), and 88% of the violent subjects have family members who abuse alcohol (vs. 73% of the non-violent group).

Crime-related variables

As one would expect, the weighted safe custody classification figure used at the prisons to rate each criminal as a maximum or medium security risk, proves to be a very good discriminator between violent and non-violent offenders ($p < .001$) (see Table 5). Prisoners gaining 420 points or above on this scale qualify for maximum security custody. The means for the violent and the non-violent sample groups were 538.6 and 317.6 respectively.

Table 5 VIOLENT VS. NON-VIOLENT GROUP: CRIME-RELATED VARIABLES

CRIME-RELATED VARIABLES	INDEP. SAMPLES t	Prob.>t	MATCHED PAIRS t	Prob.>t	GROUP	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CRIME VAR. CATEGORIES
Prison Security Classification	12.294	<.001***	13.366	<.001***	Viol:	538.6	94.9	512-566				
					NonV:	317.6	84.5	294-342				
Age at First Imprisonment	-3.103[b]	.003**	-3.411	<.01**	Viol:	20.7	4.0	19.6-21.8				
					NonV:	23.8	5.9	22.1-25.5				
Total Number of Crimes	1.766[b]	.081	1.992	N.S.	Viol:	10.4	5.6	8.8-12.0				
					NonV:	8.7	3.9	7.6-9.8				
Committed Crime/Lied to Get Alcohol/Drugs					Viol:				56%	-2.778	.096	Yes/No
					NonV:				72%			

*** $p < .001$
** $p < .01$
N.S. Nonsignificant.

Note. Violent group $n = 50$, non-violent group $n = 50$.
[a] Minus sign indicates negative relationship (from Somers' D statistic).
[b] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.).

Violent offenders were furthermore imprisoned for the first time at a significantly younger mean age of 20.7 vs. 23.8 for the non-violent group ($p = .003$). Although not statistically significant, the violent group had committed a larger number of crimes in total (a mean of 10.4 vs. 8.7 for the non-violent group), while more non-violent criminals (72% vs. 56%) had committed crime or been dishonest for the sake of obtaining alcohol or drugs.

Substance use

As the data for substance use were calculated in terms of days used, age would obviously influence these figures. Results for substance use categories are therefore presented in terms of correlations where age has been partialled out. Apart from Mandrax, the use of other hard drugs was negligible and had mainly occurred on an experimental basis.

The violent and non-violent groups do not differ significantly with regard to history of substance use. Nonsignificant positive trends exist, however, for the violent group to have a higher consumption of alcohol alone ($r = 0.144$; $p = .156$) and alcohol and cannabis combined ($r = 0.163$; $p = .108$).

Summary profile of violent vs. non-violent offenders

The significant differences between violent and non-violent subjects can be summarised as follows:

- Violent offenders gained higher dyscontrol and overt violence scores on the Monroe Dyscontrol Scale.
- More violent subjects admitted that they have become so aggressive that they have hit someone or broken things, that they tend to be irritable, get cross quickly, and regard themselves as having an aggressive disposition.
- Forty percent of the violent subjects reported that as children, they had a tendency to hurt other children or animals.
- More violent subjects have a history of suicide attempts.
- More violent prisoners manifested a greater number of the five psychopathological dimensions hypothetically related to diminished serotonin metabolism, i.e. depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol.
- The violent group reported having suffered more head injuries.
- There was a greater incidence of headaches and blackouts amongst violent offenders.
- More violent offenders have a family history of violence and family members who have been imprisoned.
- Violent criminals were generally younger at their first imprisonment and have a higher prison security classification.
- Violent subjects performed significantly poorer than non-violent criminals on part A of the Trail-making Test.

MURDERERS (n = 30)

In order to establish if murderers would have a significantly different profile from other offenders, the 30 offenders who had been convicted of murder or attempted murder (collectively referred to as "murderers") are compared with all "non-murderers", i.e. the rest of the violent plus non-violent subjects (n = 70).

The number of murderous offences per person ranged from 1 to 4. There were 23 men with 1, 5 with 2, 1 with 3, and 1 with 4 murderous convictions.

Compared to non-murderers, significantly more murderers were not in a marital or cohabiting relationship ($p < .05$), i.e. most of them had never married or were divorced.

Family history

Compared to all 70 non-murderers, Table 6 shows that more murderers have violent or aggressive family members ($p < .05$). Compared to the other 20 violent offenders, murderers have fewer relatives that abused alcohol ($p < .05$) (see Table 34 in Appendix A).

Table 6 MURDERERS: FAMILY HISTORY

VARIABLES	MURDER	n^c	% YES	CHI-SQUARE[a]	PROB.	FAM. HIST. CATEGORIES
Family Suicide Attempts	Yes:	9	33%	1.290[b]	.256	Yes/No
	No:	31	16%			
Family Psychiatric Hist.	Yes:	25	52%	0.700	.403	Yes/No
	No:	64	42%			
Violent Family Members	Yes:	29	62%	4.759	.029*	Yes/No
	No:	66	38%			
Family Been in Prison	Yes:	29	66%	0.289	.591	Yes/No
	No:	67	60%			
Family Abuse Alcohol	Yes:	30	80%	-0.010	.919	Yes/No
	No:	68	81%			
Family Abuse Drugs	Yes:	28	57%	0.093	.761	Yes/No
	No:	67	54%			

[a] Minus sign indicates neg. relationship (from Somers' D statistic)
[b] Some expected frequencies < 5; Chi-square may not be valid.
[c] n varies on account of missing values.
* $p < .05$

Dyscontrol and aggressive tendencies

From Table 7, t-tests show that murderers gained higher scores on the Monroe Dyscontrol Scale ($p < .05$), and both chi-square and t-test show significanly higher overt violence in murderers (77% vs. 41%; $p < .001$). Chi-square tests also indicate that murderers tend to get cross quickly and to regard themselves as aggressive by nature ($p < .01$), and a nonsignificant trend to be irritable and to have often/sometimes become so angry or aggressive that they have hit someone or broken things (i.e. acted out anger).

Table 7 MURDERERS: DYSCONTROL AND AGGRESSIVE TENDENCIES

AGGRESSIVE TENDENCIES	T-TESTS t	T-TESTS Prob.>t	MURDERERS	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	AGGR. VAR. CATEGORIES
Monroe Dyscontrol Scale	2.456	.016*	Yes:	31.2	7.9	28.3-34.2	63%	2.609	.106	High/Low
			No:	26.5	9.2	24.3-28.7	46%			
Monroe Overt Violence Scale	3.511	.001***	Yes:	9.0	3.4	7.7-10.3	77%	10.447	.001***	High/Low
			No:	6.2	3.8	5.3-7.1	41%			
Gets Cross Quickly Incl. Under Infl. Alc/Drugs			Yes:				73%	9.333	.002**	Yes/No
			No:				40%			
Gets Cross Quickly Only Under Infl. Alc/Drugs			Yes:				20%	-2.041	.153	Yes/No
			No:				34%			
Aggressive by Nature Incl. Under Infl. Alc/Drugs			Yes:				40%	6.994	.008**	Yes/No
			No:				16%			
Aggressive by Nature Only Under Infl. Alc/Drugs			Yes:				40%	-0.157	.692	Yes/No
			No:				44%			
Irritable			Yes:				67%	3.694	.055	Yes/No
			No:				46%			
Has Become Aggressive and Hit Someone/Broken Things			Yes:				80%	3.276	.070	Yes/No
			No:				61%			
Bully as Child (Hurt Children/Animals)			Yes:				37%	2.032	.154	Yes/No
			No:				23%			

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

Note. Murderers $n = 30$, non-murderers $n = 70$.
[a] Minus sign indicates negative relationship (from Somers' D statistic).

Clinical variables

Significant differences from Table 8 were the following: within the total sample, more murderers than non-murderers reported a tendency for hypertension (high blood pressure). Compared to 34% of the 70 non-murderers, 57% of the murderers manifested a greater number of the five characteristics hypothetically related to diminished serotonin metabolism, i.e. a history of depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol (x^2 (1) = 4.349, $p < .05$).

Furthermore, compared to the rest of the violent offenders (see Table 33 in Appendix A), fewer murderers than non-murderers reported a history of head injury and suicide attempt(s) ($p < .05$).

Table 8 MURDERERS: CLINICAL VARIABLES

CLINICAL VARIABLES	T-TESTS t	Prob >t	MUR-DER	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CLIN. VAR. CATEGORIES
Head Injuries	0.786	.434	Yes:	1.13	1.04	0.74-1.52	70%	0.000	1.000	Yes/No
			No:	0.97	0.90	0.76-1.18	70%			
Depression			Yes:				50%	1.126	.289	Yes/No
			No:				39%			
Suicide Attempts			Yes:				17%	-0.003	.954	Yes/No
			No:				17%			
Anxiety			Yes:				60%	1.389	.239	Yes/No
			No:				47%			
Insomnia			Yes:				27%	-3.267	.195	Yes/Only
			No:				46%			in jail/No
5-Symptom Cluster[c]	1.830	.070	Yes:	2.57	1.43	2.04-3.10	57%	4.349	.037*	3-5 / 0-2
			No:	1.94	1.61	1.56-2.32	34%			
Headaches			Yes:				60%	1.714	.190	Yes/No
			No:				46%			
Blackouts			Yes:				43%	1.308	.253	Yes/No
			No:				31%			
Epilepsy			Yes:				7%	0.251[b]	.617	Yes/No
			No:				4%			
Chronic Tiredness			Yes:				30%	-1.164	.281	Yes/No
			No:				41%			
High Blood Pressure			Yes:				27%	5.711[b]	.017*	Yes/No
			No:				9%			
Allergy			Yes:				23%	0.003	.959	Yes/No
			No:				23%			
Frequently Had Enuresis			Yes:				10%	-1.488	.222	Yes/No
			No:				20%			
MMPI Lie Scale			Yes:					-1.674[b]	.643	Marked/ Mod
			No:							/Normal/Low
Frequency of Sexual	-0.069	.946	Yes:	19.2	19.3	12.0-26.4		1.893	.595	2-8 / 9-13
Intercourse / Month			No:	19.5	25.7	13.4-25.6				14-30 / 31+

* $p < .05$
Murderers n=30
Non-murderers n=70

[a] Minus sign indicates negative relationship (from Somers' D statistic).
[b] Some expected frequencies < 5; Chi-square may not be valid.
[c] High dyscontrol score, irritable, depression, suicide attempt, anxiety.

Neuropsychological test results

Apart from the meaningful results on the Monroe Dyscontrol Scale and Overt Violence Subscale reported above, there was no significant difference on the neuropsychological battery to distinguish murderers.

Crime-related variables

The following variables were significant discriminators from Table 9: murderers have higher prison security classifications and a higher number of violent crimes than non-murderers ($p < .001$). They also show a nonsignificant trend to have been younger at their first imprisonment ($p = .068$) and not to have committed crime or been dishonest in order to obtain alcohol or drugs ($p = .056$).

Table 9 MURDERERS: CRIME-RELATED VARIABLES

CRIME-RELATED VARIABLES	T-TESTS t	T-TESTS Prob.>t	MURDERERS	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CRIME VAR. CATEGORIES
Number of Violent Crimes	5.527	<.001***	Yes:	6.5	3.5	5.2-7.8				
			No:	2.0	3.8	1.1-2.9				
Prison Security Classification	9.627	<.001***	Yes:	579.1	83.3	548-610				
			No:	363.4	109.8	337-390				
Age at First Imprisonment	-1.846	.068	Yes:	20.8	4.4	19.2-22.4				
			No:	22.9	5.5	21.6-24.2				
Total Number of Crimes	-0.183	.855	Yes:	9.4	4.6	7.7-11.1				
			No:	9.6	5.0	8.4-10.8				
COMMITTED CRIME/LIED TO GET ALCOHOL/DRUGS:										
Total Sample:			Yes:				50%	-3.646	.056	Yes/No
			No:				70%			
Violent Group:			Yes:				50%	-1.096	.295	Yes/No
			No:				65%			

*** $p < .001$

Note. Murderers $n = 30$, non-murderers $n = 70$.

[a] Minus sign indicates negative relationship (from Somers' D statistic).

Table 30 in Appendix A furthermore indicates that t-tests show that compared to other violent offenders, murderers have higher prison security classifications ($p < .001$), and committed fewer rapes/sexual offences ($p < .05$).

Substance use

Results revealed that with age partialled out, significantly fewer murderers than non-murderers are users of Mandrax plus cannabis combined ($r = -0.210$; $p = .037$). A nonsignificant trend also exists for fewer murderers than non-murderers to be users of cannabis on its own ($r = -0.130$; $p = .200$).

Summary profile of murderers

The following were the most significant features exhibited by the 30 murderers in contrast with the 70 non-murderers:

- Murderers gained higher dyscontrol and overt violence scores on the Monroe Dyscontrol Scale than non-murderers.
- More murderers than non-murderers tend to get cross quickly, and regard themselves as having an aggressive disposition.
- A greater number of murderers than non-murderers reported a tendency for high blood pressure.
- More murderers manifested a greater number of the five characteristics hypothetically related to diminished serotonin metabolism, i.e. a history of depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol.
- Compared to non-murderers, murderers both committed a higher number of violent crimes and have higher prison security classifications; compared to other violent offenders, they have higher classification figures only.
- The frequency of users of Mandrax in combination with cannabis was lower amongst murderers in comparison with non-murderers.
- More murderers than non-murderers have violent family members.

RAPISTS (n = 22)

In order to establish if criminals who had committed sexual offences of a violent nature would have a significantly different profile from other offenders, the 22 men who had been convicted of rape, sodomy, attempted rape/sodomy and indecent assault (collectively referred to as "rapists") are compared with all "non-rapists" (n = 78), i.e. all violent and non-violent subjects who have not been convicted of sexual crimes of a violent nature. Apart from three sexual criminals for whom the only sexual offence was sodomy, all 19 others had been convicted of rape at least once - some with one or more of the above sexual crimes in addition. The number of sexual offences per person ranged from 1 to 5, and was distributed as follows: there were 11 men with 1, 4 with 2, 5 with 3, 1 with 4, and 1 with 5 sexual offences each.

Compared to non-rapists, there was a nonsignificant trend for rapists not to be in a marital or cohabiting relationship (p = .068). Most of them were thus either divorced or had never married.

Family history

Apart from having more family members who have been in prison (p < .05), rapists do not differ significantly from non-rapists with regard to family history (see Table 10).

Table 10 RAPISTS / SEXUAL CRIMINALS: FAMILY HISTORY

VARIABLES	RAPISTS	n[a]	% YES	CHI-SQUARE	PROB.	FAM. HIST. CATEGORIES
Family Suicide Attempts	Yes:	4	50%	2.500[b]	.114	Yes/No
	No:	36	17%			
Family Psychiatric Hist.	Yes:	15	60%	1.653	.119	Yes/No
	No:	74	42%			
Violent Family Members	Yes:	20	50%	0.229	.632	Yes/No
	No:	75	44%			
Family Been in Prison	Yes:	21	81%	4.312	.038*	Yes/No
	No:	75	56%			
Family Abuse Alcohol	Yes:	22	86%	0.600[b]	.438	Yes/No
	No:	76	79%			
Family Abuse Drugs	Yes:	21	57%	0.063	.802	Yes/No
	No:	74	54%			

[a] n varies on account of missing values.
[b] Some expected frequencies < 5; Chi-square may not be valid.
* p < .05

Dyscontrol and aggressive tendencies

Surprisingly, rapists do not seem to have a particularly aggressive disposition, both in contrast to the 78 non-rapists (Table 11) and the other 28 violent offenders (see Table 32 in Appendix A). The only significant difference is that more rapists than non-rapists acknowledged that they have often/sometimes become so angry or aggressive that they have hit someone or broken things (acted out anger). Rapists furthermore show a nonsignificant trend to have higher overt violence scores.

Table 11 RAPISTS / SEXUAL CRIMINALS:
DYSCONTROL AND AGGRESSIVE TENDENCIES

AGGRESSIVE TENDENCIES	T-TESTS t	Prob >t	RAP-ISTS	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	AGGR. VAR. CATEGORIES
Monroe Dyscontrol Scale	0.521	.604	Yes:	28.8	8.7	24.9-32.7	59%	0.739	.390	High/Low
			No:	27.6	9.2	25.5-29.7	49%			
Monroe Overt Violence Scale	1.222	.225	Yes:	7.9	3.5	6.4-9.5	68%	2.959	.085	High/Low
			No:	6.8	4.0	5.9-7.7	47%			
Gets Cross Quickly Incl. Under Infl. Alc/Drugs			Yes:				64%	2.098	.148	Yes/No
			No:				46%			
Gets Cross Quickly Only Under Infl. Alc/Drugs			Yes:				27%	-0.100	.752	Yes/No
			No:				31%			
Aggressive by Nature Incl. Under Infl. Alc/Drugs			Yes:				32%	1.238	.266	Yes/No
			No:				21%			
Aggressive by Nature Only Under Infl. Alc/Drugs			Yes:				41%	-0.050	.823	Yes/No
			No:				44%			
Irritable			Yes:				59%	0.568	.451	Yes/No
			No:				50%			
Has Become Aggressive and Hit Someone/Broken Things			Yes:				86%	4.783	.029*	Yes/No
			No:				62%			
Bully as Child (Hurt Children/Animals)			Yes:				27%	0.001	.974	Yes/No
			No:				27%			

* $p < .05$ Note. Rapists/sexual criminals n = 22, non-rapists n = 78.
[a] Minus sign indicates negative relationship (from Somers' D statistic).

Neuropsychological test results

The only significant difference on the neuropsychological battery was that rapists scored higher on WCST categories achieved. A possible explanation for this, is that they also gained higher scores on Raven's IQ, both in comparison to the rest of the sample and the other violent offenders.

Clinical variables

From Table 12 it can be seen that none of the clinical variables were significant discriminators between rapists and non-rapists. The only variable approaching significance is that more rapists reported a tendency for depression.

Contrary to the expectation that rapists may have an exceptionally high sex drive, they did not report a significantly higher frequency of sexual intercourse per month (responses to this variable were elicited in relation to times when not in prison).

Table 12 RAPISTS / SEXUAL CRIMINALS: CLINICAL VARIABLES

CLINICAL VARIABLES	T-TESTS t	Prob.>t	RAP-ISTS	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CLIN. VAR. CATEGORIES
Head Injuries	0.654	.515	Yes:	1.14	0.89	0.75-1.53	82%	1.876	.171	Yes/No
			No:	0.99	0.96	0.77-1.21	67%			
Depression			Yes:				59%	3.382	.066	Yes/No
			No:				37%			
Suicide Attempts			Yes:				23%	0.656[b]	.418	Yes/No
			No:				15%			
Anxiety			Yes:				50%	-0.011	.915	Yes/No
			No:				51%			
Insomnia			Yes:				45%	0.919	.632	Yes/Only in jail/No
			No:				38%			
5-Symptom Cluster[d]	1.247	.216	Yes:	2.50	1.74	1.73-3.27	50%	0.944	.331	3-5/ 0-2
			No:	2.03	1.53	1.68-2.38	38%			
Headaches			Yes:				59%	0.932	.334	Yes/No
			No:				47%			
Blackouts			Yes:				41%	0.433	.511	Yes/No
			No:				33%			
Epilepsy			Yes:				5%	-0.012[b]	.912	Yes/No
			No:				5%			
Chronic Tiredness			Yes:				36%	-0.032	.858	Yes/No
			No:				38%			
High Blood Pressure			Yes:				14%	-0.003[b]	.956	Yes/No
			No:				14%			
Allergy			Yes:				23%	-0.001	.973	Yes/No
			No:				23%			
Frequently Had Enuresis			Yes:				14%	-0.226[b]	.634	Yes/No
			No:				18%			
MMPI Lie Scale								-2.167[b]	.539	Marked/Mod /Normal/Low
Frequency of Sexual Intercourse / Month	0.984[c]	.335	Yes:	25.7	36.1	9.7-41.7		0.499	.930	2-8/ 9-13 14-30/ 31+
			No:	17.7	19.0	13.4-22.0				

Note. Rapists/sexual criminals n = 22, non-rapists n = 78.

[a] Minus sign indicates negative relationship (from Somers' D statistic).

[b] Some expected frequencies < 5; Chi-square may not be valid.

[c] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for DF.)

[d] High dyscontrol score, irritable, depression, suicide attempt, anxiety.

Crime-related variables

The following variables were significant discriminators from Table 13: rapists have higher prison security classifications ($p < .001$) and a higher number of violent crimes than non-rapists ($p < .001$). They were also younger at their first imprisonment ($p < .05$) and have committed a higher number of crimes in total than non-rapists ($p < .05$).

Table 13 RAPISTS / SEXUAL CRIMINALS: CRIME-RELATED VARIABLES

CRIME-RELATED VARIABLES	T-TESTS t	Prob.>t	RAP-ISTS	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQ[a]	PROB.	CRIME VAR. CATEGORIES
Number of Violent Crimes	5.971	<.001***	Yes:	7.5	3.6	5.90-9.10				
			No:	2.2	3.6	1.39-3.01				
Prison Security Classification	5.513[b]	<.001***	Yes:	534.5	88.8	495-574				
			No:	398.1	140.8	366-430				
Age at First Imprisonment	-2.214[b]	.031*	Yes:	20.6	3.4	19.1-22.1				
			No:	22.7	5.6	21.4-24.0				
Total Number of Crimes	2.198	.030*	Yes:	11.5	5.8	8.9-14.1				
			No:	9.0	4.5	8.0-10.0				
COMMITTED CRIME/LIED TO GET ALC/DRUGS:										
Total Sample:			Yes:				55%	-1.094	.296	Yes/No
			No:				67%			
Violent Group:			Yes:				55%	-0.034	.854	Yes/No
			No:				57%			

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

Note. Rapists/sexual criminals $n = 22$, non-rapists $n = 78$.
[a] Minus sign indicates negative relationship (from Somers' D statistic).
[b] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.).

From Table 30 in Appendix A it can furthermore be seen that t-tests show that compared to other violent offenders, rapists have committed fewer murders ($p < .05$).

Substance use

Substance use highly significantly discriminated rapists from non-rapists, with rapists manifesting much heavier polydrug use. More rapists (86%) were users of Mandrax with cannabis compared to non-rapists (53%) ($r = 0.292$; $p = .004$). More rapists (64%) than non-rapists (24%) were furthermore users of alcohol, Mandrax and cannabis combined ($r = 0.349$; $p = .0004$). Rapists were also significantly heavier cannabis smokers ($r = 0.253$; $p = .012$), as well as more frequent users of alcohol and cannabis together ($r = 0.213$; $p = .034$).

<u>Summary profile of rapists/sexual offenders</u>

The following were the most meaningful features exhibited by the 22 rapists in contrast with the 78 non-rapists - unless within subgroup comparison is specified:

- An important finding with regard to rapists is the significant presence of polydrug use, i.e. of Mandrax smoked with cannabis of alcohol, Mandrax and cannabis combined, and alcohol and cannabis together, as well as of cannabis on its own.
- In comparison with non-rapists (both within the total sample and the violent group), rapists do not seem to have a particularly aggressive disposition, as the only aggressive tendency to reach significance is that they admitted to having become so aggressive that they hit someone or smashed objects.
- More rapists than non-rapists have family members who had been imprisoned.
- Compared to non-rapists, rapists have committed both a higher number of violent crimes and a higher total number of crimes. In addition, they have a higher prison security classification.
- Rapists were younger at the time of their first imprisonment.
- Rapists gained higher IQ scores on Raven's test, especially in comparison with other violent offenders.

DYSCONTROL (High (n = 51) vs. low (n = 49))

In order to establish if subjects who might be considered to have a problem with impulse dyscontrol would have a significantly different profile from other offenders, the 51 men who gained the highest scores (i.e. 30 or more out of a potential maximum of 54) on the Monroe Dyscontrol Scale (median score was 29) - referred to as "high dyscontrol" subjects - are compared with "low dyscontrol" subjects (n = 49) with scores of 29 or below.

Significantly more men from the high dyscontrol group were not in a marital or cohabiting relationship compared to the low dyscontrol group, both within the total sample ($p < .001$) and within the non-violent group ($p < .01$). They were thus either divorced or had never married. Within the violent group, there was a similar trend, which fell just beyond the boundary of significance ($p = .055$).

Family history

An interesting observation from Table 14 is the highly significant finding that more men from the high than the low dyscontrol group (71% vs. 19%) have violent or aggressive family members (x^2 (1) = 25.604; $p < .001$). In addition, a greater number of high dyscontrol men have family members who have been in prison (75% vs. 48%; $p < .01$).

Table 14 RELATIONSHIP BETWEEN DYSCONTROL AND FAMILY HISTORY

VARIABLES	DYS-CONTROL	n^a	% YES	CHI-SQUARE	PROB.	FAM. HIST. CATEGORIES
Family Suicide Attempts	High:	17	29%	1.637[b]	.201	Yes/No
	Low:	23	13%			
Family Psychiatric Hist.	High:	45	47%	0.109	.741	Yes/No
	Low:	44	43%			
Violent Family Members	High:	48	71%	25.604	<.001***	Yes/No
	Low:	47	19%			
Family Been in Prison	High:	48	75%	7.432	.006**	Yes/No
	Low:	48	48%			
Family Abuse Alcohol	High:	50	86%	1.896	.169	Yes/No
	Low:	48	75%			
Family Abuse Drugs	High:	47	55%	0.013	.910	Yes/No
	Low:	48	54%			

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

a n varies on account of missing values.
b Some expected frequencies < 5; Chi-square may not be valid.

Aggressive tendencies

From Table 15, chi square tests show that the high dyscontrol group gained higher scores on the Monroe Overt Violence Scale (82% vs. 20% in the low dyscontrol group; $p < .001$). More high dyscontrol subjects (94% vs. 65%) reported that they tend to get cross quickly ($p < .001$), regard themselves as aggressive by nature ($p < .001$), are irritable ($p < .01$) and have often/sometimes become so angry or aggressive that they have hit someone or smashed objects, i.e. acted out anger ($p < .05$). An aggressive tendency seems to have been a life-long pattern, as significantly more subjects from this group (41% vs. 12%) furthermore confessed to having hurt other children or animals (i.e. were "bullies") when they were children ($p < .001$).

Table 15 HIGH DYSCONTROL MEN: AGGRESSIVE TENDENCIES

AGGRESSIVE TENDENCIES	DYSCONTROL	% YES	CHI-SQUARE[a]	PROB.	AGGR.TEND. CATEGORIES
Monroe Overt Violence Subscale	High: Low:	82% 20%	38.418	<.001***	High/Low
Gets Cross Quickly Incl. Under Infl. Alc/Drugs	High: Low:	94% 65%	12.965	<.001***	Yes/No
Gets Cross Quickly Only Under Infl. Alc/Drugs	High: Low:	29% 31%	-0.017	.896	Yes/No
Aggressive by Nature Incl. Under Infl. Alc/Drugs	High: Low:	82% 49%	12.403	<.001***	Yes/No
Aggressive by Nature Only Under Infl. Alc/Drugs	High: Low:	47% 39%	0.700	.403	Yes/No
Irritable	High: Low:	65% 39%	6.732	.009**	Yes/No
Has Become Aggressive and Hit Someone/Broken Things	High: Low:	78% 55%	6.152	.013*	Yes/No
Bully as Child (Hurt Children/Animals)	High: Low:	41% 12%	10.613	.001***	Yes/No

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

Note. High dyscontrol $n = 51$, low dyscontrol $n = 49$.
[a] Minus sign indicates negative relationship (from Somers' D statistic).

Neuropsychological test results

The only significant difference on the neuropsychological test battery was that the high dyscontrol group took longer to read the first card of the Stroop test ($p < .001$) (see Table 16). Just short of significance, was a tendency to make more errors on the third Stroop colour-word interference card ($p = .051$), and to take longer on part A of the Trail-making Test ($p = .051$), while the TMT-B and IES-E showed similar trends. With age and education level partialled out (Table 31 in Appendix A), the TMT-A correlated significantly with the Monroe scale, with similar tendencies for Stroop-1 ($p = .053$), Stroop-3 ($p = .151$), and errors on Stroop-3 ($p = .063$).

Table 16 DYSCONTROL AND TEST RESULTS

TESTS	t	Prob.>t	DYSC.	MEAN	S.D.	CONF.INT.
DAC (difference) (sec.)	1.814	.073	High:	15.7	11.4	12.5-18.9
			Low:	11.8	9.9	9.0-14.7
DAL (difference) (sec.)	1.710	.090	High:	11.8	7.7	9.6-14.0
			Low:	9.3	6.6	7.4-11.2
Stroop-1 (seconds)	3.317[a]	.001***	High:	59.0	11.7	55.7-62.3
			Low:	52.3	8.4	49.9-54.7
Stroop-2 (seconds)	1.158	.250	High:	79.1	17.5	74.2-84.0
			Low:	75.4	13.9	71.4-79.4
Stroop-3 (seconds)	1.209	.230	High:	145.1	34.1	136-155
			Low:	137.7	26.8	130-145
Stroop-3 Errors	1.982[a]	.051	High:	3.6	4.2	2.4-4.8
			Low:	2.2	2.7	1.4-3.0
TMT-A (seconds)	1.976	.051	High:	49.7	15.7	45.3-54.1
			Low:	43.5	15.6	39.0-48.0
TMT-B (seconds)	1.436	.154	High:	164.2	93.8	138-191
			Low:	139.5	76.9	117-162
IES Arrow-Dot Impulse	0.227	.821	High:	4.6	2.8	3.8-5.4
			Low:	4.5	3.3	3.6-5.5
IES Arrow-Dot Ego	-1.449	.151	High:	13.5	5.1	12.1-14.9
			Low:	15.0	5.4	13.5-16.6
IES Arrow-Dot Superego	1.353	.179	High:	4.6	4.2	3.4-5.8
			Low:	3.5	3.5	2.5-4.5
WCST Categories Achieved	0.046	.963	High:	3.1	1.6	2.7-3.6
			Low:	3.1	1.9	2.6-3.7
WCST Perseverative Resp.	-0.932	.926	High:	45.4	27.7	37.6-53.2
			Low:	45.9	32.8	36.5-55.3
GAST Errors	-0.113	.910	High:	1.8	2.3	1.2-2.5
			Low:	1.9	2.5	1.2-2.6
Raven's IQ	-1.648	.103	High:	90.1	16.4	85.5-94.7
			Low:	95.5	16.3	90.8-100
QT Verbal IQ	0.167	.868	High:	86.1	12.4	82.6-89.6
			Low:	85.7	11.6	82.4-89.0

Note. High dyscontrol $n = 51$, low dyscontrol $n = 49$.

[a] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.).

*** $p < .001$

Clinical variables

A highly significant difference from Table 17 is that compared to 12% of subjects with low dyscontrol scores, 69% of high dyscontrol prisoners exhibited a greater number of the five psychopathological dimensions hypothetically related to diminished serotonin metabolism, i.e. a history of depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol (x^2 (1) = 32.841, $p < .001$; t (98) = 9.479, $p < .001$).

Although these statistics will be inflated because dyscontrol constitutes one-fifth of the score on this five-symptom variable, a combination of three of these variables (i.e. depression, suicide attempt and anxiety) still yielded highly significant results (x^2 (3) = 19.358, $p < .001$; t (98) = 4.834, $p < .001$) (not shown on table). Comparisons both within the violent and non-violent groups on the five-symptom cluster were significant on both chi-square and t-tests ($p < .001$). On the three-symptom cluster (not shown on table), t-test comparisons within both the violent and non-violent groups were still significant at the 99% level, as were chi-square tests, at the 95% confidence level.

Another highly significant clinical variable discriminating the high dyscontrol subjects is depression, with 63% of this group reporting a tendency to become depressed, vs. 20% of the low dyscontrol group (x^2 (1) = 18.388; $p < .001$). Corresponding with this greater tendency towards depression, more high dyscontrol subjects (27% vs. 6% of the low dyscontrol men) reported a history of suicide attempts ($p = .005$).

More high than low dyscontrol subjects reported tendencies for anxiety (65% vs. 37%; $p < .01$), getting bad headaches (65% vs. 35%; $p < .01$), having had blackouts (49% vs. 20%; $p < .01$), previous head injuries (80% vs. 59%; $p < .05$) and suffer from insomnia (51% vs. 29%; $p < .05$).

The dyscontrol group was the only group where the general trend towards low or normal scores on the MMPI Lie Scale reached significance - both within the total sample ($p < .01$) and within the violent group ($p < .05$), so their responses are probably relatively credible.

Table 17 RELATIONSHIP BETWEEN DYSCONTROL AND CLINICAL VARIABLES

CLINICAL VARIABLES	T-TESTS t	Prob.>t	DYS-CONTROL	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CLIN. VAR. CATEGORIES
Head Injuries	2.616	.010**	High:	1.3	1.0	1.02-1.58	80%	5.353	.021*	Yes/No
			Low:	0.8	0.8	0.57-1.03	59%			
Depression			High:				63%	18.388	<.001***	Yes/No
			Low:				20%			
Suicide Attempts	2.963[c]	.004**	High:	0.27	0.45	0.14-0.40	27%	8.057	.005**	Yes/No
			Low:	0.06	0.24	-0.01-0.13	6%			
Anxiety			High:				65%	7.824	.005**	Yes/No
			Low:				37%			
Insomnia			High:				51%	6.504	.039*	Yes/Only in jail/No
			Low:				29%			
5-Symptom Cluster[d]	9.479	<.001***	High:	3.20	1.23	2.85-3.55	69%	32.841	<.001***	3-5 / 0-2
			Low:	1.02	1.05	0.72-1.32	12%			
Headaches			High:				65%	9.004	.003**	Yes/No
			Low:				35%			
Blackouts			High:				49%	8.992	.003**	Yes/No
			Low:				20%			
Epilepsy			High:				4%	-0.255[b]	.614	Yes/No
			Low:				6%			
Chronic Tiredness			High:				45%	2.226	.136	Yes/No
			Low:				31%			
High Blood Pressure			High:				20%	2.719	.099	Yes/No
			Low:				8%			
Serious Past Illness(es)			High:				37%	0.491	.483	Yes/No
			Low:				31%			
Allergy			High:				29%	2.416	.120	Yes/No
			Low:				16%			
Frequently Had Enuresis			High:				22%	1.540	.215	Yes/No
			Low:				12%			
MMPI Lie Scale	-4.171[c]	<.001***	High:	2.0	1.6	1.55-2.45		-12.725[b]	.005**	Marked/Mod /Normal/Low
			Low:	3.7	2.4	3.01-4.39				
Frequency of Sexual Intercourse / Month	1.825[c]	.072	High:	23.8	29.8	15.4-32.2		4.133	.247	2-8 / 9-13 14-30 / 31+
			Low:	15.0	14.7	10.8-19.2				

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

Note. High dyscontrol n = 51, low dyscontrol n = 49.
[a] Minus sign indicates negative relationship (from Somers' D statistic).
[b] Some expected frequencies < 5; Chi-square may not be valid.
[c] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.).
[d] High dyscontrol score, irritable, depression, suicide attempt, anxiety.

Substance use

With age partialled out, results showed that there was a significant positive correlation between dyscontrol scores and the use of alcohol, Mandrax and cannabis combined (r = 0.308; p = .002), use of alcohol and cannabis together (days used) (r = 0.347; p = .0001), as well as use of alcohol alone (days used) (r = 0.275; p = .006) and cannabis alone (days used) (r = 0.215; p = .033).

Crime-related variables

The following variables from Table 18 were significant discriminators on chi-square tests: more high than low dyscontrol subjects are violent offenders (63% vs. 37%; $p < .01$) and admitted that they have sometimes/often committed crime or lied in order to obtain alcohol or drugs, both within the total sample (76% vs. 51%; $p < .01$) and within the non-violent group (95% vs. 58%; $p < .01$), while there is a similar but nonsignificant trend within the violent group ($p = .068$).

T-test results show that more men from the high than the low dyscontrol group have committed a higher number of violent crimes and have higher prison security classifications ($p < .05$).

Table 18 RELATIONSHIP BETWEEN DYSCONTROL AND CRIME-RELATED VARIABLES

CRIME-RELATED VARIABLES	T-TESTS *t*	Prob.>*t*	DYS-CONTROL	MEAN	*S.D.*	CONFID. INTERVAL	% YES	CHI-SQUARE	PROB.	CRIME VAR. CATEGORIES
Violent vs. Non-violent Group			High:				63%	6.763	.009**	Vio/Non-V
			Low:				37%			
Number of Violent Crimes	2.414	.018*	High:	4.4	4.4	3.16-5.64	29%	1.671	.196	High/Low
			Low:	2.4	3.8	1.31-3.49	18%			
Murder	1.274	.206	High:	0.5	0.8	0.27-0.73	37%	2.609	.106	Yes/No
			Low:	0.3	0.7	0.10-0.50	22%			
Rape / Sexual Crimes	0.908	.366	High:	0.5	0.9	0.25-0.75	25%	0.739	.390	Yes/No
			Low:	0.3	0.9	0.04-0.56	18%			
Prison Security Classification	2.453	.016*	High:	461.5	147.7	420-503				
			Low:	393.3	129.5	356-431				
Age at First Imprisonment	-1.157	.250	High:	21.7	4.8	20.4-23.1				
			Low:	22.9	5.6	21.3-24.5				
Total Number of Crimes	-0.003	.998	High:	9.6	4.7	8.3-10.9				
			Low:	9.6	5.1	8.1-11.1				
COMMITTED CRIME/LIED TO GET ALCOHOL/DRUGS:										
Total Sample:			High:				76%	7.025	.008**	Yes/No
			Low:				51%			
Violent Group:			High:				66%	3.342	.068	Yes/No
			Low:				39%			
Non-viol. Group:			High:				95%	7.858	.005**	Yes/No
			Low:				58%			

Note. High dyscontrol $n = 51$, low dyscontrol $n = 49$.
** $p < .01$
* $p < .05$

<u>Summary profile of the high dyscontrol group</u>

The following are the most significant features exhibited by high dyscontrol subjects:

- Significantly more of the high dyscontrol subjects exhibit a greater number of the five psychopathological dimensions for which a common biological substrate has been hypothesised to exist, most likely in the form of diminished serotonin metabolism (i.e. depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol).
- They manifest a greater frequency of depression, suicide attempts, anxiety, bad headaches and blackouts.
- High dyscontrol subjects reported a greater incidence of head injuries.
- More high than low dyscontrol men reported that they tend to be irritable, get cross quickly, regard themselves as having an aggressive disposition, and have often/sometimes become so aggressive that they have hit or hurt someone or broken things.
- A greater number of high than low dyscontrol subjects had elevated scores on the Overt Violence Subscale.
- More men from this group seem to manifest a life-long history of aggression, by admitting that as children, they had a tendency to hurt other children or animals.
- More high than low dyscontrol subjects have violent family members and family members with a prison record.
- More high than low dyscontrol men are violent offenders.
- More men from this group have committed a high number of violent crimes (7 or more) and have high prison security classifications.
- Both within the total sample and the non-violent group, a greater number of high dyscontrol subjects admitted that they have committed crime or been dishonest for the sake of obtaining alcohol or drugs.
- Amongst this group there are more users of the polydrug combination of alcohol, Mandrax and cannabis together, alcohol and cannabis combined, as well as of alcohol and cannabis on their own.
- It took high dyscontrol subjects longer to read the first card of the Stroop test.
- Significantly more men from this group gained low or normal scores on the MMPI Lie Scale.

DEPRESSION (n = 42)

Since it was hypothesised that an underlying depression may be a significant feature of certain violent prisoners who may concomitantly exhibit some characteristics from the five-symptom cluster hypothetically related to low serotonin metabolism (i.e. high dyscontrol, irritability, depression, anxiety and suicide attempts), the 42 people who reported a tendency to become depressed were compared to the 58 non-depressives. Depression was not formally diagnosed nosologically, and the variable represents a depressive trait rather than a state of depression at the time of the interview. The person was merely asked if he has a tendency to become depressed, and an assessment was made of whether the severity and frequency justified a positive response. A brief explanation of the feelings associated with the syndrome was given if the person seemed unsure about the meaning of the concept.

Results revealed that compared to non-depressives within the total sample, a significantly greater number of depressives are not in a marital or cohabiting relationship ($p < .01$). Most of them were thus either divorced or had never married. A similar but nonsignificant trend exists for comparisons within the violent and non-violent groups, the latter just falling short of significance ($p = .051$).

<u>Dyscontrol and aggressive tendencies</u>

From Table 19, more depressives than non-depressives (76% vs. 33%) gained high scores on the Monroe Dyscontrol Scale ($p < .001$ both from t-test and chi-square results). This was also the case on comparisons within both the violent and non-violent groups ($p < .01$) (see Table 32 in Appendix A). A similar trend was found for high scores on the Overt Violence Subscale (71% depressives vs. 38% non-depressives; x^2 (1) = 10.951, $p < .001$; t (98) = 2.641, $p < .01$), which was also significant within the violent group ($p < .01$) (not shown on table). Chi-square tests furthermore indicate that more depressives than non-depressives get cross quickly ($p < .01$) (also within the violent group at $p <$ .05), are frequently irritable ($p < .05$), and have often/sometimes become so angry or aggressive that they have hit someone or smashed objects ($p < .01$) - the latter two conditions also within the non-violent group at $p < .05$. This corresponds with previous findings of the co-existence of, <u>inter alia</u>, depression, impulse dyscontrol and aggression - hypothetically in relation to low serotonin metabolism.

Table 19 DEPRESSION VS. DYSCONTROL AND AGGRESSIVE TENDENCIES

AGGRESSIVE TENDENCIES	T-TESTS t	Prob.>t	DEPRES-SION	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	AGGR. VAR. CATEGORIES
Monroe Dyscontrol Scale	4.790	<.001***	Yes:	32.5	7.8	30.1-34.9	76%	18.388	<.001***	High/Low
			No:	24.5	8.5	22.3-26.7	33%			
Monroe Overt Violence Scale	2.641	.010**	Yes:	8.2	3.6	7.1-9.3	71%	10.951	.001***	High/Low
			No:	6.2	4.0	5.2-7.3	38%			
Gets Cross Quickly Incl. Under Infl. Alc/Drugs			Yes:				93%	7.482	.006**	Yes/No
			No:				71%			
Gets Cross Quickly Only Under Infl. Alc/Drugs			Yes:				29%	-0.070	.791	Yes/No
			No:				31%			
Aggressive by Nature Incl. Under Infl. Alc/Drugs			Yes:				71%	0.951	.329	Yes/No
			No:				62%			
Aggressive by Nature Only Under Infl. Alc/Drugs			Yes:				40%	-0.188	.664	Yes/No
			No:				45%			
Irritable			Yes:				67%	6.241	.012*	Yes/No
			No:				41%			
Has Become Aggressive and Hit Someone/Broken Things			Yes:				83%	8.737	.003**	Yes/No
			No:				55%			
Bully as Child (Hurt Children/Animals)			Yes:				31%	0.574	.449	Yes/No
			No:				24%			

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

Note. Depressives $n = 42$, non-depressives $n = 58$.

[a] Minus sign indicates negative relationship (from Somers' D statistic).

Neuropsychological test results

Apart from the meaningful results on the Monroe Dyscontrol Scale and Overt Violence Subscale reported above, the test battery yielded the following significant differences (see Table 20). Depressives took longer to complete both parts A and B of the Trail-making Test ($p < .01$). Time taken to read card 2 (coloured x's) and card 3 (colour-word interference task) of the Stroop test was also longer than for non-depressives ($p < .05$). There is also a nonsignificant trend for depressives to have lower IQ scores on the Raven's test ($p = .079$).

Table 20 RELATIONSHIP BETWEEN DEPRESSION AND TEST RESULTS

TESTS	T-TESTS t	Prob.)t	DEPRES-SION	MEAN	S.D.	CONFIDENCE INTERVAL
DAC (difference) (seconds)	0.358	.721	Yes:	14.2	10.0	11.1-17.3
			No:	13.5	11.5	10.5-16.5
DAL (difference) (seconds)	0.108	.915	Yes:	10.7	7.1	8.5-12.9
			No:	10.5	7.5	8.5-12.5
Stroop-2 (seconds)	2.091	.039*	Yes:	81.1	16.3	76.0-86.2
			No:	74.5	15.0	70.6-78.5
Stroop-3 (seconds)	2.266	.026*	Yes:	149.5	32.5	139.4-159.6
			No:	135.6	28.4	128.1-143.1
TMT-A (seconds)	2.676	.009**	Yes:	51.5	16.1	46.5-56.5
			No:	43.2	14.9	39.3-47.1
TMT-B (seconds)	2.780[a]	.007**	Yes:	181.0	101.3	149.4-212.6
			No:	131.1	67.2	113.4-148.8
IES Arrow-Dot Impulse	-1.626	.107	Yes:	4.0	2.9	3.10-4.90
			No:	5.0	3.1	4.18-5.82
IES Arrow-Dot Ego	0.098	.923	Yes:	14.3	5.7	12.5-16.1
			No:	14.2	5.0	12.9-15.5
IES Arrow-Dot Superego	0.664	.508	Yes:	4.4	4.5	3.00-5.80
			No:	3.8	3.4	2.91-4.69
WCST Categories Achieved	0.825	.411	Yes:	3.3	1.9	2.71-3.89
			No:	3.0	1.7	2.55-3.45
WCST Perseverative Responses	0.191	.849	Yes:	46.3	33.2	36.0-56.7
			No:	45.1	28.0	37.7-52.5
GAST Errors	0.790	.431	Yes:	2.07	2.54	1.28-2.86
			No:	1.69	2.26	1.10-2.28
Raven's IQ	-1.774	.079	Yes:	89.4	15.3	84.6-94.1
			No:	95.2	17.0	90.7-99.7
QT Verbal IQ	-1.111[a]	.270	Yes:	84.3	14.4	79.8-88.8
			No:	87.1	9.9	84.5-89.7

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

Note. Depressives n = 42, non-depressives n = 58.
[a] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.)

Clinical variables

A highly significant difference from Table 21 is that 81% of the depressives (compared to 12% of non-depressives) exhibited a greater number of the five psychopathological dimensions for which there is hypothesised to be a common underlying factor in the form of diminished serotonin metabolism, i.e. a history of depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol (x^2 (1) = 47.783, $p < .001$; t (98) = 10.935, $p < .001$). This significance also held for comparisons within the violent and non-violent groups. As these statistics will be inflated because depression constitutes one-fifth of this score, t was recalculated for an index of four variables excluding depression, still with highly significant results (t (98) = 6.291; $p < .001$) (not shown on table).

Further evidence in support of this five-symptom cluster theory, was that more depressives than non-depressives (76% vs. 33%) reported a tendency for anxiety (x^2 (1) = 18.388; $p < .001$). This was equally true within the violent group ($p < .001$), with a similar but nonsignificant trend in the non-violent group ($p = .09$). Suicide attempts also occurred more frequently in depressives (31% vs. 7% in non-depressives; $p < .01$). This was similarly true within the violent group ($p < .05$).

A greater number of depressives also reported a history of head injury (81% vs. 62%; $p < .05$), and contrary to usual clinical findings, a higher average frequency of sexual intercourse per month ($p < .05$) (responses to this variable were related to times when not in prison).

Table 21 RELATIONSHIP BETWEEN DEPRESSION AND CLINICAL VARIABLES

CLINICAL VARIABLES	T-TESTS *t*	Prob.>*t*	DEPRES-SION	MEAN	*S.D.*	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CLIN.VAR. CATEGORIES
Head Injuries	0.893	.374	Yes:	1.12	0.89	0.84-1.40	81%	4.136	.042*	Yes/No
			No:	0.95	0.98	0.69-1.21	62%			
Suicide Attempts			Yes:				31%	9.991	.002**	Yes/No
			No:				7%			
Anxiety			Yes:				76%	18.388	<.001***	Yes/No
			No:				33%			
Insomnia			Yes:				50%	4.023	.134	Yes/Only in jail/No
			No:				33%			
5-Symptom Cluster[d]	10.935	<.001***	Yes:	3.50	1.06	3.17-3.83	81%	47.783	<.001***	3-5/ 0-2
			No:	1.14	1.07	0.86-1.42	12%			
Headaches			Yes:				57%	1.478	.224	Yes/No
			No:				45%			
Blackouts			Yes:				36%	0.016	.899	Yes/No
			No:				34%			
Epilepsy			Yes:				7%	0.700[b]	.403	Yes/No
			No:				3%			
Chronic Tiredness			Yes:				45%	1.610	.204	Yes/No
			No:				33%			
High Blood Pressure			Yes:				17%	0.428	.513	Yes/No
			No:				12%			
Allergy			Yes:				21%	-0.101	.751	Yes/No
			No:				24%			
Frequently Had Enuresis			Yes:				21%	1.007	.316	Yes/No
			No:				14%			
MMPI Lie Scale								-5.503[b]	.138	Marked/ Mod /Normal/Low
Frequency of Sexual Intercourse / Month	2.230[c]	.030*	Yes:	26.4	31.9	16.5-36.3		7.453	.059	2-8/ 9-13 14-30/ 31+
			No:	14.4	14.1	10.7-18.1				

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

Note. Depressives n = 42, non-depressives n = 58.
[a] Minus sign indicates negative relationship (from Somers' *D* statistic).
[b] Some expected frequencies < 5; Chi-square may not be valid.
[c] Adjusted for unequal variances (*F*' (folded) statistic; Satterthwaite's approximation for *D.F.*).
[d] High dyscontrol score, irritable, depression, suicide attempt, anxiety.

Family history

Further evidence which may suggest the possibility of a hereditary basis for the five-symptom cluster hypothesis, is the evidence in depressives of a significantly positive family history for suicide attempts (50% vs. 10% in non-depressives; $p < .01$) and violence or aggression in family members (64% vs. 32%; $p < .01$) (see Table 22). A similar trend occurred with regard to suicide in family members on comparison within the violent group ($p < .05$), and for violence in family members within both the violent and non-violent groups ($p < .05$) (see Table 34 in Appendix A). Compared to non-depressives, more depressives furthermore have family members who have been imprisoned ($p < .01$), also reaching significance within the non-violent group ($p < .05$). There was furthermore a trend, just falling short of significance, for more depressives to have family members who abused drugs ($p = .051$), and this tendency reached significance on comparison within the non-violent group ($p < .05$).

Table 22 RELATIONSHIP BETWEEN DEPRESSION AND FAMILY HISTORY

VARIABLES	DEPRES-SION	n[c]	% YES	CHI-SQUARE[a]	PROB.	FAM. HIST. CATEGORIES
Family Suicide Attempts	Yes:	10	50%	7.500[b]	.006**	Yes/No
	No:	30	10%			
Family Psychiatric Hist.	Yes:	35	54%	2.035	.154	Yes/No
	No:	54	39%			
Violent Family Members	Yes:	39	64%	9.478	.002**	Yes/No
	No:	56	32%			
Family Been in Prison	Yes:	40	78%	7.450	.006**	Yes/No
	No:	56	50%			
Family Abuse Alcohol	Yes:	41	80%	-0.001	.979	Yes/No
	No:	57	81%			
Family Abuse Drugs	Yes:	39	67%	3.801	.051	Yes/No
	No:	56	46%			

[a] Minus sign indicates neg. relationship (from Somers' D statistic)
[b] Some expected frequencies < 5; Chi-square may not be valid.
[c] n varies on account of missing values.
** $p < .01$

Substance use

With age partialled out, results revealed that more depressives than non-depressives used alcohol, Mandrax and cannabis at the same time ($r = 0.343$; $p = .0005$). They were also more frequent users of alcohol and cannabis together ($r = 0.292$; $p = .003$), and heavier alcohol users ($r = 0.224$; $p = .026$).

Crime-related variables

From Table 30 (see Appendix A), it can be seen that there was a significant relationship between depression and younger age at first imprisonment within the non-violent group ($p < .001$). However, none of the crime-related variables reached statistical significance for comparisons within the total sample, but the following variables showed nonsignificant trends towards a positive relationship with depression: membership of the violent group ($p = .105$), rapists/sexual offenders ($p = .066$), higher prison security classifications ($p = .056$), and a younger age at first imprisonment ($p = .057$).

Summary profile for depression

The following are the most significant features exhibited by prisoners who reported a tendency to become depressed:

- A significantly greater number of depressives exhibit more characteristics from the five psychopathological dimensions for which a common biological substrate has been hypothesised to exist, most likely in the form of diminished serotonin metabolism (i.e. depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol).
- A greater frequency of depressive subjects suffer from anxiety.
- More depressive than non-depressive men have a history of suicide attempts (also on comparison within the violent group).
- A greater number of depressives reported previous head injuries.
- More depressives gained high dyscontrol and overt violence scores on the Monroe Dyscontrol Scale than non-depressives, both on comparison within the total sample and within the violent and non-violent groups.
- More depressives than non-depressives have a tendency to be irritable, get cross quickly, and have often/sometimes become so angry or aggressive that they have hit or hurt someone or broken things.
- A greater number of depressives have family members who have attempted suicide (also on comparison within the violent group).
- A greater frequency of depressives have violent or aggressive family members (also within both the violent and non-violent groups) and family members who have been imprisoned (also within the non-violent group).
- More depressives have family members who abuse drugs.

- The combined use of alcohol, Mandrax and cannabis occurs more frequently in the depressive than the non-depressive group.
- More depressives are heavy users of alcohol as well as of alcohol and cannabis together.
- There is a nonsignificant tendency towards a greater incidence of depression amongst rapists/sexual offenders as well as amongst violent offenders in general.
- There is a significant relationship between depression and younger age at first imprisonment within the non-violent group, and this just fell short of reaching significance within the total sample.
- Compared to non-depressives, the depressed group also show a non-significant trend to have a higher prison security classification.
- In comparison with other sample groups, where hardly any of the neuropsychological tests emerged as important discriminators, depressives performed significantly poorer than non-depressives on the Trail-making Test (parts A and B) and the Stroop test (cards 2 and 3).

ANXIETY (n = 42)

Since anxiety is one of the features from the five-symptom cluster hypothetically related on the basis of a common biological basis (i.e. high dyscontrol, irritability, depression, anxiety and suicide attempts) which has also theoretically been linked to violent behaviour, the 42 subjects who reported a tendency towards anxiety were compared to the 58 non-anxious men to investigate possible interactions on several dimensions. The presence of anxiety was assessed by asking the person if he tends to become anxious more often than other people, thus reflecting trait rather than state anxiety.

Results revealed no difference in marital status between anxious and non-anxious men within the total sample.

<u>Dyscontrol and aggressive tendencies</u>

From Table 23, more anxious than non-anxious men (65% vs. 37%) gained high scores on the Monroe Dyscontrol Scale (at p = .001 from t-test results and at p = .005 from chi-square); this was also the case on comparisons within both the violent and non-violent groups ($p < .05$). A similar trend was found for high scores on the Overt Violence Subscale (61% anxious men vs. 43% non-anxious men on chi-square (p = .073), which reached significance on the t test ($p < .05$). Chi-square tests furthermore indicate that more anxious than non-anxious men have often/sometimes become so angry or aggressive that they have hit someone or smashed objects, i.e. acted out anger (p = .004) and show a nonsignificant tendency for irritability (p = .073). Both the latter two variables were significantly related to anxiety within the non-violent group ($p < .01$ and $p < .05$ respectively). These findings are generally in agreement with the theory suggesting a relationship between, <u>inter alia</u>, anxiety, impulse dyscontrol and aggression.

Table 23 ANXIETY VS. DYSCONTROL AND AGGRESSIVE TENDENCIES

AGGRESSIVE TENDENCIES	T-TESTS t	PROB.>t	ANXIETY	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	AGGR. VAR. CATEGORIES
Monroe Dyscontrol Scale	3.415	.001***	Yes:	30.8	8.8	28.1-33.5	65%	7.824	.005**	High/Low
			No:	24.9	8.5	22.7-27.1	37%			
Monroe Overt Violence Scale	2.212	.029*	Yes:	7.8	3.7	6.65-8.95	61%	3.218	.073	High/Low
			No:	6.1	4.0	5.05-7.15	43%			
Gets Cross Quickly Incl. Under Infl. Alc/Drugs			Yes:				67%	-0.551	.458	Yes/No
			No:				73%			
Gets Cross Quickly Only Under Infl. Alc/Drugs			Yes:				33%	0.551	.458	Yes/No
			No:				27%			
Aggressive by Nature Incl. Under Infl. Alc/Drugs			Yes:				57%	-0.001	.977	Yes/No
			No:				57%			
Aggressive by Nature Only Under Infl. Alc/Drugs			Yes:				43%	0.001	.977	Yes/No
			No:				43%			
Irritable			Yes:				61%	3.218	.073	Yes/No
			No:				43%			
Has Become Aggressive and Hit Someone/Broken Things			Yes:				80%	8.443	.004**	Yes/No
			No:				53%			
Bully as Child (Hurt Children/Animals)			Yes:				31%	1.010	.315	Yes/No
			No:				22%			

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

Note. Anxious men $n = 42$, non-anxious men $n = 58$.
[a] Minus sign indicates negative relationship (from Somers' *D* statistic).

Neuropsychological test results

Apart from the meaningful results on the Monroe Dyscontrol Scale and Overt Violence Subscale reported above, anxiety showed a significant relationship with only one test. Anxious men took longer to read card 3 (colour-word interference task) of the Stroop test than non-anxious men (t (98) = 2.02; p = .047).

Clinical variables

A highly significant difference from Table 24 is that 71% of the anxious men (compared to 10% of non-anxious men) exhibited three or more of the five psychopathological dimensions (i.e. a history of depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol) for which there is hypothesised to be a common underlying factor (x^2 (1) = 37.668, $p < .001$; t (98) = 9.153, $p < .001$). This significance level also held for comparisons within the violent and non-violent groups.

Further evidence in this regard, was that more anxious than non-anxious men (63% vs. 20%) reported a tendency for depression (x^2 (1) = 18.388; $p < .001$). This was equally true within the violent group ($p < .001$), with a similar but nonsignificant trend in the non-violent group ($p = .09$). Suicide attempts also occurred more frequently in anxious men (29% vs. 4% of non-anxious men; $p < .001$). This was also significant within the violent group ($p < .01$), yet just fell short of significance in the non-violent group ($p = .063$).

A greater number of anxious men also reported a history of chronic tiredness (both within the total sample and the non-violent group at $p < .01$), frequent headaches (both within the total sample and the non-violent group at $p < .05$), a higher average frequency of sexual intercourse per month when not in prison ($p < .05$ within the violent group), and a nonsignificant trend for past history of frequent nocturnal enuresis (bed-wetting) ($p = .076$ within the total sample and $p = .114$ within the violent group).

There was a significant negative relationship within the non-violent group between anxiety and head injuries ($p < .05$ on chi-square), as well as high blood pressure ($p < .05$). Anxious subjects also showed a nonsignificant tendency to gain lower scores on the MMPI Lie Scale ($p = .06$ on chi-square, and $p = .09$ on t-test within the total sample, and $p = .105$ on t-test within the violent group).

Table 24 RELATIONSHIP BETWEEN ANXIETY AND CLINICAL VARIABLES

CLINICAL VARIABLES	T-TESTS t	PROB.>t	ANX-IETY	MEAN	S.D.	CONFID. INTERVAL	% YES	CHI-SQUARE[a]	PROB.	CLIN. VAR. CATEGORIES
Head Injuries	-0.852	.396	Yes:	0.94	0.97	0.64-1.24	65%	-1.389	.239	Yes/No
			No:	1.10	0.92	0.86-1.34	76%			
Depression			Yes:				63%	18.388	<.001***	Yes/No
			No:				20%			
Suicide Attempts	3.594[b]	.001***	Yes:	0.29	0.46	0.15-0.43	29%	11.364	.001***	Yes/No
			No:	0.04	0.20	-0.01-0.09	4%			
Insomnia			Yes:				47%	2.161	.142	Yes/ Only in jail/No
			No:				33%			
5-Symptom Cluster[d]	9.153	<.001***	Yes:	3.18	1.24	2.79-3.57	71%	37.668	<.001***	3-5/ 0-2 symptoms
			No:	1.04	1.08	0.76-1.32	10%			
Headaches			Yes:				61%	4.842	.028*	Yes/No
			No:				39%			
Blackouts			Yes:				37%	0.233	.630	Yes/No
			No:				33%			
Epilepsy			Yes:				6%	0.171[c]	.680	Yes/No
			No:				4%			
Chronic Tiredness			Yes:				51%	7.443	.006**	Yes/No
			No:				24%			
High Blood Pressure			Yes:				14%	-0.007	.936	Yes/No
			No:				14%			
Allergy			Yes:				24%	0.016	.898	Yes/No
			No:				22%			
Frequently Had Enuresis			Yes:				24%	3.145	.076	Yes/No
			No:				10%			
MMPI Lie Scale	-1.712[b]	.091						-7.419[c]	.060	Marked/ Mod /Normal/Low
Frequency Sexual Intercourse /Mont	1.204[b]	.232	Yes:					2.500	.475	2-8 / 9-13 14-30/ 31+
			No:							

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

Note. Anxious men n = 42, non-anxious men n = 58.
[a] Minus sign indicates negative relationship (from Somers' D statistic).
[b] Adjusted for unequal variances (F' (folded) statistic; Satterthwaite's approximation for D.F.)
[c] Some expected frequencies < 5; Chi-square may not be valid.
[d] High dyscontrol score, irritable, depression, suicide attempt, anxiety.

Family history

Anxious men had a significantly positive family history of suicide attempts (41% vs. 4% in non-anxious men) ($p < .01$ on both the total sample comparison and within the violent group) (see Table 25).

Table 25 RELATIONSHIP BETWEEN ANXIETY AND FAMILY HISTORY

FAMILY HISTORY	ANXIETY	n[b]	% YES	CHI-SQUARE[a]	PROB.	FAM. HIST. CATEGORIES
Family Suicide Attempts	Yes:	17	41%	8.268[c]	.004**	Yes/No
	No:	23	4%			
Family Psychiatric Hist.	Yes:	44	50%	0.899	.343	Yes/No
	No:	45	40%			
Violent Family Members	Yes:	47	51%	1.263	.261	Yes/No
	No:	48	40%			
Family Been in Prison	Yes:	48	63%	0.044	.834	Yes/No
	No:	48	60%			
Family Abuse Alcohol	Yes:	49	84%	0.588	.433	Yes/No
	No:	49	78%			
Family Abuse Drugs	Yes:	47	53%	-0.090	.765	Yes/No
	No:	48	56%			

[a] Minus sign indicates neg. relationship (from Somers' D statistic)
[b] n varies on account of missing values.
[c] Some expected frequencies < 5; Chi-square may not be valid.
** $p < .01$

Substance use

With age partialled out, results revealed that anxious men are heavier polydrug users than non-anxious men of alcohol, Mandrax and cannabis combined ($r = 0.352$; $p = .0004$), as well as of cannabis on its own ($r = 0.308$; $p = .002$). There were also non-significant trends for anxious men towards heavier use of alcohol and cannabis together ($r = 0.157$; $p = .121$), and towards smoking of Mandrax with cannabis ($r = 0.186$; $p = .065$).

Crime-related variables

Within the total sample comparison, none of the crime-related variables showed a significant relationship with anxiety, but non-violent anxious men were imprisoned for the first time at a significantly younger age ($p < .05$).

<u>Summary profile for anxiety</u>

The following are the most significant features exhibited by subjects who reported a tendency for anxiety:

- A significantly greater number of anxious men exhibit more features from the five psychopathological characteristics in which a similar neurochemical dysfunction has been hypothesised to exist from studies of serotonin levels, (i.e. depression, suicide attempt(s), irritability, anxiety, and impulse dyscontrol).
- A greater frequency of anxious subjects suffer from depression and have a history of suicide attempts (also on comparison within the violent group).
- A greater number of anxious men suffer from headaches.
- Chronic tiredness was reported more often by anxious men, both within the total sample and non-violent group comparisons.
- More anxious men gained high dyscontrol scores on the Monroe scale than non-anxious men, and higher scores on the overt violence subscale.
- More anxious than non-anxious men reported that they have often/ sometimes become so aggressive that they have hurt someone or smashed objects, although this was not significant within the violent group.
- A greater number of anxious men have family members who have attempted suicide (also within the violent group comparison).
- More anxious than non-anxious men are severe drug and polydrug users, i.e. of cannabis alone, as well as of alcohol, Mandrax and cannabis combined.
- Anxious men performed significantly worse on card 3 of the Stroop test.

FIVE-SYMPTOM CLUSTER (High n = 41)

As explained earlier, this variable was created by adding to it a score of one for the presence of each of five variables which have hypothetically been thought to have a common biological substrate on the basis of previous findings of low CSF levels of the serotonin metabolite 5-HIAA by various investigators (as described in the section "Neurochemistry of dyscontrol and violence"). These five variables are a high dyscontrol score, irritability, depression, suicide attempts and anxiety, and the presence of 3 to 5 symptoms signifies a high score. This section gives a summary of all significant findings and trends in relation to this five-symptom cluster as demonstrated either on chi-square, t-tests or correlational analysis, including relationships described in earlier sections.

The presence of a high number of symptoms on this index was characteristic of the violent group (x^2 (1) = 6.99; p = .008), murderers (x^2 (1) = 4.35; p = .037), the high dyscontrol group (x^2 (1) = 32.84; p < .001), depressives (x^2 (1) = 47.78; p < .001), anxious men (x^2 (1) = 37.67; p < .001), a high prison security classification (x^2 (1) = 6.99; p = .008), high overt violence score (x^2 (1) = 18.89; p < .001), irritability (x^2 (1) = 18.891; p < .001), acted out anger (x^2 (1) = 13.60; p < .001), and bullies, i.e. men who used to hurt other children or animals in childhood (x^2 (1) = 5.10; p = .024).

In addition to depression and anxiety, clinical factors that showed a positive relationship with the five-symptom cluster were suicide attempts (x^2 (1) = 29.47; p < .001), headaches (x^2 (1) = 9.30; p = .002), blackouts (x^2 (1) = 3.93; p = .047), and chronic tiredness (x^2 (1) = 5.16; p = .023), while there were nonsignificant tendencies for insomnia, frequent nocturnal enuresis in childhood, and a high average frequency of sexual activity - the latter reaching significance on Pearson's correlation with age partialled out. Significantly more men from this group had furthermore never been married or were divorced (x^2 (1) = 4.29; p = .038).

Apart from a significant positive relationship with family history for suicide attempts (x^2 (1) = 11.29; p = .001) and violent family members (x^2 (1) = 10.77; p = .001), this group also showed a nonsignificant

tendency to have family members with a psychiatric history and with a record of imprisonment.

With regard to substance use, there was a highly significant positive correlation between the five-symptom cluster and polydrug use, i.e. alcohol, Mandrax and cannabis together (r = 0.373; p = .0001), with age partialled out. Use of alcohol and cannabis combined (days used) also showed a positive relationship with this variable (r = 0.298; p = .003), as did cannabis use (days used) (r = 0.229; p = .023), while alcohol on its own (days used) showed a nonsignificant positive trend (r = 0.154; p = .128). This variable also correlated positively with having committed crime or lied in order to get alcohol or drugs (r = 0.268; p = .008).

Interestingly, men with a high number of symptoms from this cluster performed significantly poorly on a number of tests from the neuropsychological battery, i.e. TMT-A (t (98) = 2.14; p = .035), TMT-B (t (98) = 3.06; p = .004), Stroop-1 (t (98) = 3.98; p < .001), and Stroop-3 (t (98) = 2.39; p = .019), with a similar nonsignificant trend on Stroop-2 (t (98) = 1.75; p = .083). They also gained lower scores on both Raven's (t (98) = 2.43; p = .017) and average IQ (t (98) = 2.39; p = .019), while low MMPI Lie Scale scores (t (98) = 2.93; p = .004) indicate that they do not have a tendency for lying.

INTERRELATIONSHIPS BETWEEN VARIABLES HYPOTHETICALLY RELATED TO SEROTONIN DYSFUNCTION

Correlations were investigated between a cluster of variables which have been postulated to be interrelated on the basis of a common biological substrate, in the form of serotonin dysfunction.

In addition to the cluster of five symptoms, alcohol abuse has also been related to low serotonin metabolism (Ballenger et al., 1979; Bailly et al., 1990), but as alcohol use _per se_ was not as significant in the present study as combined use of alcohol, Mandrax and cannabis, the latter variable was included and will be referred to as "polydrug use". "Impulse dyscontrol" refers to subjects with a high score on the Monroe Dyscontrol Scale. The variables violent crime, overt violence (high score of $\geq$ 7 on Monroe subscale), irritability and acted out anger can all be regarded as dimensions of aggression dysregulation. Acted out anger refers to a response of "often" or "sometimes" (vs. "never" or "once or twice") to the question "have you ever become so angry or aggressive that you have hit someone or smashed things?". As it has been hypothesised that this hypothetical serotonin-related syndrome may be hereditary, the variables "suicide attempts by family members" and "violent family members" were also included.

able 26 CHI-SQUARE RELATIONSHIPS BETWEEN VARIABLES HYPOTHETICALLY RELATED TO SEROTONIN DYSFUNCTION (INCLUDING ODDS RATIOS AND 95% CONFIDENCE INTERVALS)

		Violent crime	Impulse dyscontrol	Overt violence	Irrit-ability	Acted out anger	Depres-sion	Suicide attempt/s	Anx-iety	5-symptom cluster[a]	Fam.suicide attempt[b]	Violent fam.member
pulse dyscontrol	x^2	6.76										
	p	.009**										
	Odds	2.90										
	CI	0.6-14.6										
ert violence	x^2	19.39	38.42									
	p	<.001***	<.001***									
	Odds	6.64 *	18.20 *									
	CI	1.3-33.3	3.6-91.3									
ritability	x^2	7.85	6.73	10.17								
	p	.005**	.009**	.001***								
	Odds	3.17	2.96	3.75								
	CI	0.6-15.9	0.6-14.9	0.7-18.8								
ted out nger	x^2	13.07	6.15	18.71	12.07							
	p	<.001***	.013*	<.001***	.001***							
	Odds	5.25 *	2.90	7.60 *	4.78							
	CI	1.05-26.3	0.6-14.5	1.5-38.1	0.95-24.0							
pression	x^2	2.63	18.38	10.95	6.24	8.74						
	p	.105	<.001***	.001***	.012*	.003**						
	Odds	1.94	6.57 *	4.09	2.83	4.06						
	CI	0.4-9.7	1.3-33.0	0.8-20.5	0.6-14.2	0.8-20.4						
icide ttempt(s)	x^2	8.58	8.06	10.77	4.91	4.18	9.99					
	p	.003**	.005**	.001***	.027*	.041*	.002***					
	Odds	6.09 *	5.80 *	9.32 *	3.67	4.47	6.05 *					
	CI	1.2-30.6	1.2-29.1	1.9-46.8	0.7-18.4	0.9-22.4	1.2-30.4					
xiety	x^2	0.36	7.82	3.22	3.22	8.44	18.39	11.36				
	p	.548	.005**	.073	.073	.004**	<.001***	.001***				
	Odds	1.27	3.16	2.07	2.07	3.63	6.57 *	9.79 *				
	CI	0.3-6.4	0.6-15.8	0.4-10.4	0.4-10.4	0.7-18.2	1.3-33.0	2.0-49.1				
symptom luster[a]	x^2	6.99	32.84	18.89	18.89	13.60	47.78	29.47	37.67			
	p	.008**	<.001***	<.001***	<.001***	<.001***	<.001***	<.001***	<.001***			
	Odds	3.02	15.68 *	6.93 *	6.93 *	6.50 *	30.96 *	N/A: one	21.12 *			
	CI	0.6-15.1	3.1-78.7	1.4-34.8	1.4-34.8	1.3-32.6	6.2-155.4	cell zero	4.2-106.0			
n. suicide ttempt(s)[b]	x^2	3.32	1.64	3.64	0.11	1.25	7.50	12.97	8.27	11.29		
	p	.068	.201	.057	.736	.263	.006**	<.001***	.004**	.001***		
	Odds	4.26	2.78	5.00	1.32	2.65	9.00 *	N/A: one	15.40 *	16.11 *		
	CI	0.8-21.4	0.6-13.9	0.99-25.1	0.3-6.6	0.5-13.3	1.8-45.2	cell zero	3.1-77.3	3.2-80.8		
olent fam. ember(s)	x^2	7.69	25.60	22.03	11.93	5.72	9.48	2.31	1.26	10.77	0.29	
	p	.006**	<.001***	<.001***	.001***	.017*	.002**	.129	.261	.001***	.593	
	Odds	3.24	10.25 *	8.50 *	4.49	3.00	3.78	2.32	1.59	4.17	1.58	
	CI	0.6-16.3	2.0-51.5	1.7-42.7	0.9-22.5	0.6-15.0	0.8-18.9	0.5-11.7	0.3-8.0	0.8-20.9	0.3-7.9	
c. + Mx + nnabis use	x^2	0.05	7.88	5.00	7.22	8.02	12.22	2.09	7.88	13.19	1.29	2.23
	p	.822	.005**	.025*	.007**	.005**	<.001***	.148	.005**	<.001***	.256	.135
	Odds	1.11	3.87	2.88	3.66	5.58 *	5.16 *	2.21	3.87	5.51 *	2.60	2.00
	CI	0.2-5.6	0.8-19.4	0.6-14.4	0.7-18.4	1.1-28.0	1.03-25.9	0.4-11.1	0.8-19.4	1.1-27.6	0.5-13.0	0.4-10.0

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

Note. CI = 95% confidence interval for odds ratio (significant if lower limit greater than or equal to 1).
[a] Impulse dyscontrol, irritability, depression, suicide attempt(s), and anxiety.
[b] Some cell frequencies less than 5 due to missing values; chi-square values may not be accurate.

Table 26 presents the interrelationships from the present study on chi-square comparisons between variables which have been postulated to be interrelated on the basis of serotonin dysfunction. The figures for the variable "family suicide attempt(s)" should, however, be interpreted with caution, since a large number of subjects did not know whether family members had attempted/committed suicide, which resulted in a large number of missing values.

As there is a degree of overlap between "5-symptom cluster" and the five variables out of which this cluster consists, these interrelationships may be inflated. However, as all these chi-square values are considerably high (see Table 26) and well beyond the .001 probability level, and since impulse dyscontrol was still highly significantly related (x^2 = 19.36 (3), p < .001) to a 3-symptom cluster consisting of depression, suicide attempt(s) and anxiety only, a chi-square probability of < .001 or at least < .01 would probably still obtain. There were moreover, positive correlations between prison classification score and both the 5-symptom (p =.005) and 3-symptom clusters (p =.05) and between bullies and the 5-symptom cluster (p = .004), with a similar nonsignificant trend for the 3-symptom cluster (p = .14).

As a more stringent measure of these interrelationships, estimated odds ratios and confidence intervals were calculated (see Table 26). When two binary variables are compared, the odds ratio is a relative measure of the odds of a positive response in one variable relative to that in another. This estimate is given by the ratio of the products of the two pairs of diagonal elements in a 2 x 2 contingency table. An odds ratio of 1 implies an insignificant result (i.e. that the probability of positive responses in the sample and control groups are equal), while an odds ratio of 6 means that the odds of a positive occurrence of a variable in the sample group (e.g. high dyscontrol) is six times that for the control group (e.g. low dyscontrol). When the 95% confidence interval does not include 1, this is an indication that the odds of the positive occurrence of a variable in the sample group is certainly significant at the 5% level (Collett, 1991).

There were numerous significant interrelationships by means of chi-square comparisons between the variables in Table 26, fifty percent of which still remained significant if judged by odds ratio confidence intervals.

In addition to the abovementioned relationship with the five-symptom cluster, this group of men who acknowledged that they used to hurt other children or animals as children, showed a positive association with the violent group ($p < .01$), high dyscontrol ($p < .001$), overt violence ($p < .001$), irritability ($p < .01$), suicide attempt(s) ($p < .05$), number of violent crimes ($p < .01$), prison classification ($p < .01$), brutal violence ($p = .012$; adjusted for unequal variances $p = .081$) and a negative relationship with MMPI Lie score ($p < .001$).

CONFESSIONS OF DISHONESTY OR CRIME IN ORDER TO OBTAIN ALCOHOL OR DRUGS

An interesting finding was the significant positive correlation ($R = .268$, $p = .008$) between number of symptoms present from the five-symptom cluster and how often a person had committed crime, lied, or broke the law in order to get alcohol or drugs. Other factors which correlated significantly positively with the latter variable were Monroe dyscontrol ($p < .001$), overt violence ($p < .001$), irritability ($p < .05$), polydrug use of alcohol, Mandrax and cannabis ($p < .001$), smoking of Mandrax with cannabis ($p = .002$), cannabis use ($p < .001$), and frequency of sexual activity ($p < .05$), while a negative correlation with the MMPI Lie Scale ($p < .001$) supports the credibility of these findings.

PERCEIVED "BENEFITS" OF SUBSTANCE USE

In response to the question of whether alcohol and/or drugs help them in certain respects (see question 41 on the clinical/biographical questionnaire), the percentages of prisoners who gave positive responses are presented in Table 27.

Table 27 PERCEIVED "BENEFITS" OF SUBSTANCE USE

QUESTION: Do you find that alcohol and/or drug use helps for:	VIOLENT GROUP (n=50)		NON-VIOLENT (n=50)		TOTAL SAMPLE (n=100)	
	ALCOHOL	DRUGS	ALCOHOL	DRUGS	ALCOHOL	DRUGS
Depression	28%	20%	34%	28%	31%	24%
Being accepted by a group	44%	38%	38%	34%	41%	36%
Worries	52%	28%	36%	34%	44%	31%
Sleeping well	44%	52%	26%	54%	35%	53%
Avoiding arguments	10%	34%	20%	32%	15%	33%
Relaxing	40%	60%	30%	54%	35%	57%
Anxiety or feelings of fear	52%	32%	22%	14%	37%	23%

Note. Percentages represent positive responses.

Alcohol gained the most votes for helping with worries, anxiety or feelings of fear and facilitating acceptance by a peer group, both within the violent group and the total sample. Within the non-violent group the frequency of positive responses was generally lower than for the violent group, with the most popular responses being group acceptance, worries, and depression. Within all three groups drugs were most frequently reported to help the person to relax and to sleep well, and more violent (32%) than non-violent subjects (14%) said that drugs helped them with anxiety or feelings of fear.

In total, alcohol gained more votes than drugs for helping with depression, group acceptance, worries, and anxiety or feelings of fear, while drugs were more popular than alcohol for sleeping well, avoiding arguments and relaxation.

PRISONERS' OPINIONS OF CAUSES OF CRIME

At the end of the individual interview subjects were asked to give their opinion about causes of crime - firstly, what caused them to commit the crime they were currently convicted of, and secondly, what they considered to be the most important cause(s) of crime in general. These data were not suitable for statistical analysis, as subjects were allowed to give more than one response. These findings are therefore reported in descriptive terms as response frequencies per number of subjects in each sample group in terms of percentage.

As could be expected, violent criminals' responses with regard to causes of crime in general tended to have a bias towards violent crime, while responses by the non-violent group generally concerned non-violent crime or crime with an economic motive, such as robbery. Where it was obvious that a subject only covered one aspect, an attempt was made to elicit a response in terms of the other aspect as well. In Table 28, responses are presented per group as well as for the total sample, arranged in descending order of frequency according to causes of crime in general as given by the total sample.

From responses within the total sample the most frequently cited cause of crime in general was Mandrax usage/purchase (55%), while this figure rose to 72% within the non-violent group. Next in line came alcohol as well as cannabis abuse/purchase at 47% and 43% respectively for the total sample and at 52% and 56% respectively for the non-violent group, and thereafter money problems (27%) and unemployment (25%) were proposed as causes of crime in general.

The frequency of a response as a cause of the person's own crime was generally much lower for the most frequently cited responses, except in the case of alcohol. The most frequently cited reason within all three groups for the cause of the person's own crime, was alcohol usage/purchase. Within the violent group, 57% considered alcohol usage to be the cause of their own crime, while 42% of the non-violent group and 49% from the total sample gave alcohol usage/purchase as the reason for committing their current crime. Apart from alcohol, other causes of their own crime offered by the non-violent group were Mandrax usage/purchase (38%), cannabis usage/purchase (24%), influenced by friends (18%), unemployment (14%), and money problems (12%).

Table 28 PRISONERS' OPINIONS OF CAUSES OF CRIME

CAUSE OF CRIME (SPONTANEOUS RESPONSES)	VIOLENT GROUP (n=49)		NON-VIOLENT (n=50)		TOTAL SAMPLE (n=99)	
	OWN CRIME (CURRENT)	CRIME IN GENERAL	OWN CRIME (CURRENT)	CRIME IN GENERAL	OWN CRIME (CURRENT)	CRIME IN GENERAL
* Mandrax usage / purchase	20%	37%	38%	72%	29%	55%
* Alcohol usage / purchase	57%	43%	42%	52%	49%	47%
* Cannabis usage / purchase	20%	31%	24%	56%	22%	43%
Alcohol usage	57%	37%	36%	42%	46%	39%
Mandrax usage	20%	22%	28%	44%	24%	33%
Cannabis usage	20%	22%	16%	36%	18%	29%
Money problem	6%	24%	12%	30%	9%	27%
Unemployment	6%	29%	14%	22%	10%	25%
Mandrax purchase	0%	14%	10%	28%	5%	21%
Cannabis purchase	0%	8%	8%	20%	4%	14%
Lost control / Lost temper	14%	10%	0%	12%	7%	11%
Obstreperous ("moedswillig")	0%	6%	0%	14%	0%	10%
Gang fights	4%	8%	0%	10%	2%	9%
Alcohol purchase	0%	6%	6%	10%	3%	8%
Bad / criminal environment	0%	4%	0%	10%	0%	7%
Hardship	0%	8%	0%	4%	0%	6%
To prove himself	2%	4%	4%	6%	3%	5%
Domestic problems	4%	4%	0%	6%	2%	5%
Homeless	0%	4%	2%	6%	1%	5%
Greed / Covetousness	0%	4%	0%	6%	0%	5%
Influenced by friend	2%	2%	18%	6%	10%	4%
Bad parenting	2%	2%	6%	6%	4%	4%
Mentally ill	0%	2%	0%	6%	0%	4%
No education	0%	4%	0%	4%	0%	4%
Marital/relationship problem	12%	4%	4%	2%	8%	3%
Don't know why / No reason	8%	4%	2%	2%	5%	3%
Wanted to make a fast buck	0%	4%	4%	2%	2%	3%
Oppression	2%	6%	2%	0%	2%	3%
Can't adjust outside prison	0%	4%	0%	2%	0%	3%
Poor communication	0%	4%	0%	2%	0%	3%
Influence of "crime college"	0%	2%	0%	4%	0%	3%
Provocation	12%	0%	0%	4%	6%	2%
Feel rejected	0%	2%	8%	2%	4%	2%
To care for family	0%	0%	6%	4%	3%	2%
To have a "nice time" / fun	0%	0%	2%	4%	1%	2%
Was threatened	0%	2%	0%	2%	0%	2%
Jealousy	10%	2%	0%	0%	5%	1%
Can't recall committing crime	6%	0%	2%	2%	4%	1%
Self-defence	8%	2%	0%	0%	4%	1%
Difficult childhood	0%	2%	6%	0%	3%	1%
Sexual lust	4%	2%	0%	0%	2%	1%
Poor self-concept	0%	0%	2%	2%	1%	1%
Was disobedient to parents	0%	2%	2%	0%	1%	1%
No motivation	0%	2%	0%	0%	0%	1%
Depression	0%	0%	0%	2%	0%	1%
No problem-solving skills	0%	2%	0%	0%	0%	1%
Fighting	10%	0%	0%	0%	5%	0%
Claims he is innocent	4%	0%	2%	0%	3%	0%
Evil ("die boosheid")	2%	0%	0%	0%	1%	0%
Revenge	0%	0%	2%	0%	1%	0%

* Total of usage and purchase responses

Other causes of their own violent crime given by the violent group were Mandrax usage (20%), cannabis usage (20%), loss of control (14%), marital/relationship problems (12%), provocation (12%), jealousy (10%), and fighting (10%), while 8% responded that they did not know why they had committed the (violent) crime or did it for no reason, and 6% of the violent men had no recollection of committing the crime.

MEMORY LAPSES DURING SUBSTANCE INTOXICATION

In relation to these reports of amnesia for the criminal event, another finding justifies mentioning. A question from the substance use questionnaire about whether the person had ever experienced memory lapses at the time of substance intoxication, revealed that amongst alcohol users, 75% from the violent group, 56% from the non-violent group, and 66% from the total sample had experienced memory lapses; while the respective figures for cannabis smokers were 13%, 4% and 9%, for users of alcohol plus cannabis 65%, 72% and 68%; for smokers of Mandrax with cannabis 41%, 35% and 38%; and for users of alcohol, Mandrax and cannabis at the same time 79%, 75% and 77%. Memory lapses thus occur very frequently in users of alcohol, Mandrax and cannabis simultaneously, followed by alcohol alone, alcohol plus cannabis, Mandrax plus cannabis, and relatively infrequently in users of cannabis on its own.

TABULAR SUMMARY OF PROMINENT FINDINGS AND TRENDS ACROSS ALL SUBGROUPS

The following tabular synopsis (Table 29) provides a bird's-eye view of significant findings and trends across the various subgroups and variables.

Table 29 SUMMARY OF SIGNIFICANT FINDINGS AND TRENDS

	VIOLENT	MURDERERS	RAPISTS	DYSCONTROL	DEPRESSION	ANXIETY	5 SYMPTOMS
<u>AGGRESSIVE TENDENCIES</u>:							
Monroe Dyscontrol	***	*		---	***	***	***
Monroe Overt Violence	***	***	~	***	***	*	***
Gets Cross Quickly	***	**		***	**		
Aggressive by Nature	***	**		***			
Irritability	**	~		**	*	~	***
Acted out anger	***	~	*	*	**	**	***
Bully as Child	**			***			*
<u>CLINICAL VARIABLES</u>:							
Head Injuries	**			**	*		
Depression	~		~	***	---	***	***
Suicide Attempts	**			**	**	***	***
Anxiety				**	***	---	***
Insomnia				*			~
5-symptom cluster	**	*		***	***	***	---
Headaches	*			**		*	**
Blackouts	*			**			*
Chronic Tiredness						**	*
High Blood Pressure	~	*		~			
Serious Past Illness(es)	* ↓						
Never married / Divorced	*	*	~	***	**		*
<u>FAMILY HISTORY</u>:							
Family Suicide Attempts	~				**	**	**
Violent Family Members	**	*		***	**		***
Family Been in Prison	**		*	**	**		~
Family Abuse Alcohol	~						
Family Abuse Drugs					~		
<u>CRIME-RELATED VARIABLES</u>:							
Prison Classification	***	***	***	*	~		**
Age at First Imprisonment	** ↓	~ ↓	* ↓		~ ↓		
<u>TEST RESULTS</u>:							
TMT-A	*			~	**		*
TMT-B					**		**
Stroop-1				***			***
Stroop-2					*		~
Stroop-3					*	*	*
<u>SUBSTANCE USE</u>:							
Alcohol use	~			**	*		~
Cannabis use		~ ↓	*	*		**	*
Alcohol + cannabis use	~		*	***	**	~	**
Mandrax + cannabis use		* ↓	**			~	
Alc + Mandrax + cannabis			***	**	***	***	****
Crime/lied to get alc/drug	~ ↓	~ ↓		**			**

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

~ Trend towards significance.
↓ Negative relationship.
<u>Note</u>. "5 Symptoms" refers to the group of subjects who manifested 3 - 5 symptoms from: high dyscontrol, irritability, depression, suicide attempts, and anxiety.

DISCUSSION

The results of this study confirm the hypothesis that impulse dyscontrol occurs more frequently among violent than non-violent criminals, as the self-report Monroe Dyscontrol Scale was highly successful in discriminating between these groups. However, contrary to expectation, the battery of neuropsychological tests, apart from part A of the Trail-making Test, proved unable to discriminate between violent and non-violent offenders.

Further hypotheses that were confirmed are the following: the violent group exhibited a greater incidence of aggressive tendencies, as well as a positive family history of violent family members and previously imprisoned relatives, while family suicide attempts and family alcohol abuse just fell short of significance. Several clinical factors were reported significantly more often by violent offenders, i.e. head injuries, suicide attempts, headaches, and blackouts, while a prominent tendency towards depression just failed to meet significance. Partial support was found for the hypothesis that violent offenders would be heavy alcohol users, indicated by a positive but nonsignificant trend. The hypothesis that more violent than non-violent criminals would have a positive family history of psychiatric problems was not confirmed.

More violent than non-violent offenders furthermore manifested three to five features from the cluster of symptoms hypothetically related to a serotonin-based disorder of inhibitory function, and there were significant intercorrelations amongst a number of variables representative of this constellation of symptoms, i.e. violent crime, impulse dyscontrol, overt violence, irritability, acted out anger, depression, suicide attempts, anxiety, five-symptom cluster, family suicide attempts and violent family members. The reader is once more requested to note that the relationships between these variables and serotonin disturbances in the brain are still hypothetical.

In addition to the above, the investigation also yielded several other interesting findings. The possibility should nevertheless be kept in mind that some significant relationships may merely be chance findings on account of the large number of comparisons performed.

These results as well as other exploratory findings will now be interpreted and discussed in greater detail. Referring back to Table 29 through the course of the discussion will assist the reader to discern indications of intra- and inter-group relationships.

DYSCONTROL AND AGGRESSIVE TENDENCIES

High scores on the Monroe Dyscontrol Scale were significantly characteristic of the violent group, murderers, depressives, anxious men, and the group with 3 to 5 features from the five-symptom cluster, but not of rapists. This insignificant result in relation to impulse dyscontrol in rapists tends to contradict the findings by Wessels (1991), who reported that rapists tend to act impulsively, as 84% of a sample of 31 rapists indicated that they had not planned to commit these acts at all. This result also disagrees with the observation by Groth (1979, quoted in Overholser & Beck, 1986) that sex offenders are impulsive men who are unable to delay gratification of sexual urges and consequently commit sexually deviant acts without adequate forethought. The present finding that rapists did not score particularly high on impulse dyscontrol may be related to the fact that this group of rapists manifested a significantly higher intellectual level, since Heilbrun (1979), who similarly found that rapists tended to fall into the higher IQ range, regarded rape to be a more premeditated type of violent crime, and found that bright psychopaths were more inclined to premeditation in their crimes.

Table 29 shows that all the subgroups except rapists (i.e. the violent group, the high dyscontrol group, murderers, depressives, anxious men, and the group with 3 to 5 features from the five-symptom cluster) also showed multiple significant relationships with various of the following five aggressive tendencies: Monroe overt violence, gets cross quickly, aggressive by nature, irritability, and acted out anger. For rapists, the only significant aggressive tendency was acted out anger, i.e. that they had often/sometimes become so angry or aggressive that they hit or hurt someone or smashed objects. This seems to be in agreement with Overholser and Beck's (1986) theory that rape is a sexual means of expressing anger and power. As rape is generally considered to be a crime of violence rather than one of uncontrolled

sexual lust, the finding that rapists seem to be the least violent of the seven subgroups was unexpected.

Bullies in childhood

Bach-y-Rita and Veno (1974) found a significant incidence of childhood cruelty to animals in a sample of habitually violent prisoners. Felthous and Kellert (1987) reviewed the literature on the relationship between childhood cruelty to animals and later violence against people. Although there were some inconsistent findings, they concluded that studies that used direct interviews to assess subjects with multiple acts of violence suggest that there is an association between a pattern of childhood cruelty to animals and later serious, recurrent aggression against people.

The present results support these findings, as significantly more subjects from the following subgroups admitted that they had been "bullies" (i.e. they had a tendency to hurt other children or animals) as children: violent offenders, the high dyscontrol group, nine men who had committed particularly brutal violent crimes, and the group with a high number of features from the five-symptom cluster. The impression of a pattern of maladaptive behaviour since childhood - possibly on the basis of an organic dysfunction in relation to this hypothetical cluster of symptoms - is further substantiated by positive correlations between bullies and overt violence score, irritability, suicide attempts, number of violent crimes and prison security classification.

CRIME-RELATED VARIABLES

Violent criminals and rapists were imprisoned for the first time at a significantly younger age, with murderers and depressives showing a similar but nonsignificant tendency, thus implying that disordered behaviour and dyscontrolled aggression has been a longstanding feature of these subgroups, but not necessarily for the high dyscontrol group, the anxious men, and the group with several features of the five-symptom cluster.

Prison classification figures tended to be higher for all index subgroups except the anxious men. Highly significant differences occurred

in relation to the violent group, murderers, rapists, high Monroe overt violence, younger age at first imprisonment, high number of both violent crimes and total number of crimes. Prison classifications were also significantly higher for the following subject groups: high dyscontrol, high number of features from the five-symptom cluster, high alcohol use, depression, irritability, high blood pressure, and head injuries.

The highly significant correlation between prison classification and the five-item Monroe Overt Violence Subscale, indicates that this scale might be a quick, accurate measure of security risk. The prominent relationship between this classification figure and dyscontrol may well be an indication that impulse dyscontrol plays an important role in violent criminal behaviour. The finding of a similar relationship with the cluster of five-symptoms further leads one to speculate that should this hypothetical cluster actually be found to have a common biological substrate which manifests in the form of dysregulatory phenomena across several dimensions, such men may, in fact have a biological vulnerability for disordered and violent behaviour. The significant findings in relation to depression and high blood pressure (which could both be regarded as disorders of regulation), as well as alcohol use (a disorder of impulse control, which has also been implicated to be related to the serotonin-related dysregulation hypothesis) all lend further support to this conjecture.

SUBSTANCE USE

Alcohol

Alcohol, which has been described as "the solvent of the super ego", is a depressant that initially depresses inhibitory neurotransmitters, leading to disinhibited behaviour in normal people but with enhanced effects in individuals with brain defects or dysfunction (Elliott, 1992, p. 600). A relationship between alcohol use and violent crime has been established in a large proportion of cases, especially when aggressive and quarrelling behaviour preceded the crime (Virkkunen, 1974). A recent study by the Medical Research Council on the prevalence of alcohol intoxication in relation to trauma in the Cape Peninsula, found that 35% of a very large randomised sample of trauma victims of all ages (including children) were alcohol related. Further-

more, positive blood alcohol levels were present in 77% of assault or vehicular trauma patients at Tygerberg Hospital (Van der Spuy, 1991).

Contrary to expectation, these previous findings and the fact that in the present study, prisoners most frequently blamed alcohol as the cause of their crime, received only moderate support from the alcohol use figures within various subgroups. The high dyscontrol group and the depressives were significantly heavy users of alcohol, while a similar but nonsignificant trend existed for the violent group and the high five-symptom cluster group. This provides reasonable support for the theory that there may possibly be a common factor underlying dys-regulation syndromes. As heavy alcohol use is furthermore liable to deplete serotonin levels eventually (Blum, 1989), this would tend to aggravate a possible pre-existing biological vulnerability to readily lose control.

In order to attempt to establish whether substance use may be a form of self-medication, subjects were questioned about the perceived "benefits" of substance use to them. In response to this investigation (see Table 27), 28% of violent men reported that alcohol relieved depression, and 52% of violent men said that it helped to relieve anxiety or feelings of fear. The significant finding that depressive men were high alcohol users could possibly be explained on this basis - on the other hand, depression may be induced by heavy alcohol use. One can further speculate that if a biologically based disorder of regulation does play a role in the development of addictive patterns of substance use, this could offer an explanation for the positive correlation between dyscontrol and alcohol use.

<u>Cannabis</u>

Heavy cannabis use occurred frequently among anxious men, rapists, the high dyscontrol group, and men with a high number of features from the five-symptom cluster. In contrast, there was a nonsignificant tendency indicating that fewer murderers than non-murderers were heavy cannabis users. The most prominently perceived benefit of drug use was in terms of relaxation (57%), and 23% of subjects specifically reported that it relieves anxiety. Prisoners furthermore often mentioned that whereas drugs made them feel more relaxed and cheerful, alcohol tended to lead to loss of control and aggression.

found that alcohol furthermore slows down the elimination rate of methaqualone from the body (Roden et al., 1977), and in experimental studies on rats, methaqualone has been shown to potentiate the effects of alcohol (Ho & Ho, 1978). It has also been noted that the synergistic effect of the simultaneous use of alcohol and hypnotics produces abnormal behaviour similar to alcohol idiosyncratic intoxication (Kaplan and Sadock, 1981).

With regard to its controversial reputation as a "love drug", experimental evidence has been found that methaqualone causes sexual arousal in the earlier reviewed studies on monkeys (Claus et al., 1980, 1981), where such an effect can clearly not be contributed to mind set, setting or expectations - to which some authors have attributed the drug's reputed aphrodisiacal qualities (Julien, 1981). It may be recalled that a survey on effects of methaqualone addiction also documented that the drug causes sexual arousal, self confidence and increased sociability (Carroll and Gallo, 1985), and that a methaqualone high produces a sensual, somewhat euphoric state, and inhibitions disappear (Ostrenga, 1973).

Some reports have also attributed aphrodisiacal properties to cannabis (Lishman, 1987; Boericke, 1927), although other authors reject the idea (Kaplan & Sadock, 1981). A previous study of 604 White and Coloured male offenders referred to a Forensic Unit in Cape Town for psychiatric assessment, found that the only drug taken by sex criminals was cannabis (Hemphill & Fisher, 1980). Mandrax abuse did not seem to be as prevalent at that time, as it is mentioned only cursorily and reliable details about its use were not available. Of the 56 sex offenders in that study, 26% abused alcohol, 7% cannabis, 7% both, and interestingly, 60% of the sexual assaults were committed by persons who did not indulge in drugs or alcohol. Of the 21% with diagnoses of severe psychopathy, 70% were abusers of alcohol, drugs or both. Of the substance abusing violent criminals, 58% used alcohol, 8% used drugs only, and 34% both. These findings supported the common phenomenon that alcohol with or without cannabis is often reported as a factor in many assaults and knife fights.

Levels of the psychoactive component of cannabis (delta-9-tetrahydrocannabinol) have been reported to be higher in South African cannabis than in that of many countries and have been increasing (Furman,1989).

It has been reported that individuals seem to use cannabis at substantially higher doses in countries like Africa and Asia, where cannabis-induced psychoses without typical schizophrenia-like psychotic symptoms have been described. Most reports have mentioned bizarre behaviour, the potential for violence, and feelings of panic (Kaufman, Khanzian, Westermeyer, Czechowicz, Mirin, & Meyer, 1987). A local study has suggested that the cannabis of the Cape is especially inclined to cause toxic psychosis (Mechoulam, McCallum, & Burstein, cited in Hemphill & Fisher, 1980) and that massive amounts of cannabis are smoked by some criminals and dropouts in South Africa - often up to 8 or 10 consecutive pipes (Hemphill & Fisher, 1980).

Although prisoners' descriptions of the subjective effects of alcohol, cannabis, and Mandrax (in various combinations) will be detailed in a subsequent paper, subjects' personal reports of their sensations under influence of these drugs with regard to sexual arousal will be briefly described here, in view of the significant correlation between "white pipe" smoking and sexual crime. Positive responses that the use of a particular substance gives indulgers an intense sexual urge, were given by 28% of all "white pipe" indulgers, 20% of users of all three substances simultaneously, 43% of cannabis indulgers, 40% of alcohol plus cannabis users, and 48% of alcohol indulgers. A greater number of positive responses by violent offenders in relation to non-violent prisoners, were given for alcohol (58% vs. 38% respectively) and cannabis (45% vs. 41%). In this criminal sample, the greatest frequency of sexual arousal as an effect was reported by alcohol users from the violent group, followed by alcohol users in total, cannabis indulgers from the violent group, and cannabis users in total.

One could therefore speculate that polydrug use may selectively enhance sexual arousal and/or sexual disinhibition in certain subjects, as it is well-known that substance effects vary from person to person. The possibility is therefore raised that since this effect seems to occur more often among alcohol and cannabis users, these substances and Mandrax may all have interactive additive effects in a certain subgroup of biologically vulnerable users, thereby causing significantly greater potentiating and/or disinhibitory effects on sexual activity.

The theory has to be entertained that the effects of drugs on "personality disordered" individuals may be substantially different from a normal population - therefore many reports of drug effects may not necessarily apply in a criminal population. Based on 15 years' clinical experience of the late Dr Samuel Yochelson (former Director of the Programme for Investigation of Criminal Behaviour in Washington D.C.), the facilitating effects of drugs on criminal behaviour were recorded. Some of the most interesting observations were acceleration of criminal thought processes, the elimination of caution and forethought in criminal intent, the potentiation of sexual disinhibition and sexual performance, the release of suicidal ideation, and the precipitation of religious experience (Gordon, 1988). It is therefore possible that in a population that is speculated to have an underlying biological instability or defect in behavioural inhibition, the use of certain substances may enhance this deficiency to such an extent that it leads to dysfunctionally disordered behaviour.

FAMILY HISTORY

Interestingly, several family history variables yielded significantly positive results within various subgroups.

Attempted (or successful) suicide occurred more often within family members of the depressive group, the anxious group, and the group with 3 to 5 symptoms from the five-symptom cluster, while falling just short of significance for the violent group.

Family members with excessively violent behaviour were reported more often by the violent group, the high dyscontrol group, murderers, depressives, and the group with a high number of features from the five-symptom cluster. Elliott (1982) similarly reported a high incidence of 49% violent family members in a large sample of recurrently violent patients from a private neurological practice.

There was a higher incidence of previously imprisoned family members within the violent group, the high dyscontrol group, rapists, and depressives.

Alcohol abuse was generally prevalent among family members of most subjects, showing a strong, yet nonsignificant positive difference only for the violent group, while a nonsignificant positive trend for a higher incidence of drug abuse among family members was found for the depressive group.

This remarkable number of significant findings in relation to family history might, on the one hand, be interpreted as evidence in support of the possibility of an underlying genetic component, although the alternative argument that the child may be influenced by the home environment, cannot be ruled out. It must, however, be kept in mind that family members were not restricted to parents only, and suicide attempts by family members are furthermore such relatively infrequent occurrences that they can hardly be considered to act as an environmental influence. This variable moreover reached significance within several of the dimensions that have hypothetically been linked to a possible common biological substrate. Another interesting observation is that the greatest number of significant family history variables occurred within the depressive group.

TEST RESULTS

While the Monroe Dyscontrol Scale was significantly effective in discriminating between violent and non-violent subjects, the only neuropsychological test that yielded a significant difference between violent and non-violent men was part A of the Trail-making Test, with violent men having longer completion times.

While the best discriminators among the neuropsychological tests between high and low dyscontrol men were Stroop-1, Stroop-3 errors, and TMT-A, the TMT-A was the only test that showed a significant positive correlation with the self-report Monroe scale (with age and education level partialled out). Stroop-1, Stroop-3, and errors on Stroop-3 nevertheless showed similar trends. Although most of the neuropsychological tests did not correlate significantly with the Monroe scale, the most consistent trends in this direction were on the TMT and Stroop. The fact that most of the neuropsychological tests used in the present study showed significant intercorrelations with each other, however, supports the convergent validity of the battery.

A lack of correlation between two self-report impulsivity scales and behavioural measures of dyscontrol was reported by Saunders et al. (1973). They expressed the view that the construct of impulsivity may not imply a unitary character trait, but could possibly be interpreted in several ways. It is therefore conceivable that these two types of measure may tap slightly different dimensions of impulse dyscontrol.

There may, however be several other reasons for the failure of these tests to emerge more strongly as significant discriminators. (1) The mean education level of the subjects may have been too low for some of these tests to yield reliable results, e.g. TMT-B. (2) Although culture-fairness was a major consideration in test selection, this may still have been a confounding factor in this low socio-economic group. (3) A possibility that was also raised by Balis and McDonald (1978), and Monroe (1978) is that the dysregulation of impulses may be a fluctuating phenomenon in some individuals, in which case neuropsychological deficits may only be detectable intermittently. Should this prove to be the case, the Monroe scale would then be the more valid measure of dyscontrol, since it is a measure of trait rather than state.

Interestingly, four of the neuropsychological tests which were well intercorrelated, i.e. TMT-A, TMT-B, Stroop-2, and Stroop-3, significantly discriminated between depressives and non-depressives, with depressives exhibiting a poorer performance. This cannot be readily explained on the basis of e.g. impaired concentration due to a depressive state, as the variable, "depression", represents a tendency to become depressed rather than a current state of depression. Anxiety may have contributed to these differences, as a strong relationship between depression and anxiety has been demonstrated, and the Stroop-3 furthermore significantly differentiated anxious from non-anxious men. Another interesting finding was that subjects with 3 to 5 symptoms from the 5-symptom cluster similarly manifested significantly poor performance on the TMT-A, TMT-B, Stroop-1, and Stroop-3, while high dyscontrol men took significantly longer on Stroop-1, and showed a similar but nonsignificant trend on TMT-A.

These findings lead one to speculate that the Stroop and Trail-making Tests might, in fact, be more sensitive to certain symptoms, or combination of symptoms, or a high number of symptoms from the cluster of features which may hypothetically be interrelated on the basis of

a common biochemical dysfunction. An exciting thought is that these tests might even be found to be sensitive to a particular type of neurochemical disturbance. If these tests prove to be able to discriminate between persons with, for example, low CSF levels of 5-HIAA and persons with normal levels, this finding could have important implications, as such tests would be considerably useful as noninvasive screening measures for possible subsequent confirmation by means of CSF analysis which requires the invasive technique of lumbar puncture.

MMPI Lie Scale

At the subject selection stage a messenger had to be sent to ascertain the education levels of prospective subjects, as this information was usually not on file. It was highly noticeable that dishonesty was by far more prevalent among the non-violent group, as many of them were found to have provided the incorrect level of education. As subjects were to be pair-matched for age and education level, this slowed down the data gathering in this group considerably.

As it was furthermore expected to find a substantial number of psychopaths in a criminal sample and psychopaths are notorious for lying, it was thought that the sincerity of subject responses might be questionable. After explaining the purpose and nature of the study to a prospective subject at the start of the interview, an attempt was made to overcome this problem by (1) emphasising confidentiality; (2) telling the person that unless he is prepared to be entirely homest, he would not be allowed to take part in the study; and (3) getting him to sign a statement to that effect. Apart from about three or four men, everyone approached was willing to participate, and my general impression was one of keen cooperation.

The general trend towards low or normal scores on the MMPI Lie Scale tends to confirm the clinical impression of the investigator that most subjects were honest and open in their responses, probably aided by these introductory precautions. The findings of this study can thus generally probably be regarded as valid.

An interesting finding in relation to the MMPI Lie Scale was the significant trend for greater honesty manifest by the same subgroups for which the Stroop and TMT were good discriminators, i.e. depression, anxiety, and high scorers on dyscontrol and the five-symptom

cluster. Since these features were furthermore significantly characteristic of violent offenders, this finding may support the idea that certain violent men are not just "evil psychopaths", but may have a different kind of underlying problem than non-violent criminals - the latter group seeming to resemble the description of inadequate psychopaths more closely. Monroe (1978) similarly reported a definite negative correlation between his dyscontrol scale and the MMPI Lie Scale.

CLINICAL VARIABLES

Head injuries

The extremely high incidence in this study of reports of previous head injuries, which was significantly higher for the violent offenders (80% vs. 60% for non-violent men), is probably an overestimation of actual brain damage suffered, since objective criteria such as length of loss of consciousness could usually not be established and no formal neurological investigations were done. The fact that this incidence is also relatively high for the non-violent group, can probably be interpreted as an indication that this variable is not necessarily biased towards the violent group, but rather a global overestimation to some extent. Bach-y-Rita and Veno (1974), for instance, also found a high incidence of 61% of head trauma in a group of 62 habitually violent prisoners.

Certain studies of cognitive capacitiy in offenders (e.g. Tarter et al., 1983) excluded violent subjects with previous head injuries from their investigations, but unfortunately they do not report to what proportion of the subject population these exclusions amounted. Most offenders seem to be unaware of the potential impact of a head injury, and the majority never undergo formal neurological, psychiatric or cognitive assessment, with the result that underlying deficits are never revealed (Lewis, Pincus, Feldman, Jackson & Bard, 1986). If, in fact, a large percentage of violent offenders may potentially be functionally compromised on account of prior head trauma, this would be a significant factor which may render these people more vulnerable to aggression dyscontrol. Excluding such persons from investigations would yield a distorted view of the actual picture, since brain damage is often an antecedent of disordered impulse control, and Elliott (1978) furthermore remarked that organic disorders tend to produce a

'partial' psychopath. In an analysis of South African psychiatrists' criteria for predicting dangerousness, organic disorders were among the variables which retrospectively best discriminated between evaluations of forensic patients as dangerous, non-dangerous, or contradictory (Zabow & Cohen, 1993). These authors found that 39% of psychiatrists rated brain damage as an important influence on decisions about dangerousness, while a further 35% rated it as moderately important.

<u>Suicide attempt(s)</u>

The fact that such a large percentage of violent offenders had previously made suicide attempts (28% vs. 6% of non-violent men), strongly supports the hypothesis that aggression dysregulation is often both self- and outwardly directed. Bach-y-Rita et al. (1971) similarly found that 41% of their group of 130 patients complaining of explosive violent behaviour had made suicidal gestures.

<u>Depression</u>

Forty two percent of the total criminal sample acknowledged a tendency to become depressed. Depression was a particularly significant feature of the high dyscontrol group, the anxious men, and the group with a high number of features from the five-symptom cluster. A similar trend which fell just short of significance existed in the violent group and the group of rapists. Although depression was not formally diagnosed in this study and is considered to reflect a trait rather than a state of depression, these findings support previous reports from the literature which have related depression to violent behaviour (Apter et al., 1990, 1993; Maiuro, Cahn, Vitaliano, Wagner, & Zegree, 1988; Van Praag, 1986) and/or criminal acts (Assael, 1984).

According to Assael, some criminal acts or phases of criminal conduct might be "behavioural equivalents" of a depressive state, similar to dipsomania (i.e. alcoholism) and drug addiction, or as a form of masked depression. He feels that affective disorder has not received sufficient attention in criminology because there is a tendency to presume that it is not often found among criminals. These people often do not have subjective symptoms or complaints regarding any mental illness. They are often unwilling to receive treatment and seem to display self depreciation and a desire for punishment. This may lead to self-destructive behaviour, or very often to the sudden, impulsive, and unpremeditated murder of a loved one, someone most similar to the

killer, thereby regarding the murder act as his own killing. Assael says that the criminal behaviour usually occurs without the person being aware that this is an expression of his periodic depressive pathology. In children or adolescents too, it is widely accepted that masked depression and feelings of frustration are often acted out in the form of delinquent behaviour.

These observations are further supported by neurobiological studies which have suggested that a common biological substrate exists in depressive and aggressive disorders (Apter et al., 1990, 1993; Coccaro et al., 1989; Van Praag, 1986).

Interestingly, a local study by Zabow and Cohen (1993) found that none of the psychiatrists rated depression as an extremely important influence on decisions about dangerousness, while 16% rated it as important, 23% as moderately important, 46% as of little importance, and 14% as of no importance. If, in fact, affective disorder in a behaviour disordered population manifests as a masked depression or "depression sine depression" (Assael, 1984), this may contribute to the underestimation of this illness in a criminal population.

Anxiety

Previous reports regarding the hypothesised common biological mechanism in psychopathological dimensions such as aggression dysregulation, impulse dyscontrol, depression and anxiety, remarked that the relationship between anxiety and both outwardly and self-directed aggression has not been widely investigated (Apter et al., 1990; Van Praag et al., 1987). The present study replicated previous findings that anxiety was highly related to both impulse dyscontrol (Maletzky, 1973), and the incidence of previous suicide attempts (Apter et al., 1990, 1991, 1993). In the present study, anxiety was furthermore found to be significantly related to a family history of suicide attempts as well.

Bach-y-Rita and Veno (1974) noted that from a sample of habitually violent criminals, one subgroup which exhibited much self-destructive behaviour such as slashing of the arms, tended to be more anxious, demanding, irritable, depressed and restless than non-self-destructive prisoners. This group was found to be the most impulsive and the most likely to describe intolerable tension states. They were furthermore

found to be more likely to have used a weapon on someone, and as a child to have been cruel to animals, to have set fires resulting in property damage, and to have experienced a spontaneous loss of consciousness (blackout).

In the present study, anxiety was, however, not characteristic of either the violent group in general, murderers or rapists, although it showed a prominent relationship with high dyscontrol, as well as a significant correlation with a high overt violence score and acted out anger. Anxiety was not associated with crime-related variables such as prison classification and age of first imprisonment, and similar to the rapists, the anxious group manifested only isolated significant relationships with aggressive tendencies. This leads one to wonder whether anxiety, in relation to other factors from the five-symptom cluster, might to a certain degree act as a protective factor within this syndrome against outwardly directed violent behaviour, in view of its prominent association with suicidal and self-injurious behaviour.

Bach-y-Rita et al. (1971) found that anxiety was a prominent characteristic of one of their subgroups of violent psychiatric patients who exhibited violent outbursts directed at varied targets, e.g. walls, furniture, people, or self. These subjects occasionally had prodromal symptoms, but no altered state of consciousness was reported, and they did not manifest features of the other three groups, i.e. (1) temporal lobe epilepsy; (2) seizure-like outbursts, usually with loss of contact with reality; and (3) pathological intoxication. These authors reported that by reducing the level of chronic and acute anxiety, they were able to reduce the frequency of violent outbursts in all groups.

In further support of previous studies, are the present findings that anxiety was also significantly associated with depression (Apter et al., 1991, 1993), and a high number of features from the five-symptom cluster (Apter et al., 1990, 1993).

Kahn, Van Praag, Wetzler, Asnis and Barr (1988) reviewed the literature on serotonin disturbances and anxiety. On the basis of evidence presented, they proposed the hypothesis that some anxiety states are characterised by hypersensitive postsynaptic serotonin receptors. Stimulation of this type of receptor system therefore induces anxiety.

They furthermore reasoned that the finding of low cerebrospinal fluid levels of the serotonin metabolite 5-HIAA in e.g. depressed patients with prominent anxiety, are not inconsistent with this theory, but could indicate that serotonin metabolism has been down-regulated in order to compensate for hypersensitivity of the serotonin receptor system. They also discussed alternative theories of increased noradrenaline function or GABA disturbances in relation to anxiety, and proposed that all neurobiological theories of anxiety should be integrated, as these systems are highly interrelated.

Another significant finding with regard to anxiety, is the significant relationship with drug and polydrug abuse. Anxious men were heavy users of cannabis alone, and alcohol, Mandrax and cannabis combined, with similar less notable trends for the use of alcohol with cannabis, and Mandrax smoked with cannabis. The fact that prisoners generally reported that drugs made them feel more relaxed, leads one to wonder whether these anxious men may wittingly, or unwittingly, be using drugs as a form of self-medication.

Headaches, blackouts, and chronic tiredness

Maletzky (1973) reported that 77% of dyscontrol subjects suffered from headaches, and Barton (1975) mentioned that complaints of headaches, blackouts and fatigue are often a feature of psychopathy. Maletzky's results were confirmed by the present finding of a higher incidence of both headaches and blackouts in the violent men and the high dyscontrol group, while the group with a high number of features from the five-symptom cluster manifested all three of the above symptoms. Anxious men reported a greater frequency of headaches and chronic tiredness. The relevance of these findings is uncertain. Although these symptoms may be manifestations of CNS instability or dysfunction, they could also be caused by excessive substance abuse.

High blood pressure

It may be recalled that there was a significant incidence of high blood pressure amongst murderers, and a similar trend ($p < .10$) was manifest in both the violent group and the high dyscontrol men. High blood pressure furthermore correlated with security risk classification and brutal crimes ($p < .05$), and showed a trend to be negatively related to heavy cannabis use ($p < .10$). There was also a weak, positive correlation between high blood pressure and presence of a

high number of features from the five-symptom cluster (p = .182). If blood pressure is regarded as an index of autonomic stability, these findings might be indicative of a dysregulatory disorder.

Although blood pressure was not clinically measured, responses of high blood pressure were verified by investigating the grounds for acknowledging the presence of this condition, as this term is also sometimes used by the Coloured people for non-specific subjective feelings of tension, pressure in the head, or headaches (Gillis et al., 1965). A positive response was only recorded if the subject said that the condition had been medically established or if antihypertensive medication had been prescribed, so there is a high likelihood that these reports were reliable.

Five-symptom cluster

This composite variable showed significant correlations with numerous relevant variables. It may be recalled that the following subgroups had a significantly higher number of features from the five-symptom cluster: violent criminals, murderers, high dyscontrol men, depressives, and anxious men. Other variables showing a positive relationship with this variable were overt violence score, irritability, acted out anger, brutal crimes (trend), bullies, suicide attempts, insomnia (trend), headaches, blackouts, chronic tiredness, nocturnal enuresis in childhood (trend), higher frequency of sexual activity (trend), never married/divorced, family suicide attempts, violent family members, family members with a psychiatric history (trend), family members imprisoned (trend), prison security classification, alcohol use (trend), cannabis use, alcohol plus cannabis use, simultaneous use of alcohol, cannabis and Mandrax, having committed crime or lied in order to get alcohol or drugs, as well as the Stroop and Trail-making Tests. In addition, significant interrelationships were demonstrated between these variables.

These findings lend strong support to the theory that this cluster of psychopathological dimensions (comprising tendencies for impulse dyscontrol, aggression, depression, suicide attempts, and anxiety) are interrelated, most probably on a biological basis, such as a diminished level of the serotonin metabolite 5-HIAA in the CSF, which has been demonstrated to have a relationship with these symptoms in a significant number of previous studies. Although these psychopatho-

logical features may, on the surface, appear to constitute separate syndromes or diagnostic categories, these findings endorse the supposition of several investigators in this field that they may, in fact represent a unitary disorder of regulation as the manifestation of a specific type of biological imbalance (Apter et al., 1990, 1993; Van Praag, 1988; Van Praag et al., 1987). The present data furthermore suggest that these features seem to have an additive effect - the more of these symptoms the person exhibits, the more dysfunctional his behaviour, and the more severe the pathology may be.

In relation to the literature reviewed, particularly with regard to Gray's BIS/BAS theory and related findings, it seems very likely that these psychopathological dimensions are the overt indications of a dysfunctional behavioural inhibition system (BIS). As this system is just as reliant for optimal functioning upon various neurochemicals as upon the neural structures of which it consists - and in view of the fact that earlier theories of structural pathology have not been able to explain a phenomenon such as psychopathy - it is conceivable that a constitutional variation in neurochemical metabolism towards the extreme end of a continuum may underlie a dysfunctional BIS. The significantly positive findings in terms of family history support the contention that these behavioural disorders may moreover be hereditary.

It would be interesting to test this hypothesis of a neurochemical imbalance as underlying cause of a deficient BIS, by means of operant conditioning studies on, for example, psychopaths found to have a deficient metabolism of some biochemical(s), while manipulating the metabolism of such neurotransmitter(s) by means of pharmacological agents. Should it prove to be possible to change the typical passive avoidance deficits and/or electrodermal responses characteristic of a deficient BIS, by means of pharmacological manipulation, and if learning or conditioning can be acquired in this way and can be sustained, this theory may have significant implications for the treatment of behaviour disordered people in future.

In conclusion, my overall impression is that violent criminals do not seem to be a homogeneous group. The high dyscontrol group and the five-symptom cluster group, however, seem to exhibit a degree of intergroup homogeneity. As head injuries were not significantly

related to the five-symptom cluster group, it is possible that some head injured subjects may have pathology of a different nature, thus constituting a separate subgroup. Rapists, furthermore seem to comprise another distinct subset of violent offenders.

All the above speculations are nevertheless purely theoretical, and do not imply that any causal inference has been made on the basis of this study.

SUMMARY OF FINDINGS

The most important results revealed by this study are the following:

- The numerous relevant significant relationships with and interrelationships between the cluster of five variables - comprising tendencies for impulse dyscontrol, aggression dysregulation, depression, suicide attempts, and anxiety - support the hypothesis expressed in several studies from the literature, that a common underlying biological disorder may exist in these psychopatholog-ical dimensions, since the same neurochemical disturbance (i.e. a reduced CSF level of the serotonin metabolite 5-HIAA), has consistently been reported in all these conditions in previous literature.

- The Monroe Dyscontrol Scale was a significant discriminator between the violent and non-violent groups, indicating that impulse dyscontrol is a prominent feature of violent offenders. Notably high scores were also exhibited by murderers, the groups reporting depression and anxiety, and the group with a high number of features from the cluster of five symptoms.

- In relation to rapists and sexual offenders, a prominent finding was a high frequency of Mandrax abuse in the form of a "white pipe" (i.e. smoked with cannabis), both on its own and in combination with alcohol. They were furthermore heavy users of cannabis alone and of alcohol and cannabis together.

- History of previous head injury was a significant discriminator for the violent group, the high dyscontrol group, and depressives, with

80 percent of the violent subjects and 62 percent of the non-violent group reporting previous head injuries.

- Depression was reported by 50 percent of the violent subjects and by 34 percent of the non-violent group, while forty two percent of the violent group have made suicide attempts, versus six percent of the non-violent group. The Monroe Dyscontrol Scale significantly discriminated depressive from non-depressive subjects, with depressives gaining higher scores on dyscontrol.

- Suicide attempts were a prominent feature of violent offenders, the high dyscontrol group, depressives, the group reporting anxiety, and the group with a high number of features from the cluster of five symptoms. Other clinical symptoms frequently occurring within the various subgroups in various combinations, were headaches, blackouts, and chronic fatigue, while high blood pressure was primarily a feature of murderers.

- A significant family history of suicide attempts was found for the groups reporting depression and anxiety, as well as for the group with a high number of features from the cluster of five symptoms. A prominent incidence of violent family members was revealed for violent offenders, murderers, high dyscontrol men, depressives, and the group with a high number of features from the cluster of five symptoms. A significant number of previously imprisoned family members was characteristic of violent offenders, rapists, the high dyscontrol group, and the group reporting depression.

- The most significant findings on the neuropsychological tests occurred within the group with a high number of features from the cluster of five symptoms, and the depressive group in terms of the Stroop and the Trail-making Test for both groups.

- Substance use in various combinations was a prominent feature among rapists, high dyscontrol men, depressives, the group reporting anxiety, and the group with a high number of features from the cluster of five symptoms.

- Prisoners' opinions of the causes of crime most frequently implicated alcohol abuse and Mandrax abuse.

SUGGESTIONS FOR MANAGEMENT AND TREATMENT OF VIOLENT OFFENDERS

Violence can potentially be a source of so much human suffering that interpersonal violence should be regarded as a public health problem. The non-judgmental attitude and empathy of Lion (1975), one of the pioneers in the field of violence, is exemplary for all professionals concerned with the problem of violent behaviour. He commented that large numbers of severely recidivist violent offenders in prisons all over the world who have committed violent acts over and over again, are considered to be refractory to help, and are generally perceived as "bad" or "evil", especially if they show no remorse. But, he says,

> many criminals have never had a chance at help. Of course many, if not most, have never really been evaluated, and many do, when you sit down with them, complain of their violence and perceive it to be dystonic. Some have exceedingly poor impulse control over violent urges. Some fit the classification of Explosive Personalities where one wonders whether brain dysfunction might not play some role in the genesis of their behavior. (Lion, 1975, p.74)

My interviews with prisoners during the present study tended to endorse this opinion expressed by Lion. It was indeed my impression that many of these men do not want to continue their violent, criminal careers and would welcome confidential counselling and an opportunity to get help. During the interviews many of them gained insight into possible sources of their problem, e.g. alcohol and/or drug abuse, and some men begged me to make arrangements for them to get help, especially with Mandrax addiction. Although prisons employ psychologists, social workers and religious workers, subjects seemed to find me more approachable as an outsider who had promised them confidentiality, as they do not seem to deem it possible to approach Correctional Services staff for help for fear of further punishment for an illegal activity.

While extracting their histories of past head injuries, others, again, linked that to when things started to go wrong for them. One man, for instance, after asking me why I would want to know about head injuries, said that he never thought that a head injury might have such an effect, but that he could now see that that was when the trouble started. Previously he could never understand why he was committing such seemingly senseless violence. For example, as soon as

he got home on the very day that he was previously released from prison, he approached someone in the neighbourhood and without reason, just attacked the man and stabbed him with a knife.

There is merit in the suggestion of Mark and Ervin (1970) that even if one can just learn to identify those people within our society who have a low threshold for impulsive violence because of some form of brain dysfunction, we will have taken a step towards treating these individuals, and even more important from the public point of view, towards preventing their violent behaviour. On a limited budget it would thus make sense if one could identify at an early stage the relatively small group of high risk offenders who are responsible for committing the majority of serious violent crimes. As much as possible of the scarce resources available could then be focused on intensive treatment of this high risk group.

Various assessment and treatment options from a multidisciplinary framework could be explored and combined. For example, someone found to have a biological vulnerability, may, subsequent to or in the course of receiving pharmacological treatment and/or nutritional supplementation, become amenable to alcohol and drug rehabilitation, social and vocational skills training, cognitive therapy, family therapy, etc. A step in this direction has recently been made with the development of a psychobiological model of temperament and character based upon a synthesis of information from genetic studies, studies of longitudinal development, psychometric investigation of personality structure, as well as neuropharmacologic and neuroanatomical studies of behavioural conditioning and learning (Cloninger, 1987a, 1987b; Cloninger, Svrakic, & Przybeck, 1993).

This model consists of four dimensions of temperament, i.e. novelty seeking, harm avoidance, reward dependence, and persistence, as well as three dimensions of character, i.e. self-directedness, cooperativeness, and self-transcendence. The four temperament factors were found to have an independent heritability of between 50% and 65% (Cloninger et al., 1993), and are thought to reflect variation in the brain's neurochemical "incentive" or behavioural activation system, the "punishment" or behavioural inhibition system, and the behavioural maintenance system. Each of these systems seems to have a particular biogenetic stimulus-response tendency which varies from person to

person. Functional interactions between these systems therefore produce integrated patterns of characteristic responses to punishment, reward, and novelty, thereby differentially influencing learning and social conditioning (Cloninger, 1987a).

The distinction in this model between temperament and character is furthermore regarded to be helpful in treatment strategies. Whereas temperament dimensions may be amenable to psychopharmacological and behavioural treatment, character traits are not. On the other hand, dimensions of character but not temperament, are amenable to treatment by means of cognitive, existential and psychodynamic psychotherapy (Svrakic, Whitehead, Przybeck, & Cloninger, 1993). It is therefore likely that the most effective approach to personality change would be a combination of cognitive-behavioural treatments and, possibly only in the initial period, medications to change individual discrepancies in temperament (Cloninger et al., 1993).

Hopefully this report will stimulate investigation of alternative avenues for a more intensive, empathic, multidimensional approach to the assessment and treatment of perpetrators of violence. In habitual offenders incarceration obviously does not serve its purpose of modifying behaviour by means of punishment. They spend their lives in prison - at enormous cost to taxpayers - yet their life pattern is not changed. In order to devise more appropriate treatment strategies, empathic professionals need to identify potential risk factors in habitual offenders, such as:

- Alcohol or drug addiction.
- Underlying depression or anxiety disorder.
- Abnormal neurochemistry or -physiology which might manifest as a functional disorder of impulse control. This may be intrinsic or as a result of e.g. head injury, deprivation of oxygen, infective illness, birth trauma, etc.

It must furthermore be determined whether alternative treatment aimed at each person's individual underlying problem, will have a more positive effect than punishment. It may be an idealistic thought, but with the aid of medical treatment, taking into account the continuum of disorders of varying severity, some violent criminals may later be placed out under correctional supervision and eventually become able to function within the wider society - just as the advent of anti-

psychotic medication made it possible for some individuals who were formerly confined to mental hospitals, to function in the community. Alternative treatment facilities and holding institutions would hopefully promote destigmatisation of offenders who have an organically based inhibitory dysfunction which results in an inability to control violent tendencies - at present, the two available labels, i.e. "bad" or "mad" are equally unacceptable. In the eyes of the general public the "bad" ones deserve punishment by incarceration, while the "mad" ones must be committed to an asylum - possibly for life.

Alcohol and drug rehabilitation

Based not only on present findings but also on previous studies, it is clear that there is a substantial relationship between alcohol/drug abuse and crime. Although Correctional Services social workers regularly run structured alcohol and drug programmes comprising counselling and therapy, there are no facilities nor funds to create the necessary infrastructure, for example, to isolate a certain section in the prison so that inmates would not be able to get access to drugs, as it is common knowledge that drugs find their way into prisons on a fairly large scale (at some prisons more than at others). Whereas, I believe, some prisons in Johannesburg offer programmes which include monitoring of drug levels in urine, no such treatment facilities are available at Pollsmoor or Brandvlei prisons. When making enquiries on behalf of prisoners who had requested me to help them with their problem of drug addiction, I was told that the only resource for medical assistance with drug withdrawal is at Lentegeur Hospital, and for obvious reasons (i.e. lack of security) Correctional Services are reluctant to make use of this facility while someone is still serving a sentence. However, there should be a better chance of getting a person motivated to seek and comply with treatment while he is still imprisoned. It therefore seems advisable that more comprehensive facilities for drug counselling, withdrawal, and rehabilitation be instituted within a greater number of prisons. Research could also be undertaken to evaluate the efficiency of existing addiction programmes and to identify shortcomings in the existing treatment facilities.

Laurie (1978) expressed the opinion that coercion seems widely underestimated as a treatment tool for addiction. He found that delinquent addicts seem to have experienced too little consistent concern from an authority figure rather than too much or the wrong kind - the

addict needs to have a prolonged therapeutic relationship with someone who really cares.

It would also be important that drug rehabilitation facilities be available in all penal institutions, as prisoners very often do not want to be transferred to other prisons for various reasons (often because they want to be in the vicinity of their family, or sometimes exactly because drugs are readily available at the current penal institution!), and in some individuals with only a tenuous or ambivalent motivation to get help, having to go away for drug treatment may not weigh up to the desire to stay close to loved ones. Within the wider community too, facilities for drug and alcohol rehabilitation should be extended and widely publicised.

Further assistance after the initial motivation and withdrawal phase is mandatory and must be available both inside and outside prisons. Expecting an addict to stay away from substances after withdrawal, is "like telling a man afflicted with infantile paralysis to run a hundred yards" (Trocchi, 1963, quoted in Laurie, 1978, p. 143).

Assessing the effectiveness of drug rehabilitation programs, Laurie noted that in a study by Vaillant (1966) it was found that the most successful treatment turned out to be imprisonment of more than eight months followed by more than a year's parole (i.e. involuntary supervision) - the probability that significant abstinence would occur under these conditions was fifteen times greater than after voluntary hospitalisation. Imprisonment without parole, however, was scarcely more effective than voluntary treatment, and longer exposure to therapy yielded longer abstinence than brief participation in therapy.

In the long term, it is likely that substance abuse rehabilitation efforts would prove to be cost-effective, especially if biological vulnerabilities to addiction could additionally be alleviated on a pharmacological basis, particularly in the initial treatment phase. The possibility now exists that such vulnerability may even be detected at an early stage as it has been found that blood platelets from persons with a positive family history of alcoholism have a lower content of adenylyl cyclase even when they are not actively drinking (Samson & Harris, 1992). Such a marker may prove to be a useful adjunct in designing treatment or prevention strategies for offenders.

LIMITATIONS OF THE STUDY

As mentioned earlier, the large number of correlational analyses increases the risk that some significant findings may be due to chance.

A possible criticism of the study is that the experimenter was not blind to whether subjects were violent or non-violent offenders. While avoiding this would have improved the research design, it was unavoidable under the circumstances of having been a single-handed project.

While it would have been desirable to employ a wider range of measures of impulse dyscontrol in an exploratory study, practical considerations, such as the length of testing sessions, attention span of subjects, availability of testing material and suitability to the population, made this impossible.

The original aim was to include a normal control group with no criminal offences. Several instances and companies were approached, but only one company was willing to let employees participate in the study, and unfortunately their education level was too high. Objections raised included, for example: the study was considered to be "of a very sensitive nature and could lead to staff and union reaction"; logistical problems were anticipated in locating labourers at different sites; and inability to take employees off the production line on account of being short staffed due to the economic recession. Furthermore, research funding had run out, as the project took much longer to complete than anticipated.

It would have been desirable to interview mothers or other caretaker figures of the subjects in order to obtain information about complications with pregnancy or birth, problems or illnesses in childhood, history of dyscontrolled behaviour, family history, etc. Due to various reasons, this was not possible in the present study, although consent was obtained from almost everyone that I could do so. Should it be deemed worth while to make further funding available for research in this area, these interviews could still be undertaken in future.

RECOMMENDATIONS FOR FUTURE RESEARCH

It is recommended that the present investigation be extended to a non-criminal control group as originally intended, as variables that did not differ significantly between violent and non-violent prisoner groups, may, in fact, show a meaningful difference between a criminal and a non-criminal population. Such a follow-up study could, in addition, aim to identify protective factors which may be incorporated into prevention or treatment programs.

Publication of the results of this study could stimulate more comprehensive research of a multidisciplinary nature on the role of impulse control disorder in violence - for example, controlled neuropsychological assessment, studies investigating neurochemical imbalances, electrophysiological measures such as electrodermal responses, possible genetic factors, various clinical factors, response to pharmacological treatment, role of alcohol and drug abuse, unemployment, etc. Studies of this nature would hopefully, also be extended to the area of family violence.

The present study could have practical implications with regard to the latest policy of the Department of Correctional Services concerning deinstitutionalisation of offenders. Reliable predictive methods which could accurately identify potentially violent and dangerous recidivists are necessary in order to implement this policy successfully. Results of this study confirmed that the actuarial classification system which is currently used in the prisons is very successful in distinguishing habitual violent from non-violent offenders. This system, however, is based exclusively on history of past and present convictions and is applied specifically for the purpose of assigning the prisoner to either a medium or maximum security institution.

The importance of this discriminating ability is not denied, but if additional screening measures could detect risk factors at a more individual level (which would most likely present as distinctive symptom clusters or syndromes), more effective identification of a potential for habitual violence may be achieved at an earlier stage in the development of a criminal career. The construction of a set of criteria which would successfully predict dangerousness has long been an elusive ideal and the subject of much controversy. However, keeping

an innovative and open mind in this regard is more likely to lead towards success in the evolvement of such a measure than an attitude of cynicism, especially in view of the rapid advances being made in the neurosciences with the aid of modern technology.

Hopefully, this study would provoke investigation of alternative interdisciplinary prevention and treatment approaches specifically addressing individual deficiencies (for example, cognitive, behavioural, pharmacological, and socio-economical strategies). Should there be indications of possible organic involvement, further investigation can be undertaken by more sophisticated methods, for example biochemical assays, EEG, or other electrophysiological measures which could assist in devising a treatment regime. Monroe (1978) expressed the opinion that should pharmacological treatment prove to be effective in even a small subgroup of violent offenders, this could become a significant alternative or supplementary treatment to incarceration. As considerable progress has been made in the neurosciences since 1978, and numerous reports of successful pharmacological treatment of violent tendencies have been published, it is not impossible that Monroe's idea could become a reality.

The multicultural nature of the South African population merits cross-cultural investigations in the area of violence. As this study consisted only of subjects from the so-called "coloured" population, further studies may uncover different patterns of risk factors in relation to violent or criminal behaviour in different cultural groups or different geographical areas.

Research is furthermore urgently needed into ways of curbing and treating the problems of alcohol and Mandrax abuse and the associated gang violence especially in the Cape Peninsula.

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APPENDIX A - TABLES

Table 30 T-TESTS: SIGNIFICANT DIFFERENCES AND TRENDS

Table 31 SIGNIFICANT CORRELATIONS AND TRENDS (PARTIAL FOR AGE AND STANDARD)

Table 32 CHI-SQUARE RELATIONSHIPS: DYSCONTROL AND AGGRESSIVE TENDENCIES

Table 33 CHI-SQUARE RELATIONSHIPS: CLINICAL VARIABLES

Table 34 CHI-SQUARE RELATIONSHIPS: FAMILY HISTORY

T-TESTS - SIGNIFICANT DIFFERENCES BETWEEN MEANS ON BINARY CATEGORIES

BINARY CATEGORIES		n Yes/ High	n No/ Low	Classif- ication	Head Injuries	DAC (diff.)	DAL (diff.)	Stroop-2	Stroop-3	TMT-A	TMT-B	IES Impulse	IES Ego	IES Superego	WCST Cat.Achd	WCST Persev'n	Monroe Dyscntrl	Monroe Overt Vio	Ravens IQ	QT-IQ	GAST Errors	Age 1st Imprisnt	Tot.no.of Crimes	No.of Vio Crimes	No. of Murders	No.of Sex Crimes	Frq Sex i/course	Alcohol Use	Cannabis Use	Alc+Can Use	Mandrax +Cannabis	Alc + Mx +Can Use
VIOLENT GROUP (yes/no)	T	50	50	0.0000	0.0102 MP (.05					0.0300 MP (.05				(0.0618)			0.0014 MP (.075	0.0000				-0.0026	(0.0809)							MP(.05	(-0.0962) MP(~.05	
CLASSIFICATION Max. security?	T	50	50	(0.0558)			0.0308			0.0420			-0.0354	0.0220		(0.0541)	0.0061	0.0000				-0.0018	0.0014	0.0001	0.0000	0.0005		(0.1112)		(0.1958)	(-0.1167)	
HEAD INJURIES (yes/no)	T	70	30	(0.0897)						0.0326	0.0144			0.0177							0.0451			(0.0589)			0.0099					
	V	40	10				0.0232			(0.0503)	0.0272														(-0.0994)		0.0182					
	NV	30	20											(0.0785)							(0.0972)			---	---	---			-0.0450		(-0.0767)	
TOTAL NUMBER OF CRIMES * (high/low)	T	50	50	0.0006								-0.0058	0.0204							0.0104		-0.0000	---	---			0.0370					
	V	27	23	0.0039								-0.0028	(0.0962)							0.0047		-0.0001	---	---			(0.1383)					
	NV	23	27	0.0003						(-0.0798)			(0.0823)	(-0.0732)								-0.0147	---	---	---	---	(0.1445)					
HIGH NUMBER OF VIOLENT CRIMES (yes/no)	T	24	76	0.0001								-0.0031					(0.2705)	0.0008		0.0020		-0.0001	0.0000	0.0005	0.0055	0.0016	(0.1950)	-0.0460	(0.8179)	(-0.6517)	-0.0110	(-0.5005)
	V	24	26	0.0023								-0.0129								0.0060		-0.0046	0.0000	0.0001		(0.0679)		-0.0090	(0.4903)	(-0.1780)	(-0.2293)	(-0.4560)
	NV	0	0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MURDERERS AND ATTEMPTERS (yes/no)	T	30	70	0.0000													0.0158	0.0007				(-0.0679)		0.0000	—			(0.3800)	(-0.2989)	(0.5372)	(-0.0530)	(-0.4489)
	V	30	20	0.0001								(0.0540)													—	-0.0125		(0.9152)	(-0.3560)	(-0.6170)	(-0.1915)	(-0.2256)
	NV	0	0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
RAPISTS AND SEX OFFENDERS (yes/no)	T	22	78	0.0001								(-0.0894)			0.0399		(0.6037)	(0.2246)	0.0367			-0.0309	0.0303	0.0000		—		(0.7728)	0.0118	(0.0898)	(0.1954)	(0.4145)
	V	22	28												0.0126		(-0.1502)	(-0.0778)	0.0098						-0.0267	—		(-0.7459)	0.0007	(0.1965)	0.0035	(0.1828)
	NV	0	0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FREQ'CY SEXUAL INTERCOURSE/mth (high/low)	T	38	62	(0.1285)	0.0428																		0.0127				---					
	V	18	32	0.0105														0.0367					(0.0523)	0.0213			---					
	NV	20	30	(0.1125)	(0.0550)																		(0.0671)	---	---	---	---					(-0.0711)
ALCOHOL USE (high vs. low/no)	T	50	50							0.0180							0.0105	0.0256				0.0089										
	V	29	21														(0.0560)					0.0043										
	NV	21	29							(0.0846)												0.0279		---	---	---						
CANNABIS USE (high vs. low/no)	T	50	50				(0.0659)										0.0419	0.0223	0.0463		(-0.0855)				(-0.0535)							
	V	24	26																						-0.0370							
	NV	26	24				0.0278										0.0284	0.0079			-0.0320			---	---	---						
ALC + CAN. USE (high vs. low/no)	T	50	50				0.0297	(.0603)	(0.0713)								0.0355	(0.0872)														
	V	26	24				0.0460																									
	NV	24	26										(-0.0986)	.0298			0.0197	(0.0749)						---	---	---						
MX + CAN. USE (high vs. low/no)	T	50	50																(0.0535)						(-0.0529)							
	V	23	27																(0.0586)					(0.0564)	(-0.0735)	0.0410						
	NV	27	23		-0.0059		0.0170											(0.0655)			(-0.0922)			---	---	---						
ALC + MANDRAX + CANNABIS USE (yes/no)	T	27	73														0.0006	(0.0519)							(-0.0713)	0.0466						
	V	14	36														0.0165								-0.0839	0.0359						
	NV	13	37														0.0025	0.0229		(-0.0538)				---	---	---						
BULLY AS CHILD; HURT KIDS/ANIM. (yes/no)	T	27	73	0.0089			0.0433										0.0000	0.0000			(-0.0761)			0.0060								
	V	20	30		(0.0965)												0.0019	0.0031														
	NV	7	43														(0.0603)	0.0185						---	---	---						

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T-TESTS - SIGNIFICANT DIFFERENCES BETWEEN MEANS ON BINARY CATEGORIES

BINARY CATEGORIES		Yes/ High (N)	No/ Low (N)	Classif- ication	Head Injuries	DAC (diff.)	DAL (diff.)	Stroop-2	Stroop-3	TMT-A	TMT-B	IES Impulse	IES Ego	IES Superego	WCST Cat.Achd	WCST Persev'n	Monroe Dyscntrl	Monroe Overt Vio	Ravens IQ	DT-IQ	GAST Errors	Age 1st Imprismt	Tot.no.of Crimes	No.of Vio Crimes	No. of Murders	No.of Sex Crimes	Frq Sex i/course	Alcohol Use	Cannabis Use	Alc+Can Use	Mandrax +Cannabis	Alc + Mx +Can Use
IRRITABLE	T	52	48	0.0228	(0.0567)					0.0183	0.0125		-0.0148	0.0335		(0.1944)	0.0013	0.0000				(-0.0967)		0.0006					(0.0827)			(0.0836)
(yes/no)	V	33	17		0.0229								(-0.0757)			(0.1094)	0.0498	0.0014						(0.0521)			0.0196			0.0117		
	NV	19	31			(-0.0585)					0.0378							(0.0874)						---	---	---		-0.0452				
EVER BECOME	T	67	33	0.0020			(0.0933)										0.0023	0.0000				(-0.0780)	0.0047	0.0001		(0.1234)			0.0058	0.0089	0.0163	0.0045
AGGRESSIVE?	V	42	8		0.0054													0.0067		(0.0679)			0.0414	0.0361			0.0010		(0.1419)			
(yes/no)	NV	25	25														(0.0789)	0.0023						---	---	---			0.0051	0.0287	0.0022	0.0349
GETS CROSS	T	80	20	0.0023		-0.0489				0.0153	0.0001				-0.0443	0.0149	0.0000	0.0000						0.0001	0.0011				(0.0968)	0.0218		0.0094
QUICKLY	V	46	4								0.0001						0.0014	0.0002												0.0001		
(yes/no)	NV	34	16			-0.0096					0.0032	(0.0733)	(-0.0804)		-0.0322	0.0047	0.0004	0.0057						---	---	---						0.0322
HAS AGGRESSIVE	T	66	34	0.0087										(0.0669)			0.0000	0.0000			(-0.0950)			0.0016	0.0064				0.0265	0.0012	0.0318	0.0170
NATURE	V	41	9		0.0126												0.0020	0.0001		(0.0731)							(0.0571)			0.0076		
(yes/no)	NV	25	25		(0.0576)		0.0228							(0.0764)	-0.0076	0.0354	0.0009	0.0032						---	---	---			0.0083	(0.0672)	0.0011	0.0349
BLACKOUT(S)	T	35	65		0.0212												0.0020	0.0009														(0.0984)
(yes/no)	V	23	27															0.0046													(0.0522)	0.0380
	NV	12	38					(0.0998)									0.0178							---	---	---						
HYPERTENSION	T	14	86	0.0433		(0.0504)																			0.0471					(-0.0935)		
(HI BLOOD PRES)	V	10	40			(0.0734)						-0.0147													(0.0799)							
(yes/no)	NV	4	46																					---	---	---					-0.0006	
BAD HEADACHES	T	50	50														0.0027	(0.0551)					-0.0194									0.0023
(yes/no)	V	30	20																			0.0278	-0.0011								0.0138	0.0255
	NV	20	30																-0.0455	(-0.0546)				---	---	---						0.0457
DEPRESSION	T	42	58	(0.0558)				0.0391	0.0256	0.0087	0.0071						0.0000	0.0094	(-0.0792)			(-0.0573)				(0.0662)	0.0303			0.0264		0.0105
(yes/no)	V	25	25					(0.0878)	(0.0663)	0.0241	0.0119						0.0002										0.0298	0.0198	(0.0841)	0.0131	(0.0792)	0.0097
	NV	11	33												(0.0871)		0.0261					-0.0007	(0.0474)	---	---	---						
SUICIDE ATTEMPT	T	17	83	(0.0950)	0.0298												0.0003	0.0019						0.0169								
(yes/no)	V	14	36														0.0193															
	NV	3	47												0.0466		(0.0818)							---	---	---						
CHRONIC	T	38	62		(-0.0900)												(0.0820)												0.0051		0.0003	0.0097
TIREDNESS	V	16	34	(0.0983)																											0.0401	(0.1117)
(yes/no)	NV	22	28														0.0225							---	---	---			0.0290		0.0015	0.0307
ALLERGY	T	23	77					(0.0934)	(0.0707)				(-0.0986)	0.028										(-0.0941)				0.0399	(0.0684)	(0.0712)	(0.0803)	(0.3576)
(yes/no)	V	11	39						(0.0768)				-0.0199								0.0484							(0.0535)	(0.1078)	(0.0835)	(0.0886)	(0.0644)
	NV	12	38																					---	---	---						

MP = Probability > t on t-test for correlated samples (Matched Pairs) (Robson, 1973, pp. 78-79).

Note: A minus sign (i.e. a negative figure) is used to indicate the direction of the difference between means, in order to keep the table as simple as possible. The 'yes/high' group of the variable left, serves as an index, and the minus sign indicates that the mean of the non-index group is higher in relation to the variable at the top. For example: p = -.0031 for subjects from the total group (T) with a HIGH number of violent crimes, gained a LOWER score on the IES-I.

Note: Some non-significant figures are included in brackets in order to complete a pattern or to illustrate trends.

SIGNIFICANT PEARSON PARTIAL CORRELATION COEFFICIENTS / PROB > |R| UNDER H0: PARTIAL RHO=0 (AGE & STD) (N=100)

	No of Head Injuries	DAC (diff)	DAL (diff)	Stroop-1	Stroop-2	Stroop-3	Stroop-3 errors	TMT-A	TMT-B	IES Impulse	IES Ego	IES Superego	WCST Persev'n	WCST Cat.Achd	GAST errors	MMPI-Lie Scale	Monroe Dyscntrl	Monroe Overt Vio	Ravens IQ	GT-IQ	Average IQ	Age 1st imprismnt	Tot.no.of crimes	No.ofVio crimes	No. of Murders	Alcohol use	Cannabis use	Alc+Can use	Mandrax+ Cannabis
DAC (diff.)	0.27013 0.0071																												
DAL (diff.)	(0.18773 0.0642)	0.61030 0.0001																											
Stroop-1																													
Stroop-2				0.67602 0.0001																									
Stroop-3				0.44558 0.0001	0.69798 0.0001																								
Stroop-3 errors				0.23685 0.0189	0.25129 0.0126	0.42023 0.0001																							
TMT-A			0.20338 0.0446	0.28325 0.0047	0.30354 0.0024	0.23160 0.0218																							
TMT-B		(-0.18124 0.0741)		0.40970 0.0001	0.44134 0.0001	0.39270 0.0001	(0.18441 0.0691)	0.37714 0.0001																					
IES Impulse							0.27627 0.0059	(0.18577 0.0670)	0.27805 0.0056																				
IES Ego							-0.26431 0.0085	-0.22747 0.0243	-0.25293 0.0120	-0.63262 0.0001																			
IES Superego							(0.17616 0.0827)	(0.17886 0.0780)			-0.79256 0.0001																		
WCST Persev'n				(0.19273 0.0573)					0.26527 0.0083	0.35803 0.0003	-0.32590 0.0011	(0.17746 0.0805)																	
WCST Catg.Achd				-0.24316 0.0158	-0.22927 0.0232				-0.30088 0.0026	-0.31265 0.0017	0.30903 0.0020	-0.20857 0.0393	-0.74607 0.0001																
GAST errors							0.21322 0.0350					(0.18053 0.0753)																	
MMPI-Lie Scale										0.22278 0.0275				-0.21224 0.0359															
Monroe Dyscontrl				(0.19650 0.0525)			(0.18829 0.0634)	0.22077 0.0289								-0.49568 0.0001													
Monroe Overt Vio			0.20462 0.0433													-0.51605 0.0001	0.79541 0.0001												
Ravens IQ				(-0.19291 0.0570)	-0.27338 0.0065	-0.19947 0.0489	(-0.18796 0.0638)	-0.27999 0.0052	-0.44840 0.0001	-0.29173 0.0036	0.43556 0.0001	-0.28634 0.0043	-0.35491 0.0003	0.33059 0.0009	-0.22892 0.0234		(-0.17256 0.0893)												

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Table 31 SIGNIFICANT CORRELATIONS AND TRENDS (PARTIAL FOR AGE & STD)

SIGNIFICANT PEARSON PARTIAL CORRELATION COEFFICIENTS / PROB) :R: UNDER HO: PARTIAL RHO=0 (AGE & STD) (N=100)

	No of Head Injuries	DAC (diff)	DAL (diff)	Stroop-1	Stroop-2	Stroop-3	Stroop-3 errors	TMT-A	TMT-B	IES Impulse	IES Ego	IES Superego	WCST Persev'n	WCST Cat.Achd	GAST errors	MMPI-Lie Scale	Monroe Dyscntrl	Monroe Overt Vio	Ravens IQ	QT-IQ	Average IQ	Age 1st imprisnmnt	Tot.no.of crimes	No.ofVio crimes	No. of Murders	Alcohol use	Cannabis use	Alc+Can use	Mandrax+ Cannabis
QT=IQ				-0.21349 0.0348	-0.22193 0.0281	(-0.18120 0.0742)		-0.23748 0.0185	(-0.17425 0.0862)				-0.23428 0.0202			-0.26161 0.0093			0.20097 0.0472										
Average IQ				-0.25697 0.0106	-0.32210 0.0012	-0.24508 0.0150	(-0.18447 0.0690)	-0.33521 0.0007	-0.42930 0.0001	-0.30712 0.0021	0.39192 0.0001	-0.29827 0.0029	-0.39007 0.0001	0.33795 0.0007	(-0.18630 0.0662)	-0.23221 0.0214			0.85948 0.0001	0.67347 0.0001									
Age 1st imprisnmnt																													
Tot.no.of crimes										-0.29543 0.0031				0.21006 0.0379						(0.18659 0.0658)		-0.58768 0.0001							
No.of Vio crimes	0.25194 0.0123							(0.19058 0.0601)		(-0.19226 0.0579)		0.20473 0.0432					0.23779 0.0184	0.45062 0.0001		0.22661 0.0248		-0.38521 0.0001	0.49046 0.0001						
No. of murders																	0.19865 0.0499	0.31636 0.0015				-0.24074 0.0169		0.47789 0.0001					
No.of sex crimes										-0.21633 0.0324				0.25649 0.0108					0.23207 0.0215	0.20431 0.0436	0.28174 0.0049		0.21108 0.0378	0.44129 0.0001					
Frqcy sex i/course	0.29011 0.0038			0.23778 0.0184																		(-0.17923 0.0774)	0.30576 0.0022	(0.18862 0.0751)					
Alcohol use							0.21916 0.0301	0.19951 0.0489								-0.24395 0.0155	0.27219 0.0067	0.21307 0.0352											
Cannabis use	-0.26138 0.0093														-0.22247 0.0277	-0.22753 0.0242	(0.18758 0.0644)	0.23722 0.0187	0.24553 0.0148		(0.19399 0.0556)					(0.19634 0.0527)			
Alc + Can use																-0.31211 0.0018	0.33422 0.0008	0.32784 0.0010								0.70202 0.0001	0.53860 0.0001		
Mandrax +Cannabis	-0.17125 0.0918			0.20171 0.0464																					-0.20686 0.041		0.66198 0.0001	0.31175 0.0018	
Alc + Mx + Can use				0.22243 0.0277	(0.18809 0.0636)	0.22427 0.0264											0.27691 0.0058	0.22511 0.0258								0.32756 0.0010	0.37338 0.0002	0.49512 0.0001	0.48522 0.0001
When last used Alc							-0.20385 0.0441												(0.17919 0.0775)	0.21720 0.0317	0.24856 0.0136	-0.20813 0.0397			0.31342 0.0017	-0.28303 0.0047		-0.25262 0.0121	
When last used Can		0.20869 0.0392	0.22160 0.0283				-0.19870 0.0498																	0.21020 0.0378	0.21493 0.0336	(-0.18920 0.0621)	-0.20585 0.0420		
When last Alc + Can		0.24933 0.0133	0.23086 0.0222																							-0.20928 0.0386			
When last Mx + Can								(-0.18000 0.0761)							-0.22251 0.0277				(0.19409 0.0555)		0.20382 0.0441			0.28060 0.0051	0.23411 0.0203				
When last Alc+C +Mx																			(0.18901 0.0623)		0.21348 0.0348						0.29574 0.0031		

Note: Some non-significant figures are included in brackets in order to complete a pattern or to illustrate trends.

Table 32 CHI-SQUARE RELATIONSHIPS: DYSCONTROL AND AGGRESSIVE TENDENCIES

CATEGORIES	n		Dyscontrol (Monroe Scale) High/Low	Get Cross Quickly Incl. from Alc/Drugs Yes/No	Get Cross Quickly Only From Alc/Drugs Yes/No	Ever Become Aggressive Yes/No	Irritable Yes/No	Aggressive by Nature Incl. from Alc/Drugs Yes/No	Aggressive Only Under Influence Alc/Drugs Yes/No	Bully as Child Yes/No
GROUP: VIOLENT	50 Vio.	x^2:	6.763	19.360	-4.762	13.071	7.853	12.705	0.041	8.574
/ NON-VIOLENT	50 N-V	p:	.009**	.000***	.029*	.000***	.005**	.000***	.840	.003**
NUMBER OF VIOLENT	24 High	x^2:	1.671	7.895	-1.264	8.690	4.488	9.296	-0.023	3.446
CRIMES: Tot. sample	76 Low	p:	.196	.005**	.261	.003**	.034*	.002**	.880	.063
NUMBER OF VIOLENT	24 High	x^2:	-0.045	0.921	0.020	2.018	0.480	0.946	-0.102	0.053
CRIMES: Violent grp	26 Low	p:	.832	.337	.887	.155	.488	.331	.749	.817
MURDERERS /ATTEMPT-	30 Yes	x^2:	2.609	9.333	-2.041	3.276	3.694	6.994	-0.157	2.032
ERS: Total sample	70 No	p:	.106	.002**	.153	.070	.055	.008**	.692	.154
MURDERERS /ATTEMPT-	30 Yes	x^2:	-0.014	0.181	0.000	-0.893	0.015	-0.203	-0.487	-0.347
ERS: Violent group	20 No	p:	.904	.670	1.000	.345	.903	.652	.485	.556
RAPISTS /SEXUAL OF-	22 Yes	x^2:	0.739	2.098	-0.100	4.783	0.568	1.238	-0.050	0.001
FENDERS: Tot.sample	78 No	p:	.390	.148	.752	.029*	.451	.266	.823	.974
RAPISTS /SEXUAL OF-	22 Yes	x^2:	-0.411	-0.064	1.299	0.163	-0.836	-2.289	-0.152	-2.652
FENDERS: Viol.group	28 No	p:	.522	.801	.254	.686	.361	.130	.696	.103
DYSCONTROL:	51 High	x^2:	---	12.965	-0.017	6.152	6.732	12.403	0.700	10.613
Total sample	49 Low	p:	---	.000***	.896	.013*	.009**	.000***	.403	.001***
DYSCONTROL:	32 High	x^2:	---	7.729	-0.087	2.903	3.209	4.480	-0.002	6.380
Violent group	16 Low	p:	---	.005**	.768	.088	.073	.034*	.962	.012*
DYSCONTROL:	19 High	x^2:	---	3.701	0.693	0.764	1.142	4.160	1.422	1.266
Non-violent group	31 Low	p:	---	.054	.405	.382	.285	.041*	.233	.261
DEPRESSION:	42 Yes	x^2:	18.388	7.482	-0.070	8.737	6.241	0.951	-0.188	0.574
Total sample	58 No	p:	.000***	.006**	.791	.003**	.012*	.329	.664	.449
DEPRESSION:	32 Yes	x^2:	8.681	4.348	0.000	2.381	0.802	0.136	0.000	0.000
Violent group	16 No	p:	.003**	.037*	1.000	.123	.370	.713	1.000	1.000
DEPRESSION:	19 Yes	x^2:	7.797	2.439	0.015	4.367	4.741	0.089	-0.475	0.285
Non-violent group	31 No	p:	.005**	.118	.903	.037*	.029*	.765	.490	.594
NUMBER OF ECONOMIC	37 High	x^2:	-4.405	-1.216	1.825	-0.252	-1.807	-2.745	-0.611	-0.589
CRIMES: Tot. sample	52 Low	p:	.036*	.270	.177	.616	.179	.098	.434	.443
NUMBER OF ECONOMIC	6 High	x^2:	-6.032	-0.804	0.420	1.289	-1.231	0.008	0.118	-0.173
CRIMES: Violent grp	33 Low	p:	.014*	.370	.517	.256	.267	.929	.731	.677
NUMBER OF ECONOMIC	31 High	x^2:	0.017	0.330	0.127	0.764	0.536	-0.085	-1.422	1.943
CRIMES: Non-vio grp	19 Low	p:	.895	.566	.721	.382	.464	.771	.233	.163

Table 33 CHI-SQUARE RELATIONSHIPS: CLINICAL VARIABLES

CATEGORIES	n		Head Injur-ies	Depress-ion	Attempted Suicide	Chronic Tired-ness	High Blood Pressure	Head-aches	Black-out(s)	Epi-lepsy	Allergy	Enu-resis
			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
GROUP: VIOLENT	50 Viol.	x^2:	4.762	2.627	8.575	-1.528	2.990	4.000	5.319	1.895	-0.056	0.071
/ NON-VIOLENT	50 Non-V	p:	.029*	.105	.003**	.216	.084	.046*	.021*	.169	.812	.790
NUMBER OF VIOLENT	24 High	x^2:	0.376	0.190	1.432	-0.292	1.225	0.000	1.629	-1.662	-1.966	-0.002
CRIMES: Tot. sample	76 Low	p:	.540	.663	.231	.589	.268	1.000	.202	.197	.161	.960
NUMBER OF VIOLENT	24 High	x^2:	-0.721	-0.321	-0.206	0.038	0.020	-1.923	-0.001	-4.013	-2.427	-0.056
CRIMES: Violent grp	26 Low	p:	.396	.571	.650	.846	.887	.166	.982	.045*	.119	.814
MURDERERS /ATTEMPT-	30 Yes	x^2:	0.000	1.126	-0.003	-1.164	5.711	1.714	1.308	0.251	0.003	-1.488
ERS: Total sample	70 No	p:	1.000	.289	.954	.281	.017*	.190	.253	.617	.959	.222
MURDERERS /ATTEMPT-	30 Yes	x^2:	-4.688	0.000	-4.778	-0.138	2.083	0.000	-0.215	-0.181	0.078	-3.252
ERS: Violent group	20 No	p:	.030*	1.000	.029*	.710	.149	1.000	.643	.670	.780	.071
RAPISTS /SEXUAL OF-	22 Yes	x^2:	1.876	3.382	0.656	-0.032	-0.003	0.932	0.433	-0.012	-0.001	-0.226
FENDERS: Tot.sample	78 No	p:	.171	.066	.418	.858	.956	.334	.511	.912	.973	.634
RAPISTS /SEXUAL OF-	22 Yes	x^2:	0.081	1.299	-0.542	0.344	-0.994	-0.014	-0.410	-0.637	0.012	-0.507
FENDERS: Viol.group	28 No	p:	.776	.254	.462	.558	.319	.907	.522	.425	.912	.477
DYSCONTROL:	51 High	x^2:	5.353	18.388	8.057	2.226	2.719	9.004	8.992	-0.255	2.416	1.540
Total sample	49 Low	p:	.021*	.000***	.005**	.136	.099	.003**	.003**	.614	.120	.215
DYSCONTROL:	32 High	x^2:	1.063	8.681	3.979	1.236	1.389	8.333	3.760	-0.370	1.943	0.034
Violent group	18 Low	p:	.302	.003**	.046*	.266	.239	.004**	.053	.543	.163	.854
DYSCONTROL:	19 High	x^2:	2.391	7.797	1.113	2.401	0.266	0.693	2.771	-0.625	0.965	2.426
Non-violent group	31 Low	p:	.122	.005**	.291	.121	.606	.405	.096	.429	.326	.119
DEPRESSION:	42 Yes	x^2:	4.136	---	9.991	1.610	0.428	1.478	0.016	0.700	-0.101	1.007
Total sample	58 No	p:	.042*	---	.002**	.204	.513	.224	.899	.403	.751	.316
DEPRESSION:	25 Yes	x^2:	0.500	---	6.349	1.471	0.500	0.000	-0.081	1.087	0.117	0.136
Violent group	25 No	p:	.480	---	.012*	.225	.480	1.000	.777	.297	.733	0.713
DEPRESSION:	17 Yes	x^2:	2.911	---	1.518	0.836	-0.157	1.797	-0.003	-0.526	-0.570	1.086
Non-violent group	33 No	p:	.088	---	.218	.361	.692	.180	.955	.468	.450	0.297
NUMBER OF ECONOMIC	37 High	x^2:	-6.028	0.000	-2.144	-0.004	-2.827	-5.924	-2.495	-0.474	0.414	6.097
CRIMES: Tot. sample	52 Low	p:	.014*	.988	.143	.952	.093	.015*	.114	.491	.520	.014*
NUMBER OF ECONOMIC	6 High	x^2:	-0.009	-0.672	-0.300	-3.152	-1.551	-7.464	-0.469	0.804	-2.127	1.755
CRIMES: Violent grp	33 Low	p:	.925	.412	.584	.076	.213	.006**	.493	.370	.145	.185
NUMBER OF ECONOMIC	31 High	x^2:	-2.391	2.289	0.030	0.045	-0.266	-0.693	-0.09	-1.665	3.050	5.837
CRIMES: Non-vio grp	19 Low	p:	.122	.130	.864	.833	.606	.405	.764	.197	.081	.016*

Table 34 CHI-SQUARE RELATIONSHIPS: FAMILY HISTORY

CATEGORIES		Family Member(s) Attempted Suicide n^a	Yes/No	Family Member(s) Psychiatric History n^a	Yes/No	Family Member(s) Violent / Aggressive n^a	Yes/No	Family Member(s) Imprisoned n^a	Yes/No	Family Member(s) Abused Alcohol n^a	Yes/No	Family Member(s) Abused Drugs n^a	Yes/No
GROUP: VIOLENT	x^2:	14 Vio.	3.324	40 Vio.	1.676	47 Vio.	7.690	48 Vio	7.432	49 Vio	3.199	47 Vio	0.276
/ NON-VIOLENT	p:	26 NonV	.068	49 NonV	.195	48 NonV	**.006****	48 N-V	**.006****	49 NonV	.074	48 NonV	.600
NUMBER OF VIOLENT	x^2:	8 High	5.625	19 High	1.637	22 High	3.901	23 High	8.302	24 High	2.485	23 High	0.461
CRIMES: Tot. sample	p:	32 Low	**.018***	70 Low	.201	73 Low	**.048***	73 Low	**.004****	74 Low	.115	72 Low	.497
NUMBER OF VIOLENT	x^2:	8 High	1.659	19 High	0.422	22 High	0.283	23 High	3.367	24 High	0.670	23 High	0.216
CRIMES: Violent grp	p:	6 Low	.198	21 Low	.516	25 Low	.595	25 Low	.067	25 Low	.413	24 Low	.642
MURDERERS /ATTEMPT-	x^2:	9 Yes	1.290	25 Yes	0.700	29 Yes	4.759	29 Yes	0.289	30 Yes	-0.010	28 Yes	0.093
ERS: Total sample	p:	31 No	.256	64 No	.403	66 No	**.029***	67 No	.591	68 No	.919	67 No	.761
MURDERERS /ATTEMPT-	x^2:	9 Yes	-0.062	25 Yes	-0.007	29 Yes	0.19[illegible]	29 Yes	-3.514	30 Yes	-4.330	28 Yes	-0.003
ERS: Violent group	p:	5 No	.803	15 No	.935	18 No	.658	19 No	.061	19 No	**.037***	19 No	.959
RAPISTS /SEXUAL OF-	x^2:	4 Yes	2.500	15 Yes	1.653	20 Yes	0.229	21 Yes	4.312	22 Yes	0.600	21 Yes	0.063
FENDERS: Tot.sample	p:	36 No	.114	74 No	.119	75 No	.632	75 No	**.038***	76 No	.438	74 No	.802
RAPISTS /SEXUAL OF-	x^2:	4 Yes	0.498	15 Yes	0.541	20 Yes	-1.325	21 Yes	0.705	22 Yes	-0.072	21 Yes	-0.001
FENDERS: Viol.group	p:	10 No	.480	25 No	.462	27 No	.250	27 No	.401	27 No	.789	74 No	.970
DYSCONTROL:	x^2:	17 High	1.637	45 High	0.109	48 High	25.604	48 High	7.432	50 High	1.896	47 High	0.013
Total sample	p:	23 Low	.201	44 Low	.741	47 Low	**.000*****	48 Low	**.006****	48 Low	.169	48 Low	.910
DYSCONTROL:	x^2:	9 High	-0.062	27 High	0.311	31 High	16.787	31 High	6.831	32 High	0.707	30 Hi	-0.574
Violent group	p:	5 Low	.803	13 Low	.577	16 Low	**.000*****	17 Low	**.009****	17 Low	.400	17 Low	.449
DYSCONTROL:	x^2:	8 High	2.052	18 High	-0.355	17 High	5.765	17 High	0.266	18 High	0.271	17 High	0.479
Non-violent group	p:	18 Low	.152	31 Low	.551	31 Low	**.016***	31 Low	.606	31 Low	.603	31 Low	.489
DEPRESSION:	x^2:	10 Yes	7.500	35 Yes	2.035	39 Yes	9.478	40 Yes	7.450	41 Yes	-0.001	39 Yes	3.801
Total sample	p:	30 No	**.006****	54 No	.154	56 No	**.002****	56 No	**.006****	57 No	.979	56 No	.051
DEPRESSION:	x^2:	6 Yes	4.381	18 Yes	0.973	23 Yes	3.845	24 Yes	1.778	25 Yes	0.856	23 Yes	0.216
Violent group	p:	8 No	**.036***	22 No	.324	24 No	**.050***	24 No	.182	24 No	.355	24 No	.642
DEPRESSION:	x^2:	4 Yes	0.839	17 Yes	0.752	16 Yes	3.927	16 Yes	4.174	16 Yes	-1.467	16 Yes	5.050
Non-violent group	p:	22 No	.360	32 No	.386	32 No	**.048***	32 No	**.041***	33 No	.226	32 No	**.025***
NUMBER OF ECONOMIC	x^2:	17 High	-0.033	36 High	-0.601	36 High	-3.893	37 High	0.468	37 Hi	-0.937	37 Hi	-0.258
CRIMES: Tot. sample	p:	20 Low	.855	42 Low	.438	48 Low	**.048***	48 Low	.494	50 Low	.333	47 Low	.612
NUMBER OF ECONOMIC	x^2:	2 High	0.196	5 High	-2.435	5 High	-3.510	6 High	1.386	6 High	0.838	6 Hi	-0.602
CRIMES: Violent grp	p:	9 Low	.658	24 Low	.119	31 Low	.061	31 Low	.239	32 Low	.360	30 Low	.438
NUMBER OF ECONOMIC	x^2:	15 High	0.112	31 High	0.355	31 High	0.041	31 High	0.479	31 Hi	-0.271	31 High	0.266
CRIMES: Non-vio grp	p:	11 Low	.738	18 Low	.551	17 Low	.839	17 Low	.489	18 Low	.603	17 Low	.606

[a] n varies on account of missing data for family history categories, so where n is small, x^2 values may not be accurate

APPENDIX B - QUESTIONNAIRES AND TEST MATERIAL

Clinical/biographical questionnaire

Monroe Dyscontrol Scale

Alcohol and drug questionnaire

Sample page from IES Arrow-dot Test

Examples from Trail-making Test

Quick Test

Graphic Alternating Sequences Test

CLINICAL/BIOGRAPHICAL QUESTIONNAIRE

1. Wie het jou grootgemaak? Eie ma en pa [ ] Ouma [ ]
   Eie ma [ ] Tante [ ]
   Eie pa [ ] Inrigting [ ]
   Ander (sê wie): ....

---

2. Waarmee het jou ouers/voogde geld verdien (werk/beroep)? Pa: ....
   Ma: ....

---

3. Leef jou ma of die persoon wat jou grootgemaak het nog? Ja [ ] Nee [ ]

   Mag ek maar indien nodig met haar/hom gesels oor jou,
   bv. oor jou gedrag/siektes/probleme as kind? Ja [ ] Nee [ ]

   Haar/sy naam en woonadres: .... Verwantskap: ......
   ....
   ....
   Telefoonnommer: ....

---

4. Waar woon jou pa? .... Weet nie [ ]
   .... Oorlede [ ]

---

5. Hoeveel susters het jy? [ ]
   Hoeveel broers het jy? [ ]
   Die hoeveelste kind is jy? Oudste [ ] ....de oudste Jongste [ ]

---

6. Sou jy sê jou tafelmaniere (of jou eetmaniere) is nie heeltemal so goed wanneer jy sommer by die huis is as wanneer jy met iemand (of by iemand) gaan uiteet nie?
   Waar [ ] Onwaar [ ]

---

7. Waarmee het jy op skool probleme gehad? Lees [ ] Konsentrasie [ ]
   Skrif [ ] Onthou (geheue) [ ]
   Het jy ooit gedruip? Ja [ ] Nee [ ] Spelling [ ] Somme [ ]
   Watter standerds? .... Niks [ ] Ander: ....

---

8. Hoe dikwels het jy stokkies gedraai? Nooit [ ] 3 - 8 keer [ ]
   1 of 2 keer [ ] Meer as 8 keer [ ]

---

9. Wat was die hoogste standerd wat jy geslaag het,
   insluitende tronkskool indien van toepassing? ....

---

10. Af en toe dink ek aan dinge wat te afgryslik (of gruwelik of afskuwelik) is om oor te praat.
    Waar [ ] Onwaar [ ]

---

11. Ek voel by tye lus om te vloek. Waar [ ] Onwaar [ ]

---

12. Ek word soms kwaad. Waar [ ] Onwaar [ ]

---

13. Sou jy sê jy is iemand wat geneig is om gou kwaad te word? Ja [ ] Soms [ ]
    Slegs onder invloed van drank of dwelms [ ] Nee [ ]
    Indien "JA", vanaf watter ouderdom is jy geneig om kort van humeur te wees? ....

---

14. Ek praat nie altyd die waarheid nie. Waar [ ] Onwaar [ ]

---

15. Was jy ooit by tye buitengewoon suspisieus of agterdogtig teenoor mense of het jy gevoel asof vreemde mense van jou praat of planne teen jou maak?
    Nooit [ ] 1 of 2 keer [ ] Soms [ ] Dikwels [ ]

---

16. Het jy al so kwaad of aggressief geraak dat jy iemand geslaan, of seergemaak, of dinge gebreek het? Nooit [ ] 1 of 2 keer [ ] Soms [ ] Dikwels [ ]

---

17. Nou en dan stel ek dit wat ek vandag behoort te doen uit tot môre. Waar[ ] Onwaar[ ]

18. Watter ernstige siektes het jy gehad (ook as kind)? ....

19. Het jy enige ernstige kopbeserings gehad? Ja [ ] Nee [ ] Indien "JA", beskryf en sê:
Jaar/oud: ...... Hoe lank bewusteloos: ...... Waar op kop: .... Skedel gebreek? ...... Gevolge: ....

20. Was jy ooit in die hospitaal? Ja [ ] Nee [ ]
Wanneer, waarvoor en hoe lank? ....

21. Met watter van die volgende het jy ooit probleme gehad?

Hoë bloeddruk	[ ]	Hartkwaal	[ ]
Erge hoofpyne	[ ]	Asma	[ ]
Floutes of "blackouts"	[ ]	Allergies vir iets?	[ ] ....
		Epilepsie/"fits"	[ ]
Tering (TB)	[ ]	Altyd moeg	[ ]
Baie swak tande	[ ]	Maagsweer	[ ]

Prikkelbaarheid (word gou kwaad of gou geïrriteerd) [ ]

22. Raak jy meer dikwels as ander mense baie terneergedruk of neerslagtig? Ja[ ] Nee[ ]

23. Partykeer as ek nie lekker voel nie, is ek kwaad. Waar [ ] Onwaar [ ]

24. Het jy al ooit probeer selfmoord pleeg? Ja [ ] Nee [ ]
Hoeveel keer? ..... keer
Op watter manier(e)? ....
Wanneer was dit? .... **Het iemand in jou familie ooit probeer selfmoord pleeg?**

25. Raak jy meer dikwels bekommerd of angstig (worried) as ander mense? Ja [ ] Nee [ ]

26. Raak jy gou en maklik aan die slaap? Ja [ ] Nee [ ] Indien NEE, net in tronk? Ja[ ]

27. Tot op watter ouderdom het jy soms nog 'n bednatmaak ongeluk gekry? .... jaar
Het dit dikwels gebeur? Ja [ ] Nee [ ]

28. Is jy of was jy as kind geneig om ander kinders of diere seer te maak? Ja[ ] Nee[ ]

29. Sou jy sê dat jy in 'n speletjie liewer sou wen as verloor? Ja [ ] Nee [ ]

30. As jy by 'n fliek sou kon inkom sonder om te betaal, en jy kon seker wees dat jy nie gesien sou word nie, sou jy dit moontlik gedoen het? Ja [ ] Nee [ ]

31. Sou jy sê jy was as kind redelik stil van geaardheid, min of meer net so aktief as die meeste ander kinders, of was jy altyd in die moeilikheid by jou ouers of by die skool omdat hulle gesê het dat jy baie meer woelig of aktief of ondeund was as die ander kinders?

Stil/soet	[ ]
Baie ondeund	[ ]
Kon nooit stilsit nie	[ ]
Moeilikheidmaker	[ ]
Niks stouter as ander kinders nie	[ ]

32. Het jy enige werkondervinding gehad toe jy nie in die tronk was nie? Ja[ ] Nee[ ]
Watter werk het jy gedoen en vir hoe lank? <u>Werk</u> <u>Tydperk</u>

Wat was die langste tyd wat jy by een plek gewerk het? ....

33. Sou jy sê dat jy daarvan hou om 'n paar belangrike mense te ken omdat dit jou belangrik laat voel? Ja [ ] Nee [ ]

34. Wat is jou huwelikstaat?

Nooit getroud	[ ]	Getroud	[ ]	Geskei	[ ]
Wewenaar	[ ]	Saamgewoon	[ ]	Vervreem	[ ]

35. Ek hou nie van elkeen wat ek ken nie. Waar [ ] Onwaar [ ]

36. Hoe oud was jy toe jy jou eerste misdaad begaan het? .... jaar

37. Hoe oud was jy toe jy vir die eerste keer in die tronk was? .... jaar

38. Sou jy sê jy is van nature bakleierig of aggressief? Ja [ ] Soms [ ]
Slegs onder invloed van drank of dwelms [ ] Nee [ ]

39. Sou jy sê jy skinder soms 'n bietjie? Ja [ ] Nee [ ]

40. Het jy ooit gelieg, gesteel of die wet oortree om geld in die hande te kry om drank of dwelms te koop? Nooit [ ] 1 of 2 keer [ ] Soms [ ] Dikwels [ ]

41. Help drank/dwelms jou met:

	DRANK	DWELMS
Depressie/teneergedruktheid	[ ]	[ ]
Aanvaarding deur vriende	[ ]	[ ]
Bekommernisse	[ ]	[ ]
Om goed te slaap	[ ]	[ ]
Om argumente te vermy	[ ]	[ ]
Om te ontspan	[ ]	[ ]
Vrees of angsgevoelens	[ ]	[ ]
Ander (sê wat)		

42. Wie van jou familie is ooit behandel vir senuwees (nerves), 'n sielkundige probleem, of deur 'n kopdokter bv. by Valkenberg Hospitaal? (Vul ook in hoeveel broers, ens. daaraan gely het)

	Senuwees	Depressie	Ander Kwaal?	Weet nie
Pa	[ ]	[ ]	....	[ ]
Ma	[ ]	[ ]	....	[ ]
.... Broers	[ ]	[ ]	....	[ ]
.... Susters	[ ]	[ ]	....	[ ]
.... Ooms	[ ]	[ ]	....	[ ]
.... Oupas	[ ]	[ ]	....	[ ]
Ander:	[ ]	[ ]	....	

43. Wie van jou familie is of was:
(Vul ook in hoeveel broers, ens.)

	Baie gewelddadig	Bakleierig/ aggressief	Misdadiger /in tronk	Weet nie
Pa	[ ]	[ ]	[ ]	[ ]
Ma	[ ]	[ ]	[ ]	[ ]
.... Broers	[ ]	[ ]	[ ]	[ ]
.... Susters	[ ]	[ ]	[ ]	[ ]
.... Ooms	[ ]	[ ]	[ ]	[ ]
.... Oupas	[ ]	[ ]	[ ]	[ ]
Ander:	[ ]	[ ]	[ ]	

44. Wie van jou familie het drank of dwelms misbruik?
(Vul ook in hoeveel broers, ens. dit misbruik het)

	Drank	Dwelms (watter?)	Weet nie
Pa	[ ]	....	[ ]
Ma	[ ]	....	[ ]
.... Broers	[ ]	....	[ ]
.... Susters	[ ]	....	[ ]
.... Ooms	[ ]	....	[ ]
.... Oupas	[ ]	....	[ ]
Ander:	[ ]	....	

45. Lag jy nou en dan vir 'n vuil grap? Ja [ ] Nee [ ]

46. Was jy al ooit in 'n boot uit op die see? Ja [ ] Nee [ ]

Het jy al ooit seesiek geraak op 'n boot Ja [ ] Nee [ ]
of naar geword as jy in 'n voertuig ry (karsiek gekry)? Ja [ ] Nee [ ]

Ek het al die vrae eerlik beantwoord sonder om te lieg. Ja [ ] Nee [ ]

47. Wat sou jy sê was die oorsaak of het gemaak dat jy die ding of dinge gedoen het waarvoor jy nou in die tronk is?

48. Mense verskil baie wat hulle behoeftes aan seks aanbetref:
Toe jy nog buite was, hoe dikwels het jy gewoonlik seks gehad?

49. Jy het seker nou al baie geluister na die ander mense in die tronk en jy het seker ook al tyd gehad om te dink – wat sou jy sê is die rede of redes waarom mense oor die algemeen dinge doen wat hulle in die tronk laat beland?

50. Wat sou jy sê kan gedoen word sodat mense nie weer en weer in die tronk sal beland nie?

51. Is daar volgens jou êrens 'n tekortkoming wat betref die lewe hier in die tronk, en op watter manier sou jy graag wou sien dat dinge hier in die tronk vir julle verbeter word?

MONROE DYSCONTROL SCALE

....

Antwoord elke vraag hieronder deur 'n kruis te maak in net een van die vier blokkies langs die vraag. As jy 'n vraag nie verstaan nie, vra dat die vraag aan jou verduidelik moet word. (Die Engels word onderaan tussen hakies gegee.)

		Nooit / Never	Selde / Rarely	Soms / Sometimes	Dikwels / Often
1.	Ek het al impulsief iets gedoen (dit beteken op die ingewing van die oomblik, of sonder om tweekeer te dink). (I have acted on a whim or impulse.)	☐	☐	☐	☐
2.	Ek het al skielik van bui verander. (I have had sudden changes in my moods.)	☐	☐	☐	☐
3.	Ek het al die ondervinding gehad dat ek deurmekaar voel (selfs al is ek) op 'n bekende plek. (I have had the experience of feeling confused (even) in a familiar place.)	☐	☐	☐	☐
4.	Ek voel nie heeltemal aanspreeklik vir wat ek doen nie. (I do not feel totally responsible for what I do.)	☐	☐	☐	☐
5.	Ek het al my selfbeheer verloor selfs al wou ek nie. (I have lost control of myself even though I did not want to.)	☐	☐	☐	☐
6.	My optrede het my al verbaas. (I have been surprised by my actions.)	☐	☐	☐	☐
7)	Ek het al my selfbeheer verloor en ander mense seergemaak. (I have lost control of myself and hurt other people.)	☐	☐	☐	☐
8.	Ek het al onduidelik gepraat omdat my mond nie die klanke mooi wou vorm nie. (My speech has been slurred.)	☐	☐	☐	☐
9.	Ek het al my bewussyn verloor (flou geword). (I have had "blackouts".)	☐	☐	☐	☐

BLAAI OM ASSEBLIEF

	Item	Nooit / Never	Selde / Rarely	Soms / Sometimes	Dikwels / Often
10.	Ek het al wild en onbeheerbaar geword na een of twee drankies. (I have become wild and uncontrollable after one or two drinks.)	☐	☐	☐	☐
11)	Ek het al so kwaad geword dat ek goed stukkend gebreek het. (I have become so angry that I smashed things.)	☐	☐	☐	☐
12)	Ek het al ander mense bang gemaak met my humeur (woedebuie). (I have frightened other people with my temper.)	☐	☐	☐	☐
13.	Ek het al by my positiewe gekom sonder dat ek geweet het waar ek is of hoe ek daar gekom het. (I have "come to" without knowing where I was or how I got there.)	☐	☐	☐	☐
14.	Ek het al onbeskryflike gevoelens van bangheid of angs gehad. (I have had indescribable frightening feelings.)	☐	☐	☐	☐
15.	Ek het al so gespanne gevoel dat ek wou skreeu. (I have been so tense I would like to scream.)	☐	☐	☐	☐
16.	Ek het al die skielike drang of impuls gehad om myself dood te maak. (I have had the impulse to kill myself.)	☐	☐	☐	☐
17)	Ek was al kwaad genoeg om iemand dood te maak. (I have been angry enough to kill somebody.)	☐	☐	☐	☐
18)	Ek het al 'n ander persoon liggaamlik aangeval en seergemaak. (I have physically attacked and hurt another person.)	☐	☐	☐	☐

Hierdie vrae gaan oor jou gebruik van sterk drank (alkohol) en dwelmmiddels (drugs). Wees asseblief eerlik - onthou, ek gaan nie jou persoonlike antwoorde aan enigiemand bekendmaak nie. Vul slegs die inligting in by die kolomme van die middels wat jy gebruik het.

Watter middels het jy ooit gebruik of uitprobeer? (Maak 'n X in die [ ] en vul in ander middels of kombinasies gebruik in die ekstra kolomme.)	[ ] **ALKOHOLIESE DRANK**	[ ] **DAGGA**	[ ] **DRANK EN DAGGA (SAAM)**	[ ] **MANDRAX EN DAGGA (SAAM)**	[ ] **MANDRAX DAGGA EN DRANK (SAAM)**	Ander: (ook snuifmiddels)	Ander:	Ander:	Ander: ....
Vir watter tydperke en hoe dikwels het jy elkeen gebruik? Gee in die blokke hier langsaan jare of ouderdom gebruik met die volgende kodes: Daagliks 1 Byna elke dag 2 Net oor naweke 3 5-10 keer per maand 4 1-4 keer per maand 5 5-10 keer per jaar 6 1-4 keer per jaar 7 Net 1 of 2 keer uitprobeer 8 Nooit 9 byvoorbeeld: **ALKOHOL**: 1985-86: 4; 1987-89: 1; of 18-19 jr.: 5; 20-24 jr.: 2 **DAGGA**: 1988-92 2; of 21-25jr. 2									
Hoe onlangs het jy die middel/s gebruik?	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)	0 - 2 uur [ ] 3 - 4 uur [ ] 5 - 12 uur [ ] 13 - 23 uur [ ] 1 - 2 dae [ ] 3 - 4 dae [ ] 5 - 6 dae [ ] 1 - 3 weke [ ] 1 - 2 maande [ ] 3 - 5 maande [ ] 6 - 11 maande [ ] .... jaar (vul in)
Watter van die middel/s het jy in die tronk ook gebruik?	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]

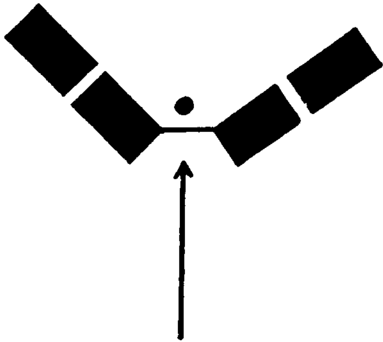
BLAAI OM ASSEBLIEF

Merk en/of vul weer hier in watter middels jy al gebruik het.	[ ] ALKOHOLIESE DRANK	[ ] DAGGA	[ ] DRANK EN DAGGA (SAAM)	[ ] MANDRAX EN DAGGA (SAAM)	[ ] MANDRAX DAGGA EN DRANK (SAAM)	Ander:	Ander:	Ander:	Ander: ....
Op watter manier/e het jy die middel gebruik?	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]	Ingesluk [ ] Gerook [ ] Inspuiting [ ] Ingesnuif [ ] .... [ ]
Toe jy nie van die middel in die hande kon kry nie of probeer het om op te hou om dit te gebruik, watter van die volgende onttrekkingssimptome het jy gehad?	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in):	Hartkloppings[ ] Sweet baie [ ] Geïrriteerd [ ] Voel siek/swak [ ] Vrees/angs [ ] Neerslagtig [ ] Gewelddadig[ ] Naarheid [ ] Hande bewe [ ] Ander (vul in): ....
Watter van hierdie tipes dinge het jy gedoen terwyl jy onder invloed was van die middel/s?	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]	Vrou geslaan [ ] Kind geslaan [ ] Inbraak/steel [ ] Sex crime bv rape[ ] Manslag [ ] Aanranding[ ] Roof [ ] Moord of poging[ ]
As jy onder invloed van die middel is, hoe laat dit jou voel?	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]	Kommerloos [ ] Ontspanne [ ] Bakleierig [ ] Geïrriteerd [ ] Erge sekslus [ ] Bedreigd [ ] Gelukkig [ ] Verloor beheer[ ] .... [ ]
Sê mense soms jy het dinge gedoen terwyl jy onder invloed van die middel/s was waarvan jy dan niks kan onthou nie?	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]	Ja [ ] Nee [ ]

SAMPLE PAGE FROM I E S ARROW-DOT TEST

ARROW-DOT

13



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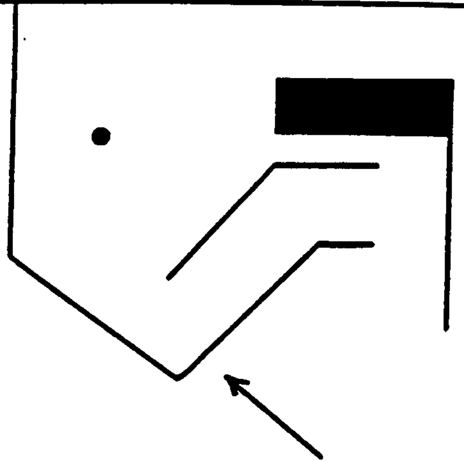
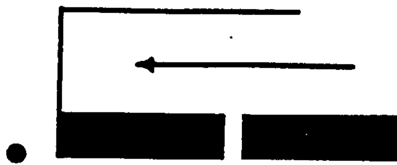
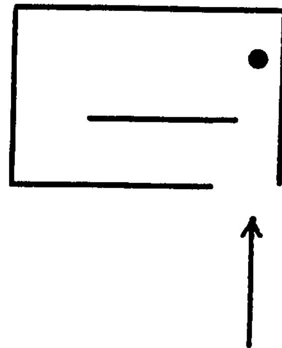


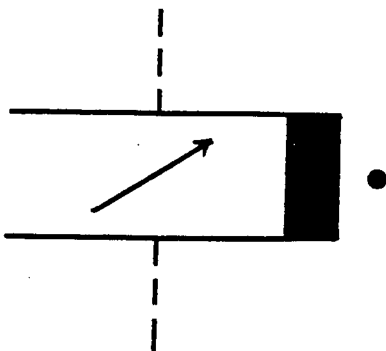
15



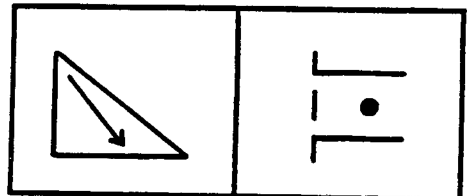
16



17



18

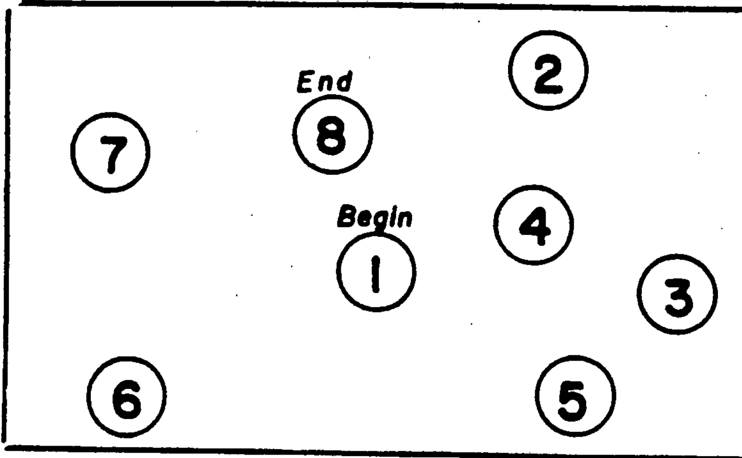


EXAMPLES FROM TRAIL-MAKING TEST

TRAIL MAKING

Part A

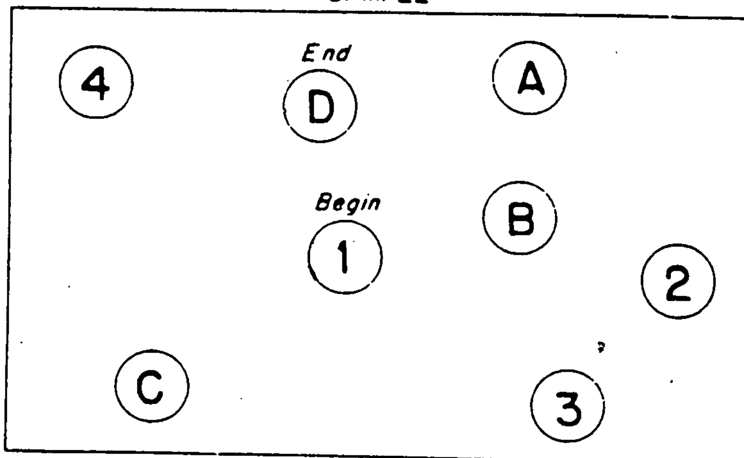
SAMPLE



TRAIL MAKING

Part B

SAMPLE



QUICK TEST

Hierdie is 'n toets om te kyk of jy weet wat die woorde in die lys hieronder beteken.
Lees elke woord en as jy die woord ken, kyk watter een van die prentjies gemerk A, B, C of D pas die beste by die woord en maak 'n kruis in die blokkie met dieselfde letter.
As jy 'n woord nie ken nie, **MOET ASSEBLIEF NIE RAAI NIE**, merk net die "Weet nie" blokkie.
Punte sal afgetrek word vir verkeerde raaiskote.
Maak seker dat jy net een van die blokkies langs 'n woord merk.
Moenie bekommerd wees as jy party van die woorde nie ken nie, want sommige van die woorde is doelbewus baie moeilik.

	A	B	C	D	Weet nie
vrou	☐	☐	☐	☐	☐
stop	☐	☐	☐	☐	☐
fluitjie	☐	☐	☐	☐	☐
heining	☐	☐	☐	☐	☐
drink	☐	☐	☐	☐	☐
wrak	☐	☐	☐	☐	☐
musiek	☐	☐	☐	☐	☐
medisyne	☐	☐	☐	☐	☐
pistool	☐	☐	☐	☐	☐
peper	☐	☐	☐	☐	☐
reisies	☐	☐	☐	☐	☐
sout	☐	☐	☐	☐	☐
skoen	☐	☐	☐	☐	☐
lyfband	☐	☐	☐	☐	☐
suiker	☐	☐	☐	☐	☐

BLAAI OM ASSEBLIEF

	A	B	C	D	Weet nie
skolier					
lepel					
voetgangers					
toeskouers					
beampte					
paartjies					
gesellig					
ontsag					
waaghalsig					
vloeistof					
renbaan					
ritme					
pawiljoen					
elegant					
pylvak					
oplossing					
dissipline					
draaitafel					

BLAAI OM ASSEBLIEF

	A	B	C	D	Weet nie
wedywer	☐	☐	☐	☐	☐
outoriteit	☐	☐	☐	☐	☐
gekristalliseerd	☐	☐	☐	☐	☐
tabberd	☐	☐	☐	☐	☐
lower	☐	☐	☐	☐	☐
saggarien	☐	☐	☐	☐	☐
rangstrepe	☐	☐	☐	☐	☐
fraktuur	☐	☐	☐	☐	☐
intimiteit	☐	☐	☐	☐	☐
imperatief	☐	☐	☐	☐	☐
konkoksie	☐	☐	☐	☐	☐
omhels	☐	☐	☐	☐	☐
meniskus	☐	☐	☐	☐	☐
pulwer	☐	☐	☐	☐	☐
dipsomanie	☐	☐	☐	☐	☐
uniform	☐	☐	☐	☐	☐
dans	☐	☐	☐	☐	☐

GRAPHIC ALTERNATING SEQUENCES TEST