

NEUROPSYCHOLOGICAL CORRELATES IN SEXUAL
AND NON-SEXUAL OFFENDERS

CENTRE FOR NEWFOUNDLAND STUDIES

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JEFFREY LEWIS ABRACEN, B.A. (Honours)



Neuropsychological Correlates in Sexual and Non-Sexual
Offenders

BY

Jeffrey Lewis Abracen, B.A. (Honours)

A thesis submitted to the School of Graduate Studies in
partial fulfillment of the requirements for the degree of
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Abstract

In an attempt to replicate the findings of Yeudall et al.(1986) (Cited in Flor-Henry, 1987) the three neuropsychological measures which most significantly differentiated sex offenders from normal controls in that study (i.e., Coloured Progressive Matrices, Trail Making B, Williams Verbal Learning Test) were administered to three groups of subjects. An experimental group consisting of a homogeneous group of convicted sex offenders (child molesters) was compared to a group of non-violent non-sex prison controls as well as to a group of normal controls. Several background measures were also administered to all subjects to control for the effects of variables related to neuropsychological test performance. Results indicated that when the effects of the background variables were not included in the analyses the findings were in accord with those of Yeudall et al. (1986). On both the Coloured Progressive Matrices and Williams Verbal Learning Test the sex offenders scored significantly lower than normal controls. No differences were found between sex offenders and prison controls on any of these measures. When the effects of the background variables were controlled for, no differences emerged between any of the groups on any of the neuropsychological measures. The results do not support Flor-

Henry's (1980, 1987) neuropsychological theory as to the etiology of the paraphilias.

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Table of Contents

	Page Number
Introduction.....	1
Classification of the Paraphilias.....	2
Implications for Research.....	3
Environmental Theories.....	9
Learning Theories.....	10
Psychodynamic Theories.....	12
Personality Theories.....	13
Genetic Theories.....	16
Physiological Theories.....	19
Hormonal Theories.....	19
Neuropsychological Research.....	26
Neurological Conditions Associated with	
Sexual Deviation.....	26
Studies Related to Neuropsychological Dysfunction	
in Sexually Deviant Populations.....	28
Methodological Considerations.....	32
Flor-Henry's (1980, 1987) Theory.....	34
The Present Investigation.....	42
Hypotheses.....	43

Method	4 5
Subjects	45
Sex Offenders.....	45
Prison Controls	48
Normal Controls.....	49
Procedure.....	50
Measures.....	52
 Result.....	 5 7
Background/Matching Variables	57
Background/Matching Variables Significantly Associated with Neuropsychological Measures.....	57
Neuropsychological Measures	60
Discriminant Function Analyses.....	66
Repeaters Versus Non-Repeaters.....	66
 Discussion	 7 2
Limitations of the Study.....	86
Conclusions.....	87
Directions for Future Research.....	88
 References.....	 9 1

Appendices.....	102
Appendix A: Structured Sexual History	
Interview	102
Appendix B: Consent Form.....	105
Appendix C: Demographic Questionnaire	106
Appendix D: The Hospital Anxiety and	
Depression Inventory	107
Appendix E: Spielberger State Self-Evaluation	
Questionnaire.....	112
Appendix F: Michigan Alcoholism Screening	
Test.....	114
Appendix G: The National Adult Reading Test.....	117

List of Tables

	Page Number
Table 1: Means and Standard Deviations for	
Background Variables.....	58
Table 2: Pearson's Correlation Matrix of Background/	
Matching Variables and Neuropsychological	
Measures.....	61
Table 3: Correlations Between Neuropsychological	
Measures.....	63
Table 4: MANCOVA on Neuropsychological Measures	
using Age, Education and MAST as Covariates	64
Table 5: Contrasts.....	65
Table 6: Discriminant Function Analysis on All	
Variables.....	68
Table 7: Discriminant Function Analysis on	
Background Variables.....	69
Table 8: Discriminant Function Analysis on	
Neuropsychological Variables.....	70

List of Figures

	Page Number
Figure 1: Means for Sexual Assaulters, Prison Controls and Normal Controls on Background Measures.....	59
Figure 2: Means for Sexual Assaulters, Prison Controls and Normal Controls on Neuropsychological Measures.....	67

INTRODUCTION

The sexual deviations, or paraphilias as they have been called in the revision of the third edition of Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1987), have been the subject of scientific inquiry for over a century; for example, formal writings on exhibitionism date to 1877, when the phenomenon was first described and named by Leseque (cited in Evans, 1970). However, an adequate explanation of these conditions has not been provided.

There are almost as many theories as to the development of the sexual deviations as there are writers. However, to date, no one theory can adequately explain these puzzling variations in human sexual behaviour. Theories based upon environmental factors or on physical influences have been proposed. Conditioning theories attempt to explain the sexual deviations on the basis of a person's learning history. Personality theorists concentrate on the individual's "traits" or types and attempt to find associations between such traits as "dependency" and the sexual deviations (Fisher & Howell, 1970). Other theorists have looked at the influence of genetic factors. With reference to physiological theories researchers interested in hormonal levels have focussed on the circulating levels of various hormones (e.g., testosterone) in sexual

deviants and controls. Finally, a number of theorists have concentrated on the neuropsychological aspects of sexual deviation. These theories will be reviewed under the general headings of "Environmental," "Personality," "Genetic," "Physiological," and "Neuropsychological" theories, respectively. Research related to these approaches will be briefly reviewed.

Before one can begin to discuss the various theories related to the etiology of the paraphilias it is important to raise a number of issues regarding their classification. As will become obvious, there are difficulties in classifying the various paraphilias as distinct clinical entities. The implications for research in this area will also be addressed.

Classification of the Paraphilias

It is commonly believed that most sexually deviant individuals suffer from only one paraphilia. Yet, a number of studies have clearly demonstrated that an individual may suffer from several sexual deviations at the same time (e.g., Langevin, 1985; Abel et al., 1988). Abel et al. (1988) found that most paraphiliacs have had significant experience with as many as ten different types of deviant sexual behaviour. In light of this, it is interesting to note that the DSM-III-R lists only eight types of deviation and provides a third residual category "Paraphilia Not Otherwise Specified."

A related issue involves the close association between a number of the specific paraphilias. Langevin (1985) has suggested that voyeurism may not exist as a distinct clinical entity and only exists in association with other paraphilias. Rooth (1973) has commented on the association between exhibitionism and pedophilia. Freund (Freund et al., 1972; Freund, 1976) has proposed that voyeurism, toucheurism, exhibitionism, and frotteurism, obscene telephone calling, and some cases of the preferential rape pattern involve a common underlying disorder which he terms "courtship disorder." Freund and his colleagues have conducted a number of studies which have yielded results in support of the existence of "courtship disorders" (Freund & Blanchard, 1986; Freund, Scher, & Hucker, 1983).

Implications for Research

Research in the area of the paraphilias becomes problematic when one takes the findings of Abel et al. (1988), Langevin (1985) and Freund et al. (1983) into account (i.e., that the paraphilias may not exist as distinct diagnostic entities as proposed by DSM-111-R). For practical reasons, many researchers have used groups of prisoners convicted of a given sexual offence when trying to test a homogeneous group of offenders. The problem is that these individuals may not comprise a homogeneous group. Persons with a previous

history of different types of sexual offences may be included in the sex offender group; further, these individuals may also have been previously convicted of crimes of a non-sexual nature.

If these individuals are likely to suffer from multiple paraphilias, some attempt must be made to establish what other paraphiliac behaviours they exhibit. The opposite may also apply; for example, not all persons convicted of a sexual offence against a child are pedophiles, many are opportunistic or alcohol related offences (Langevin, 1985). Recently, specific criteria have been established for the diagnosis of the paraphilias including pedophilia. According to the latest edition of the DSM (APA, 1987) three criteria must be met for a diagnosis of pedophilia: First, "over a period of at least six months recurrent intense sexual urges and sexually arousing fantasies involving sexual activity with a prepubescent child or children." Second, "the person has acted on these urges, or is markedly distressed by them." Last, "the person is at least 16 years old and at least five years older than the child."

Studies typically state that a certain number of sexually deviant individuals were studied. In some cases groups such as "sexual molesters of children and adolescents" (e.g., Hendricks et al., 1988 p. 108) have been used. However, unstated was whether these individuals met diagnostic criteria for

pedophilia or any additional paraphilias. In others, diagnostic labels have been applied to subjects without sufficient information. Buhrich et al. (1979), for example, examined a group of transvestites; yet, this diagnosis appears to have rested almost exclusively on being a member of a club for transvestites (i.e., self-diagnosis).

In the majority of cases, however, it is simply left to the reader's imagination as to how a particular diagnosis was reached. For example, Fedora et al. (1986) state that "fourteen exhibitionists were compared with 21 paid normal controls" (pp. 419). Leaving aside the issue that the control subjects were paid while the experimental group was not, there is no mention in the study of the taking of a sexual history. Presumably police or hospital records were used to determine a diagnosis. The question then arises as to which system of classification was used? Similar examples are not hard to find: Scott et al. (1984) studied 36 male patients arrested for sexual assault, providing almost no information regarding sexual histories. Forgac and his colleagues (1984) tested a series of men arrested for genital exposure, and relied on police and hospital records for their information. Tarter et al. (1983) used individuals referred from juvenile court. In each case, the reader is provided only with the most cursory of information regarding recruitment criteria.

Even in those studies where sexual histories have been taken, no information regarding the presence or absence of other deviant sexual behaviours not specifically the focus of the article have been presented (e.g., Boyar & Aiman, 1982). In fact, the only experimental studies that discussed the presence of multiple paraphilias in their subject population appear to be those of Abel et al. (1988), Bradford and McLean (1984), Freund et al. (1983), Freund and Blanchard, (1986), Langevin. (1985), and Kolarsky et al. (1967). Authors may thus describe their experimental group as consisting of pedophiles; however, without taking a careful sexual history, subjects having multiple paraphilias might be grouped with individuals having only one paraphilia.

The possibility also exists that so few studies have reported instances of multiple paraphilias within the same individual because such persons are rare. However, the fact that so many of the subjects of Freund et al. (1983) Freund and Blanchard, (1986) and of Abel et al. (1988) were found to have multiple paraphilias suggests that this is not the case. Rather, it appears that most authors have relied upon pre-existing diagnostic records, and pre-existing classification schemes which may be inadequate and inaccurate.

Clearly, it is quite time-consuming to obtain a detailed sexual history; in fact, such interviews may take several hours

(Abel et al., 1988). Moreover, Abel et al. (1988) have noted that sex offenders may be unwilling to divulge information regarding sexual offences of which they have not been convicted, fearing legal repercussions (i.e., they often fake good). Thus, it is unlikely that an adequate assessment has been made in many of the studies.

If one is to test homogeneous groups of subjects, a number of important changes must be made in research practice. First, diagnoses cannot be based solely on hospital or prison records. Subjects should be interviewed using a standardized clinical interview which specifically questions the individual not only about one specific type of deviation (e.g., relating to the criminal charge) but about the entire spectrum of paraphilias. The questions in the interview should focus on diagnoses based on DSM-111-R or some other acceptable classification system. Every effort should be made to convince the client that information which he relates is strictly confidential and will not be used in court proceedings. For example, a letter from the Attorney General's office or a similar branch of the federal government stating that none of the data collected can be used in court proceedings may be useful to further convince the client that participation and honesty are not going to lead to further possible legal sanctions (e.g., Abel et al., 1984). A sufficient amount of time

must also be allowed for each interview. Not all clients will immediately divulge the information in which the interviewer is interested. There is no substitute for spending the necessary time with the client; and unless the research team conducts the interviews themselves, there is no guarantee that even these basic requirements will be met.

In addition, researchers have to clearly specify the procedures used in subject selection. A detailed description of the subject population must also be provided if comparison between studies is to be possible. To state, for example, that a certain number of child molesters was tested tells us little about the population; the reader must be provided with information regarding the number of subjects who were repeat offenders, how many met accepted definitions of pedophilia or other paraphilia, degree of alcohol dependency, and whether any suffered from psychological/psychiatric conditions.

There are additional ways of determining homogeneous sub-groups of subjects. For example, Langevin (1985), in order to gain a greater understanding of voyeurism, first subdivided a group of nonexclusive voyeurs on the basis of whether peeping equalled or exceeded other sexual outlets. Langevin (1985) then analyzed the data separately for the group who peeped over 100 times versus those who did so fewer times.

Such time consuming procedures are needed if homogeneous groups of subjects are to be used. If such methods are not used, comparisons across studies becomes difficult in that it is hard to determine the exact nature of the population studied.

The paraphilias have generated much research. In spite of the limitations of many of these studies, the findings are important in that they help shed some light on the nature of these disorders. We shall now turn our attention to these studies. However, before doing so, it must be noted that the limitations outlined above make interpretation of the existing research findings extremely difficult. Further, any conclusions reached can, at best, be viewed as only tentative, given the rather heterogeneous nature of the populations studied.

Environmental Theories

At least two classes of environmental theories which attempt to explain the etiology of the paraphilias can be identified: those which emphasize learning, and those of the psychodynamic perspective. (A third area of investigation which has received some attention is whether sexual offenders have abnormal personality profiles. Research regarding this area will be discussed in a separate section as some authors have speculated that particular personality traits thought to

be related to the onset of sexual deviations may be a result of "nature" rather than "nurture.")

In spite of the fact that numerous books and articles have been written on the subject of environmental perspectives, surprisingly few empirical studies have been conducted. Many have relied on case studies as evidence for their positions. Unfortunately, authors typically discuss only those cases which support their perspective and it is not clear as to how many individuals seen at a particular clinic demonstrate the characteristics of interest. Each of the perspectives will be discussed in turn and related evidence presented.

Learning Theories

Behavioural theorists (e.g., McGuire, Carlisle, and Young, 1965) have used principles of conditioning to explain these disorders. According to McGuire and his colleagues (1965), deviant sexual behaviour is the result of a gradual learning process which begins after an initial sexual experience. This experience provides the individual with fantasy material for later masturbation. Subsequent masturbation using the deviant stimulus as fantasy with pleasurable sexual arousal and orgasm is then believed to increase the arousing value of the deviant stimuli, while at the same time extinguishing other sexual stimuli through lack of

reinforcement. As evidence in favour of the theory, the authors present data on the development of paraphilias in seven cases which they had interviewed. However, the authors themselves noted that such evidence cannot be taken as proof for the theory. Hawton (1983) added that social skills deficits may strengthen the development of deviance.

A more flexible theory has been proposed by Bandura (1969) who has suggested a three-stage model for the presence of the sexual deviations. This theory posits the involvement of several types of learning, rather than masturbatory conditioning alone. In the first stage, parents model deviant behaviour (e.g., exhibitionism) in either blatant or attenuated forms. Once the responses are elicited, either by direct instigation or modelling, they are endowed with exaggerated sexual significance and strong positive valence. Last, Bandura suggests that the parents tend to maintain the child's deviant sexual responses on an instrumental basis over a long period, both through direct and vicarious reinforcement. Again case studies are presented in support of the theory.

Blair and Lanyon (1981) have pointed out that behavioural theories as to the etiology of the paraphilias seldom speak of syndromes that would characterize specific sexual deviations. Further, there is no direct evidence which exclusively supports the behavioural or social-learning explanations of their

etiology. Nonetheless, behavioural treatments of the paraphilias have been found to be moderately effective (Abel et al., 1984; Blair & Lanyon, 1981; Marshall & Barbaree, 1988). Although this lends some support to the behavioural perspective it does not validate it, behavioural treatments may be effective regardless of the actual cause of these conditions.

More recently, Marshall (1989) has suggested that a lack of intimacy and loneliness may be associated with the development of the paraphilias. According to Marshall (1989) individuals who have difficulty forming emotional attachments throughout their lives or who have had disruptions in such relationships may suffer from loneliness due to a lack of intimate relationships. In order to compensate for their loneliness such individuals may seek intimacy through sexuality or through less threatening partners.

Psychodynamic Theories

In his early writings, Freud emphasized the idea that in the perverse individual certain "partial" instincts tend to occupy the center of erotic life (Etchegoyen, 1989). In contrast to this, normal persons were thought to subordinate these "partial" instincts to genital primacy which was arranged with reference to a sexual object (Etchegoyen, 1989). Later, Freud appeared to have placed much greater emphasis on castration

anxiety as causative in the development of the paraphilias (Freud, 1950). For example, in 1927 he explained fetishism as repressed affect generated by a fear of castration (Etchegoyen, 1989).

Although some empirical evidence exists in support of the psychodynamic approach (Hammer, 1968) it is difficult to empirically test many of the hypotheses derived from this theory, due to the rather subjective nature of the work in the area. It is, for instance, very difficult to quantify or operationalise concepts such as "castration anxiety"; yet, this is just what is needed if one is to test these concepts empirically.

Personality Theories

There is a prevailing notion that anomalies in sexual preference are somehow associated with underlying personality structures. However, this assumption is based more upon clinical impression than on experimental data. For example, Revitch and Weiss (1962) state that "In our experience, the majority of heterosexual pedophiles seek out children for sexual gratification because of personality inadequacies" (p. 76); yet, they provide no empirical evidence to substantiate their proposition. A number of other authors have also claimed that exhibitionists and pedophiles are

immature (e.g., Rooth, 1971) inadequate (e.g., Fisher, 1969; Fisher & Howell, 1970), and dependent (Bell & Hall, 1971).

Aside from the difficulties associated with the operational definitions of such terms as "inadequate", a number of empirical investigations have yielded results that are at odds with the above clinical impressions. Langevin et al. (1978) compared groups of males with various paraphilias to sexually normal controls. Both the Minnesota Multiphasic Personality Inventory (MMPI) and the Sixteen Personality Factors (16PF) were administered. Results indicated that various groups of pedophiles (e.g., Heterosexual, Homosexual) and exhibitionists were no more shy, dependent and passive than normal controls. In terms of their overall level of adjustment, exhibitionists could not be differentiated from normal controls. In contrast, pedophiles demonstrated considerable emotional disturbance. On the MMPI these groups had the highest number of significantly elevated scores on hypochondriasis. Many pedophiles had elevations on other sections of the MMPI including the depression and psychopathic deviate scales. On the 16PF they scored high on tension. Langevin et al. (1979) replicated these findings regarding exhibitionists, using a more extensive battery of tests, both on the same population as was used in their 1978 study and on a separate population of exhibitionists.

A second line of inquiry has centered around the hypothesis that, if psychopathology (as measured by the MMPI) is associated with the paraphilias, then increased levels of disturbance should be associated with increased numbers of offences. McCreary (1975), in support of this contention, found that severity of psychopathology in male exhibitionists was greater among those with larger numbers of past exhibitionistic offences. However, Forgac et al. (1984) found that this relationship did not apply to pure exhibitionism. Further, they provided evidence that the association found by McCreary (1975) was, in fact, an association between non-exhibitionistic offences and psychopathology.

In summary, Langevin et al. (1979) may well be correct when they state that "The results provide more information on what the exhibitionist is not than what he is" (p. 327). Thus, at present, the results of the few quantitative studies which have been conducted in this area suggest that sexual offenders, and in particular exhibitionists, are not shy, dependent and passive. However, there is some evidence to suggest that pedophiles may suffer from emotional disturbance. It is, of course, entirely possible that such emotional disturbance may be a consequence of the disorder rather than the cause (e.g., ridicule by society at large and other prisoners, or fear of

being attacked or killed by other prisoners, may result in elevated levels of emotional distress in pedophiles).

Genetic Theories

There have been few studies relating genetics and the paraphilias. These have yielded mixed results. Although some of the early researchers (e.g., Kallmann, 1952) made strong claims based on their findings, such optimism is no longer widespread. Methodological limitations in these studies as well as competing explanations have contributed to this trend.

With only one exception (Gaffney et al., 1984) all the studies in this area that could be located compared concordance rates among monozygotic (MZ) and dizygotic (DZ) twins (e.g., Heston, 1968; Kallmann, 1952) or looked at pairs of identical twins to see if they were concordant for a given sexual deviation (e.g., Klintworth, 1962; Rainer et al., 1960). The rationale behind this methodology is that MZ twins share identical genetic information, unlike DZ twins; environmental influences are presumed to be the same across groups. Hence, observed differences between MZ and DZ twins should be due to genetic factors.

Kallmann (1952) has perhaps reported the most striking findings in this regard. He reported a 100% concordance rate for homosexuality in 37 MZ twins; the correspondence rate in 26 DZ twins was 12%. Since Kallmann first published his data,

several authors have raised serious questions as to the credibility of this research. Marshall (1984) has noted that there are a number of very serious omissions in Kallmann's reports. Such facts as to how zygosity was determined and whether it was determined by Kallmann himself are in question. (Marshall (1984) presents evidence to the effect that, in all likelihood, Kallmann both determined diagnosis and zygosity.) An additional problem is that homosexuality is not currently regarded as a sexual deviation. (In fact only one study (Gaffney et al., 1984) could be located where the condition investigated was not homosexuality.)

Bancroft (1975, Cited in Rosen, 1979) has reviewed the evidence related to the genetic influences in male homosexuality. Based on this review, he concluded that, at most, genetic factors may sensitize an individual to certain environmental influences; however, they do not necessarily influence the direction of the libido directly.

Gaffney and his colleagues (1984) investigated the familial transmission of pedophilia. They conducted a naturalistic, double-blind, family history comparison of sexual deviancy in first degree relatives of inpatients with pedophilia and nonpedophilic paraphilia. A psychiatric control group consisting of individuals suffering from depression was also used. Pedophilia was found in five of 33 families of

pedophiles and in one of 21 families of nonpedophilic paraphilia. These differences were statistically significant. An additional four of 21 nonpedophilic paraphiliac families had a sexual deviance not involving pedophilia. The depressive families had, as expected, a low familial rate of paraphilia (three per cent versus 18.5% in paraphilic families).

Based on the findings of Gaffney et al. (1984) it would appear that pedophilia may be transmitted in families. It is unclear, however, whether the same applies to the other paraphilias. With reference to individuals with a paraphilia other than pedophilia no analyses were presented with reference to family transmission. Even if this problem were resolved it does not help to explain the manner of transmission. In fairness, the authors themselves note that the study does not resolve this issue.

In summary, it does not appear that genetic endowment alone can explain the development of the paraphilias. Many of the studies which have been conducted on the topic have involved homosexuals. Moreover, these studies suffer from a number of serious methodological problems. Further, homosexuality is no longer viewed as a psychiatric condition by the criteria currently adopted by the American Psychiatric Association, namely DSM-111-R. The one study which could be located using other sexually deviant populations yielded

results which are inconclusive as to the manner of transmission.

Physiological Theories

Hormonal Theories

Several authors have examined hormonal levels in sexually deviant populations. One of the earlier studies in the area was conducted by Migeon et al. (1968). These authors compared normal subjects to 14 male to female transsexuals seen at a medical clinic. Among subjects who had not received estrogen therapy, only one patient was found to have an elevated level of pregnanediol; all other measures for these individuals were within normal limits. For transsexual subjects treated with estrogen, a marked decrease in plasma testosterone was observed, but was not statistically different than that observed in normal female subjects.

Buhrich and his colleagues (1979) compared plasma testosterone, serum follicle stimulating hormone (FSH), and serum luteinizing hormone (LH) levels in 26 heterosexual transvestites to those of normal controls. Levels of these hormones were found to be similar across groups and were within the normal range. However, six transvestites had serum FSH levels above the upper limit of normal. As well, seven individuals in the transvestite group had serum LH levels below the lower limit of normal.

Boyar and Aiman (1982) compared 10 aspects of hypothalamic and pituitary function in 13 male-to-female transsexuals and seven normal controls. Results indicated that some aspect of LH or FSH secretory dynamics was abnormal in seven of 13 transsexual men. A single abnormality was present in one subject; in all other subjects with some abnormal response, there were two to seven abnormalities present. In each case, these abnormalities exceeded the 95% confidence level for normal men. However, it is difficult to evaluate hormonal studies in transsexuals as many have been taking hormones prior to study.

In a review of research conducted in his laboratory, Dorner (1988) noted that the lower the estrogen-convertible androgen or primary estrogen level during brain differentiation, the higher the evocability of a positive estrogen action on LH secretion in later life. This finding was clearly demonstrated in rats, although the author concedes that in humans findings have only raised the "possibility of similar organizing effects (p. 60)."

In several studies, Dorner and his colleagues (See Dorner 1988 for a review) have induced positive estrogen feedback LH secretion in a number of homosexual men following the administration of estrogen. In contrast, both heterosexual and bisexual men did not demonstrate such a response. Similar

results were obtained for homosexual male-to-female transsexuals.

Although these findings are suggestive, they do not justify the concept of "inborn homosexuality" (p. 60) due to low androgen levels during prenatal sexual brain differentiation, as described by Dorner (1988). At present, much of the research in the area is correlational in nature and the primary importance of either physiological or environmental factors has not been clarified. Further, it does not explain the presence of these disorders in individuals who do not display a significant estrogen feedback LH secretion. It should also be noted that at least one study (Hendricks et al., 1989) has reported results which are at variance with the studies reported by Dorner (1988). Gladue et al. (1984), however, reported results which support Dorner's (1988) theory.

Meyer-Bahlberg (1980), in a review of the literature on hormonal influences on homosexuality, concluded that the only hormonal difference between homosexual and heterosexual males that has been reported relatively consistently concerns the ratio between two androgen metabolites, androsterone and etiocholanolone, in urine. Homosexuals were found to have decreased levels of these hormones relative to heterosexuals.

The author cautions that the biological functions of these metabolites, if any, are unknown.

Berlin (1983) evaluated 41 men, all of whom met the DSM-111 criteria for some paraphilia, looking for the possible presence of biological abnormalities. Although no significant abnormalities were detected in 12 of the 41, a total of 63 abnormalities were found among the other 29 men. These included 18 abnormal levels of testosterone and 14 of luteinizing hormone.

Gaffney and Berlin (1984) administered 100mg of luteinizing hormone releasing hormone (LHRH) to men with pedophilia and non-pedophilic paraphilia as well as to normal controls. Levels of LH were then monitored in all subjects. As opposed to the other two groups, the pedophiles responded with a marked elevation of LH indicative of hypothalamic-pituitary-gonadal dysfunction.

Several studies have been concerned with the relationship between androgens and aggression in sexually deviant populations. Rada et al. (1976) compared plasma testosterone levels in a group of 52 rapists with 12 subjects charged with child molesting without violence. The ranges and means of the plasma testosterone levels for rapists and child molesters were within normal limits. However, it was observed that the rapists who were judged to be most violent

had a significantly higher mean plasma testosterone level than normals, child molesters, and other rapists in this study.

Bradford and McLean (1984) examined 50 consecutive male sexual offenders presenting to a university department of forensic psychiatry who were studied in depth as part of a pretrial psychiatric assessment. Subjects included individuals charged with crimes ranging from non-violent behaviour (e.g., exhibitionism, fetishism, and pedophilia) to violent crimes (e.g., rape). A control group, randomly selected by computer, was also used. Subjects were divided into "high", "low", and "no" violence groups based on psychiatric interviews, court records and police reports. The authors failed to find any significant relationship between testosterone levels and sexual deviance. Further, no relationship was found between level of violent behaviour and testosterone levels.

Langevin (1985) found limited evidence of hormonal differences between a group of 20 individuals convicted of rape or sexual assault and non-violent non-sex control subjects (N=20). Three blood samples were drawn at 15 minute intervals. In univariate analysis only Dehydroepiandrosterone Sulfate (DHAS) was significant with the experimental group scoring higher than controls. This finding could have been due to differences between the groups in violence rather than deviant sexual behaviour, however.

A number of methodological problems with the above studies must be noted before any conclusions can be reached as to hormonal influences on deviant sexual behaviour. First, as raised by Meyer-Bahlburg (1977), is the fact that hormone levels are very sensitive to environmental influences. He noted that prisoners and members of such diverse populations as psychiatric patients, and homosexual organizations are likely to differ not only in their psychological but also in their somatic and endocrine makeup. Further, the environments in which these individuals live may be quite different (e.g., prison, hospital). Thus, hormone differences may be due to background variables rather than causally related to sexual orientation itself.

Second, a number of the studies cited above have taken only one blood sample (e.g., Bradford and McLean, 1984; Rada et al., 1976). In order to obtain a reliable estimate of endocrinological levels several such samples need be taken because of intra-individual variability (Meyer-Bahlburg, 1980). In yet another study, it is not clear as to how many samples were taken (Buhrich et al., 1979). Nonetheless, studies involving comprehensive sampling do exist: Boyar and Aiman (1982, discussed above), for example, took blood samples every twenty minutes for 24 hours.

Third, recent evidence suggests that testosterone may be related to general sexual arousability in both men and women (Sherwin, 1988). It may be that a certain level of androgens is needed for normal sexual appetite and for ejaculation (Bancroft, 1984). However, whether higher than average levels of testosterone are related to the development of sexual deviation is an entirely different question; increased levels of testosterone may be a result of sexual behaviour, not the cause (Meyer-Bahlburg, 1980). Similarly, the association between androgens and aggression appears to be less clear than some have claimed (O'Carroll & Bancroft, 1985). Thus, it is unlikely, as has previously been suggested, that excessive levels of androgen are associated with sexually anomalous behaviour (Bancroft, 1989).

In summary, a number of studies have been conducted on hormonal levels in various sexually deviant populations. Very few, if any, consistent differences have been observed across studies. Such differences may or may not be of clinical significance. Last, any observed differences in hormonal levels may well be a result of, rather than the cause of, such behaviour. Hormonal differences between various populations, may, in other words, result from behaviour or environments that group members are exposed to rather than being causally related to group differences in sexual behaviour.

Neuropsychological Research

The association between neurological/neuropsychological conditions and the sexual deviations has been noted in the literature for at least twenty years (e.g., Whiskin, 1968). Quantitative research in the area has been rather sparse, however, with many researchers reporting only case studies. The comparatively small number of studies which have employed control groups suffer from a number of problems which make interpretation of their results difficult. Nonetheless, tentative conclusions may be made based on the existing research.

In the following section the research on the association between various neurological conditions and the paraphilias will be reviewed. Following this, there will be a review of the existing research relating to neuropsychological functioning in sexual offenders. A discussion of Flor-Henry's (1980, 1987) recent, and potentially important, neuropsychological theory as to the origins of the sexual deviations will finally be presented.

Neurological Conditions Associated with Sexual Deviation

Several neurological conditions are known to be related to alterations in sexual behaviour. The Kluver-Bucy syndrome, which is associated with bi-temporal pathology, has been

linked to various forms of sexual disinhibition, and is characterized by emotional placidity, hyperorality, and sensory agnosia (Cummings, 1985). The Gilles la Tourette Syndrome is a disorder manifest by involuntary tics and vocalizations beginning before the age of 15 years. The behaviours associated with this syndrome frequently include copropraxia (lewd gestures), and may include compulsive exhibitionism or sexual touching (Cummings, 1985).

Several studies on the association between dementia and sexual deviation have also been reported (Hucker & Ben Aron, 1985; Whiskin, 1968). Hucker and Ben Aron (1985) compared a sample of 43 elderly sex offenders with a control group consisting of 43 sex offenders aged 30 years or younger. Fourteen percent of the elderly sex offenders were diagnosed as having dementia as compared to only two percent of young sex offenders. When compared to the 49% of elderly sex offenders who were found to be suffering from dementia by Zeeger (1966, 1978, Cited in Hucker and Ben Aron, 1985) and 60% of Whiskin's (1968) group, the figures of Hucker and Ben Aron (1985) seem rather low. The reason for the discrepancy most probably lies in the methods used to diagnose dementia in the different studies. The criteria used to define dementia in the studies by Whiskin (1968) and Zeeger (1966, 1978, Cited in Hucker & Ben Aron, 1985) were vague and many of the subjects

would probably not have been classified as having an organic dementia by contemporary standards (e.g., DSM-111-R).

Several issues need be kept in mind when interpreting this literature. Although such conditions as the Kluver-Bucy syndrome can explain some cases of sexually deviant behaviour, they cannot account for all such instances. This may also be the situation regarding dementia. As Hucker and Ben-Aron (1985) have noted, the incidence of dementia in their elderly population of offenders was similar to the incidence found in the population at large. A certain percentage of individuals with neurological conditions may be expected to engage in sexually deviant acts, but such evidence does not constitute a theory as to the etiology of the paraphilias. Clearly, there are cases where neurological disorders can be related to deviant sexual behaviour; however, neurological conditions are unlikely to be the cause of sexual deviation except in a minority of offenders.

Studies related to Neuropsychological Dysfunction in Sexually Deviant Populations

A number of studies have been conducted on the association between neuropsychological impairment and the sexual deviations. These studies will be reviewed, followed by a number of methodological considerations with reference to the research in this area.

Yeudall and Fromm-Auch (1979) administered a modified and expanded version of the Halstead-Reitan neuropsychological test battery to experimental and control subjects. Results indicated that 96 percent of the neuropsychological profiles of 24 males with a history of sexual offences were indicative of neurological impairment. A greater number of profiles were found to have dominant greater than non-dominant hemisphere cerebral dysfunction.

Graber et al. (1982) administered the Luria-Nebraska Neuropsychological Test Battery, and recorded computed tomography (CT) scan, and regional cerebral blood flow in six subjects designated as mentally disordered sex offenders according to the Nebraska Penal Code. The findings were compared with those of a psychosocially normal group. Results indicated that two of the six patients were definitely abnormal with respect to all of the three measures employed. Two others were abnormal with respect to two of the measures used. In two others there was essentially no evidence of cerebral abnormality.

Tarter et al. (1983) compared juvenile violent, non-violent, and sexual offenders across the Pittsburgh Initial Neuro-psychological Test System. No systematic group differences were noted, nor was cognitive status related to the severity of violent behaviour.

Scott et al. (1984) administered the Luria-Nebraska Test Battery to 36 male subjects who had been arrested for sexual assault and compared the results to a control group of normal subjects. The sexual assaulters performed significantly worse on seven of the 14 scales on the battery. Subjects were then divided into those who assaulted children and those who forcibly assaulted adults. The subjects arrested for sexual molestation of prepubescent children performed worse on all scales of the Luria than those arrested for rape. Among the child molesters, 36% met the criteria for diagnosing brain dysfunction, and 29% performed in the borderline range.

Langevin (1985) compared 20 sexually aggressive prisoners who were convicted of rape, attempted rape, or indecent assault with a control group of 20 non-violent non-sexual offenders. Brain pathology was assessed anatomically by CT scan and behaviourally by the Reitan Battery. Results indicated that although 45% of all cases had some pathology there were no significant differences between the two groups. However, 56% of the individuals diagnosed as being sadists had evidence of neurological damage which was most often manifested by right temporal horn dilation and atrophy, or a structural anomaly being visible on the CT scan. Although it is not specifically related to the paraphilias this study is included because individuals convicted of indecent assault

sometimes commit their crimes against minors. Unfortunately, whether this was the case in the present study is unclear as such information was not provided.

Fedora et al. (1986) monitored the sexually arousing effects of erotic and nonerotic slides with a penile mercury strain gauge. Subjects were 14 exhibitionists, 21 normal controls, and 34 nonexhibitionist sex offenders. Results indicated that exhibitionists responded sexually to scenes of fully clothed erotically neutral females, whereas the other two groups did not respond to this slide material. The authors state that the results support the hypothesis that exhibitionists display culturally unapproved sexual display behaviour as a consequence of cortical disinhibition. Although this may be the case, the authors did not measure cortical disinhibition and therefore the conclusions reached must be viewed with caution.

In one of the most comprehensive studies to date Hucker and his colleagues (1986) compared heterosexual, homosexual and bisexual pedophiles to non-violent non-sex offenders on both neuropsychological (i.e., the Luria-Nebraska Neuropsychological test battery) and neurophysiological indices (Computed Tomography or CT). Results indicated that left temporo-parietal pathology was more frequent in

pedophiles as measured by both neuropsychological test batteries and neurophysiological investigations.

Hendricks et al. (1988) compared 16 men incarcerated for sexual molestation of children and adolescents on measures of cerebral blood flow and by CT scan. A normal control group composed of professional and staff employees at a university were also tested. Compared with normals, child molesters were found to have thinner and less dense skulls and lower cerebral blood flow volumes.

In summary, several studies have been conducted on neuropsychological dysfunction in sexually deviant individuals. Although it is difficult to draw any definite conclusions from these studies there appears to be some evidence in support of the claim that sex offenders demonstrate neuropsychological dysfunction.

Methodological Considerations

There are a number of methodological problems with the studies on the association between neuropsychological dysfunction and the paraphilias. First, several researchers have used imprisoned sex offenders as subjects and have only compared them to normal controls (e.g., Scott et al., 1984; Yeudall & Fromm Auch, 1979). Hence, it is possible that the differences that emerged were due to discrepancies between non-specific offenders and normal subjects, rather than to the

presence of sexual deviation per se. In fact, no neuropsychological study could be located where sex offenders were compared to both non-sex prisoner controls and normal individuals. Further, those studies which have used prisoners as control subjects have found few if any significant differences between groups on neuropsychological measures (Langevin, 1985; Tarter et al., 1983), the exception being Hucker et al. (1986).

Second, heterogeneous groups of subjects have been used. For example, Yeudall & Fromm Auch's (1979) experimental group consisted of sexual deviants who, in a number of cases, had also committed violent crimes of a non-sexual nature (i.e., homicide, prison breaking, breaking and entering, theft, failure to appear in court, and dangerous driving). Therefore, it is possible that violent offenders differ from non-violent individuals, regardless of the type of offence. In fact, there is evidence to suggest that this is the case (e.g., Langevin, 1990; Spellacy, 1978).

Finally, there may be differences between recidivist and non-recidivist offenders (Yeudall, Fedora, & Fromm, 1986). Few studies have controlled for these possibilities.

There is also a need to study homogeneous groups of subjects. Although more empirical research is needed with reference to all of the sexual deviations, sexual molesters of

children may be a particularly important group to study. Given the devastating effects such crimes have on the victim it is important that we learn as much as possible about the individuals who perpetrate these crimes in the hope that such knowledge can be used to prevent such offences in the future. Further, recent evidence suggests that the sexual abuse of children is far more prevalent than once believed, and that a significant minority of children are exposed to such abuse (Courtois, 1988). It should also be recalled that Hucker et al. (1986), in one of the few studies to employ prison controls, found significant evidence of neuropsychological dysfunction in pedophiles.

In summary, a number of neuropsychological studies have been conducted on sex offenders. These studies suffer from a number of methodological flaws and significant results tend only to be found when sex offenders are compared to normal controls. However, existing studies have yielded results that lend some support to the claim that sex offenders evidence more neuropsychological impairment than normal controls.

Flor-Henry's (1980, 1987) Theory

Recently, several authors have suggested that neurological and neuropsychological factors may be involved in the development of the paraphilias (Fedora, Reddon & Yeudall, 1986; Flor-Henry, 1980, 1987; Hucker & Ben Aron, 1985;

Hucker et al., 1986; Yeudall, Fedora & Fromm, 1986). Possibly the most detailed theory has been proposed by Flor-Henry (1980, 1987). Flor-Henry notes that the sexual deviations are far more common in males as opposed to females. Further, he states that male specialization depends upon testosterone/left hemisphere interactions which result in a developmental delay of the left hemisphere. In short, the dominant hemisphere develops more slowly in males and is more sensitive to damage during the early stages of its development when compared to females of the same age.

Flor-Henry also speculates that the orgasmic response is mediated by neural systems in the non-dominant hemisphere and that the dominant hemisphere may be responsible for the inhibition of socially inappropriate behaviours. Hence, it is possible that unusual patterns of neural organization in the dominant hemisphere of males (which is responsible for the inhibition of inappropriate sexual behaviour) may result in the development of sexually deviant behaviour (Flor-Henry, 1980). Flor-Henry (1980, 1987) has suggested that the frontal and temporal lobes may be particularly important with reference to the inhibition of deviant sexual behaviour.

If the dominant hemisphere of males is more sensitive to damage than that of females, and if the inhibition of inappropriate sexual behaviour is localized in this hemisphere,

then this would explain why more males are found to engage in sexually deviant acts. Certainly, this explanation provides some interesting research possibilities.

Much of the evidence upon which Flor-Henry (1980, 1987) bases his theory comes from research with epileptics and persons with tumors. In specific, he quotes a variety of studies which have found that at least some epileptics do manifest disturbances in sexual functioning. However, most of the investigations cited by Flor-Henry (1980, 1987) are based on very few individuals or are case studies (e.g., Epstein, 1961; Johnson, 1965).

One of the few exceptions is the study by Kolarsky et al. (1967) to which Flor-Henry (1980) refers as "the methodologically most rigorous investigation of the question of sexual deviation and its relationship to temporal lobe dysfunction" (p. 259). The sample consisted of 86 unselected males between the ages of 15 and 45 years of age who were drawn from the register of the Central Antiepileptic Clinic of Prague. Detailed sexual histories of the subjects were taken and were collected independently of neurological data. Results indicated that sexual deviation was significantly associated with temporal lesions occurring before the end of the first year of life and that it was more commonly associated with temporal than with extratemporal lesions.

There are a number of serious problems with the studies quoted by Flor-Henry (1980, 1987). Hermann and Whitman (1984), in an excellent review of research on the behavioural correlates of epilepsy, concluded that most studies have a number of serious methodological flaws. These included not controlling for medication (which recent research suggests may result in alterations of a number of hormones (e.g., free testosterone, LH)), lack of adequate control groups, and insufficient use of covariance procedures.

The study by Kolarsky et al. (1967), considered by Flor-Henry (1980) to be one of the best studies in this area, is lacking with regard to each of these factors. In terms of medication, there is no systematic attempt to control for differences between subjects. The authors stated that "the influence of antiepileptic medication and of other epilepsy-related factors....could be excluded as etiological factors" (pp. 742-743). Yet, this may not be the case. Antiepileptic drugs have recently been found to effect various hormones thought to be related to sexual behaviour (e.g., Fenwick, 1985; Toone et al., 1983).

With reference to controls no such individuals were tested. A group consisting of neurological patients not suffering from epilepsy, or chronic care outpatients not

suffering from neurological conditions might have been employed as controls.

Finally, a number of competing explanations for the results might have been eliminated had covariance procedures been used. The results indicated that sexual deviations were associated with temporal lobe lesions occurring before the end of the first year of life. The authors concluded, based on this data, that it is the age of onset of epilepsy that is critical in the development of the sexual deviations. However, it may be that individuals diagnosed as sexually deviant not only had an earlier age of onset for epilepsy but may also have had more serious neurological damage than controls. If this were true then it would be the severity of neurological damage and not age which accounted for the differences between the groups. Controlling for such factors would help eliminate such competing explanations.

A related problem involves the fact that epileptic children are, in many cases, subject to a very different environmental development when compared to normal children. Differences between normal and epileptic children may include attendance at special schools, ridicule, hospitalization, and side-effects of medication.

As can be seen, even "the methodologically most rigorous study" on the association between epilepsy and sexual

deviations cited by Flor-Henry (1980, 1987) is open to criticism in a number of important respects. However, this does not invalidate Flor-Henry's theory regarding dominant frontal and temporal lobe dysfunction in paraphiliacs. In fact, there are a number of studies which support Flor-Henry's (1980, 1987) position. The research of Hucker and his colleagues (1986), and Yeudall and Fromm-Auch (1979), cited in the preceding section, support Flor-Henry's theory.

Possibly the most striking and potentially important findings on the association between neuropsychological impairment and the paraphilias have been reported by Yeudall and colleagues at the Alberta Hospital (1986) (cited in Flor-Henry, 1987) . In specific, a group of court-referred sexual deviants was found to be markedly impaired (i.e., three standard deviations below control means) relative to control subjects on Williams Verbal Learning Test, Coloured Progressive Matrices, and Trail Making B. These measures were reported by Flor-Henry (1987) to reflect damage in the left frontal and temporal lobes. The overall pattern of cerebral dysfunction was found to be bilateral frontotemporal, left>right. It should be emphasized that a difference of three standard deviations is exceptionally rare in studies on the etiology of the paraphilias where most researchers tend to find no differences between groups or differences that are

"just statistically different." Clearly, these massive between group differences suggest that neuropsychological functioning may be impaired in sex offenders.

Nineteen of the 23 exhibitionists investigated by Yeudall et al. (1986) were studied neurophysiologically (Flor-Henry et al, 1986a,b). Electroencephalographic (EEG) recordings revealed that the exhibitionists, in accord with Flor-Henry's (1980,1987) theory, demonstrated both a dislocation of frontal/temporo-parietal relationships as well as intra-hemispheric disorganization of the dominant hemisphere.

The only study which specifically tried to replicate the findings of Yeudall et al. (1986) (Cited in Flor-Henry, 1987) was conducted by O'Carroll (1989a). A heterogeneous group of sexual deviants (N=11) was compared with a psychologically distressed control group (anxious patients)(N=11) and a group of normal controls (N=11). The measures administered included the three tests which most significantly differentiated sex offenders from controls in the study by Yeudall et al. (1986)(cited in Flor-Henry, 1987)(i.e., Williams Verbal Learning, Trail Making B, Coloured Progressive Matrices). No significant differences emerged when the sexual deviants were compared with either of the control groups on any of the measures employed. The small sample size may account for the lack of statistically significant results,

although if Flor-Henry's (1987) findings were robust and clinically significant one would perhaps have expected differences to emerge, even in studies using relatively few subjects. O'Carroll (1989a) suggested that his failure to replicate may have possibly been due to differences in the populations studied, in terms of severity and/or recidivism.

Other studies discussed above have yielded results inconsistent with Flor-Henry's theory. Included are Langevin (1985), and Tarter et al. (1983) who found no difference between sex offenders and prison controls on measures of neuropsychological functioning. Further, Hoenig and Kenna (1979), found that more female transsexuals evidenced neurological dysfunction than male transsexuals. However, Flor-Henry's group have reported several studies which did yield results in accord with Flor-Henry's (1980, 1987) theory (e.g., Flor-Henry, 1986a, b; Yeudall et al.(1986) (Cited in Flor-Henry, 1987).

It should be noted that the studies cited above which have used prison controls have used subjects convicted of non-violent non-sexual offences. The reason for using non-violent non-sexual prisoners as controls is that studies which have compared violent criminals with non-violent non-sexual criminals have typically reported that violent prisoners are

more impaired on neuropsychological measures (See Langevin, 1990 for a discussion).

In summary, Flor-Henry (1980, 1987) has proposed that the paraphilias may be associated with dominant frontal and temporal lobe damage in males. Several studies have reported results which support this position (e.g., Hucker et al., 1986; Scott et al., 1984; Yeudall et al.(1986) (Cited in Flor-Henry, 1987; Yeudall & Fromm-Auch, 1979) whereas others have reported findings which failed to support Flor-Henry's(1980, 1987) theory (e.g., Langevin, 1985; O'Carroll, 1989a; Tarter et al., 1983).

The Present Investigation

The present study aims to test Flor-Henry's (1987) theory regarding dominant frontal and temporal lobe impairment in sex offenders. Trail Making B, the Coloured Progressive Matrices, and Williams Verbal Learning Test, the three measures which most significantly differentiated sex offenders from controls in the study reported by Yeudall et al. (1986), will be administered to three groups of subjects. (These tests are presumed by Flor-Henry (1987) to reflect functioning of the dominant frontal and temporal lobes). As in the study by Yeudall et al. (1986) a group of sex offenders will be compared to a group of normal controls. However, a group of individuals convicted of non-violent non-sexual crimes will

be used as a second control group. This is felt to be important as few studies have found differences between sex offenders and prison controls. Those studies which have found differences between sex offenders and controls have tended to use groups of normal controls. Further, a homogeneous group of sex offenders will be used, and a detailed psychosexual history will be taken on each of these individuals. Finally, groups will be compared on a number of background measures thought to be related to performance on neuropsychological tests. It may well be, for example, that sex offenders perform more poorly than normal controls simply because they are less intelligent, have fewer years of education, or have long histories of alcoholism. These factors need to be controlled in any study on the association between neuropsychological impairment and sexual deviation. To date, few studies have attempted to control for these important potential sources of variation.

Hypotheses

It is hypothesized that differences will be found between prison and normal populations on measures reflecting neuropsychological impairment, but that there will be no differences between sexual and non-sexual offenders. The rationale for this latter hypothesis is that most studies that have used prison control groups have found few differences

between sexual and non-sexual offenders (e.g., Langevin, 1985; Tarter et al. 1983). Studies reporting significant differences between groups have tended to use normal control groups as a basis of comparison (e.g., Graber et al., 1982; Scott et al., 1984). Further, it is hypothesized that among prisoners, repeaters, regardless of their crime, will demonstrate more evidence of neuropsychological impairment relative to non-repeaters. The rationale for this prediction is that it has been previously suggested that repeat offenders irrespective of type of offence may evidence greater neuropsychological impairment than non-repeater offenders (Yeudall, Fedora & Fromm, 1986).

METHOD

Subjects

Sex Offenders

Three groups of subjects were selected for study. The first group of subjects consisted of individuals who had been convicted of sexual assault against children (SO). Subjects in this group were recruited both from among inmates at Her Majesty's Penitentiary in St. John's, Newfoundland as well as from the clients of a forensic psychiatrist. None of the individuals tested in this group had ever been imprisoned for crimes of a non-sexual nature and none had a history of violence (i.e., no men who had committed violent sexual assault were recruited). All but two of the subjects were tested in Her Majesty's Penitentiary in St. John's. Of these two individuals one was tested at St. Clare's Mercy Hospital in St. John's, and the other at the Waterford Hospital in St. John's. One subject in the SO group could not read and was thus unable to complete the National Adult Reading Test (NART, see measures) (all questionnaires were read to this subject). The subject reported that he did know the alphabet and thus completed Trail Making B. One subject did not complete the Coloured Progressive matrices. In all, 10 subjects were tested in prison and two were inpatients in hospitals located

in St. John's. All subjects in this group were in prison for their first time.

Subjects in this group were interviewed either by a forensic psychiatrist, the principal researcher, or both. In the case of seven subjects it was not possible for both interviewers to be present. Four of these individuals were interviewed by the psychiatrist alone. The remaining three subjects were interviewed by the principal researcher. All interviews were conducted using an identical structured interview schedule (Appendix A) developed based on DSM-111-R diagnostic criteria for the paraphilias.

The purpose of the interview schedule was to arrive at a diagnosis with reference to the presence and nature of pedophilia and to discuss the exact nature of the offences carried out against the victim(s). Information regarding the sexual development of the subject was also recorded. All diagnoses were based on the criteria specified by DSM-111-R (American Psychiatric Association, 1987). Based on the interview data none of the subjects met DSM-111-R diagnostic criteria for any paraphilia, including pedophilia. Specifically, none of the subjects reported having recurrent intense sexual urges or fantasies about pre-pubescent children and therefore did not fulfill DSM-111-R criteria for pedophilia (but see discussion).

Subjects in all three groups were tested if they were under 75 years of age. Subjects were excluded from study if evidence of head injury, tumor, stroke, psychiatric hospitalization (except if this was related to child sexual abuse), or violent crimes was detected.

All subjects were required to score above the recommended cut-off score of 23 on the Mini Mental State Examination (Dick et al., 1984), a screening measure for gross cognitive impairment. This measure was used to ensure that all subjects would be oriented to place, time and person prior to participating and to screen out individuals who may have been suffering from gross cognitive impairment (e.g., dementia).

In all, 21 sexual offenders were approached. Of these, 16 agreed to be tested. One subject refused to complete testing and the data from one individual could not be used due to a history of stroke. With one subject testing could not be completed as he was unable to understand the instructions to many of the tests. The data from one additional subject was not used as he scored under 23 on the Mini Mental State Examination. The final sample of sex offenders consisted of 12 subjects. Seven of these individuals had been involved only with male children, whereas the remaining subjects had been involved only with female children.

Prison Controls

A group of prisoners (PCON) who had been convicted of non-violent non-sexual crimes (e.g., property crimes) served as controls. This group comprised individuals who had been convicted of one or more crimes of a non-violent non-sexual nature. Prison controls were recruited both from Her Majesty's Penitentiary in St. John's (N=8) and from the prison in Salmonier Line, Newfoundland (N=4). Five individuals in this group had been imprisoned only once. The remaining seven individuals had been imprisoned two or more times.

Information regarding these subjects were obtained from classification officers at Her Majesty's Penitentiary in St. John's. Exclusion criteria were identical to those used for sexual offenders with the exception that no history of sexual offences could be present. Information was obtained regarding both the number and type of offences committed.

Twenty-eight subjects believed to meet the requirements for inclusion in the prison control groups were interviewed. Of these 17 agreed to be tested. The data from four PCON subjects were not used as it was subsequently discovered that they had a history of one or more violent crimes. The data from one subject was excluded as he did not exceed the recommended cutoff score for the Mini-Mental State Examination. In all, 12 subjects completed testing.

Two subjects in this group were unable to read and thus did not complete the NART (all questionnaires were read to these subjects). These subjects reported that they did know the alphabet and thus were given Trail Making B to complete. Among prisoners roughly the same proportion of subjects within each group were single, married or divorced. With reference to sex offenders seven individuals were single, four were married, and one was divorced. Among prison controls, seven individuals were single, two were married, and three were either separated or divorced.

Normal Controls

A third group of adult male normal control subjects (NCON) were also used. The data obtained from these subjects provided a means of making comparisons between the "man on the street" and the groups of prisoners who were studied. These subjects were recruited from among the non-professional staff at St. Clare's Mercy Hospital, a general hospital located in St. John's, Newfoundland as well as from the staff at Her Majesty's Penitentiary in St. John's. For the purpose of this study "normal" was defined as having never been convicted of an indictable offence and having never received psychiatric/psychological help. The demographic questionnaire asked subjects about having received psychiatric/psychological help and whether they had ever been

convicted of an indictable offence. Nineteen individuals were approached and of these 17 agreed to be tested. The data from four subjects were excluded because of their professional training. In all, 13 subjects were included in the data analysis. Of these, three were single, nine were married, and one was divorced.

Procedure

All subjects were asked to sign a consent form (see Apendix B). Each subject was also informed that he was under no obligation to participate in the study. (Given that many of the subjects were prisoners and may have felt obligated to participate, thinking that the consent form was a mere formality, a special effort was made to inform them that they were truly under no obligation to participate in the study.) Further, every effort was made to ensure that as few persons as possible knew whether an individual did or did not participate in the study. For example, all prisoners were interviewed in a room located on their ward of the prison, rather than taking them through other areas.

The recruitment procedure for all prisoner groups was as follows: A list of names (obtained either from a forensic psychiatrist or from a prison classification officer) was obtained prior to entering the prison. Upon entering the prison the list was given to the Lieutenant on duty. The unit in which

the subjects were located was determined and the researchers were escorted to those units. The guards on the unit were told to escort the prisoners whom the researchers requested to an interview room located on the unit. The guards were not told what the purpose of the interview was.

When the subject arrived at the interview room the researchers introduced themselves and briefly described the purpose of the study. Subjects were then asked if they wished to participate and were told that they were free to decline. It was stressed that if they wished to participate the information obtained was confidential. Subjects were shown that the investigators had obtained a letter from the Attorney General's office stating that none of the data collected could be used in a court of law and that the research was strictly for scientific purposes.

Subjects in the SO group were then told that there were two parts to the study. In the first part they would be asked a number of personal questions regarding their development and the specific nature of their crime. In the second part, they were asked to fill out a number of questionnaires and to perform several tasks. Subjects in the PCON group were simply told that they would be asked to fill out a number of questionnaires and perform several tasks.

Subjects were then asked if they wished to participate. If they accepted they were asked to sign a consent form. If they declined the subject was thanked and was escorted back to his cell. All subjects were tested individually.

For the normal controls the recruitment procedure was as follows. The staff at St. Clare's Hospital who participated in the study were approached by a forensic psychiatrist who was on staff at the hospital. The staff at Her Majesty's Penitentiary in St. John's who participated in the study were contacted by the principal researcher. The purpose of the study was explained to each subject and they were then asked if they wished to participate in the study

The present investigation was approved by both Memorial University's Faculty of Science Ethics Committee, as well as by the Human Subjects Investigations Committee.

Measures

The following measures were administered in the following order to all subjects:

1. A demographic questionnaire which asked the subject about his age (years), level of education (years), marital status, occupation (if applicable) and medical history (Appendix C).
2. The Hospital Anxiety and Depression Scale (HAD) (Zigmond & Snaith, 1983) (Appendix D). This scale was administered in order to control for clinical levels of anxiety

and depression, as both conditions can significantly effect neuropsychological test performance (Lezak, 1983).

3. The State Anxiety Inventory (STAI) (Spielberger, Gorsuch, and Lushene, 1970) (Appendix E) was administered to assess anxiety during the testing situation which may effect neuropsychological test performance.

4 The Michigan Alcohol Screening Test (MAST) (Selzer, 1971) (Appendix F). This measure provided a means of assessing whether an individual was or has ever been alcohol dependent. Given that there is an association between the abuse of alcohol and various types of criminal behaviour (Langevin, 1985) it was felt that this was an important variable to assess. Further, alcohol abuse may result in damage to the brain which can be detected on neuropsychological tests (Lezak, 1983). This measure has also been used in other investigations on sexually deviant individuals (e.g., Langevin, 1985).

5. The National Adult Reading Test (NART) (Nelson, 1982) (Appendix G). This test provides a rapid method of estimating an individual's intelligence level, and is highly correlated with the Wechsler Intelligence Scales for adults (Nelson & O'Connell, 1978). The rationale for the inclusion of this measure was that it allowed us to make comparisons between the various groups on level of intellectual functioning

which, if not controlled for, might otherwise complicate interpretation of the results. This was particularly important as some studies have reported lower intelligence quotients among sex offenders (e.g., Marshall & Barbaree, 1988).

The following three measures were those which Yeudall et al. (1986) (Cited in Flor-Henry, 1987) found to significantly differentiate sex offenders from controls, sex offenders scoring more than three standard deviations below control means. These measures were proposed by Flor-Henry (1987) to reflect dominant frontal/temporal functioning.

6. Coloured Progressive Matrices (Raven, 1962). This test consists of a series of designs, each with a piece missing. The subject is given a choice between six pieces, only one of which correctly completes the design. This is a visual-spatial problem solving task.

7. Williams Verbal Learning Task (Williams, 1968). This task involves having the subject learn the meanings of words which he has never encountered. Subjects are first read a list of eight words and their definitions. The subject is told to tell the experimenter if any of the words are familiar to him. If the client says that he has heard a word before another word is selected from a standard list. After the words and their meanings are read the subject is presented with the words alone and asked for their meanings. A series of trials are then

presented to the subject with each trial consisting of the eight words. If the subject does not know the answer, or guesses incorrectly, the correct answer is provided. The test is discontinued after either the subject performs perfectly on a given trial or after five trials in which there is at least one error.

8. Trail Making B Task (Army Individual Test Battery, 1944). This task involves having the subject join a series of numbers and letters in order so that the number one is joined with A, number two is joined by B and so on. The subject is first given a sample trial and is then given a longer series of numbers and letters. The test is timed and any mistakes made by the subject are pointed out. The subject is told to correct his mistake before proceeding further. The score is based on the number of seconds required to complete the task accurately.

9. The Mini-Mental State Examination (MMS)(Dick et al., 1984). This test was administered in order to control for general level of orientation of the groups. The purpose of the MMS is to act as a screening measure for subjects suffering global cognitive impairment (e.g., dementia). Subjects were either asked a specific question (e.g., "What time is it?") or were asked to perform a specific task (e.g., to follow a simple written instruction).

Subjects were first asked to complete the questionnaires (i.e., Demographic Questionnaire, HAD, STAI, and MAST). Following this the NART and neuropsychological measures (Williams Verbal Learning Task, Trail Making B, and the Coloured Progressive Matrices) were administered. Last, the Mini Mental State Examination was administered. The entire testing procedure lasted approximately 45 minutes.

RESULTS

All data were analyzed using the Statistical Package for Social Sciences-X (Nie, Hull, Jenkins, Steinbrenner, & Brent, 1975; SPSS Inc., 1986). Results relevant to the hypotheses are presented first for the background/matching variables and then for the neuropsychological measures.

Background/Matching Variables

A Multivariate Analysis of Variance (MANOVA) was performed on the background/matching variables (See Table 1). As can be seen the overall MANOVA is significant. Univariate results indicated that the groups differed significantly on Age, The Hospital Anxiety and Depression Scale (HAD)(Depression subscale), and on The Spielberger State Trait Anxiety Inventory (STAI)(See Figure 1).

Post Hoc analyses (Scheffe') revealed that the sex offenders were significantly ($P<.05$) older when compared to prison controls. Sex offenders were also found to be significantly ($P<.05$) more depressed (HADD) and more anxious (STAI) when compared to normal controls; however, no statistically significant results emerged on these measures when sex offenders were compared with prison controls.

Background/Matching Variables Significantly Correlated with Neuropsychological Measures

In order to determine which of the background/matching

Table 1Manova (Approx F=2.82(Wilks), P<.003)Means and Standard Deviations for BackgroundVariables

<u>Variable</u>	<u>Sex Offend</u>	<u>Prison Cont</u>	<u>Norm Cont</u>	<u>Univariate</u>
AGE	44.0(±10.19)	28.9(±9.44)	34.1(±7.04)	F=8.23**
EDUC	11.5(±4.34)	10.1(±2.51)	11.5(±1.13)	F=.90
HADA	9.5(±4.97)	8.3(±5.0)	6.2(±2.44)	F=1.99
HADD	7.0(±4.45)	4.2(±3.31)	1.9(±1.32)	F=7.48**
NART(IQ)	102.5(±10.76)	97.5(±6.09)	102.6(±5.9)	F=1.57
MAST	11.1(±12.26)	11.1(±11.07)	2.8(±3.89)	F=3.05
STAI	46.2(±13.05)	39.0(±13.43)	33.2(±6.86)	F=3.98*

Note:P<.05=*

P<.01 = **

P<.001=***

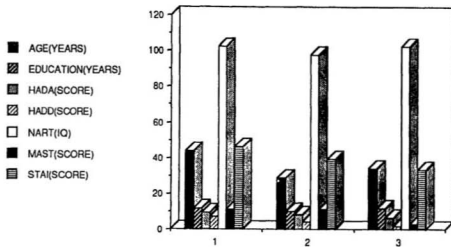


Figure 1: Means for Background/Matching Variables by Group
(Group1=Sex Offenders, Group 2=Prison Controls, Group
3=Normal Controls)

variables were significantly correlated with the neuropsychological measures a correlation matrix was calculated (See Table 2). As can be seen from Table 2 Age, Education (number of years), and scores on the Michigan Alcoholism Screening Test (MAST) were all significantly correlated with scores on one or more of the neuropsychological measures.

Neuropsychological Measures

In order to ensure that any differences obtained between groups on the neuropsychological measures were not the indirect result of differences on the background variables, a multiple analysis of covariance (MANCOVA) was performed. Those variables significantly correlated with the neuropsychological tests were entered as covariates. As noted above Age, Education, and MAST were significantly correlated with the neuropsychological tests. These three variables were therefore used as covariates.

Although post hoc analyses revealed that there were significant differences between the groups on the HADD and STAI these variables were not used as covariates. The rationale for excluding these measures was that scores on these measures were not correlated with scores on the neuropsychological tests (See Table 2). Scores on the three

Table 2**Pearson's Correlation Matrix of Background/Matching Variables and Neuropsychological Measures**

	AGE	EDUC	HADA	HADD	NART	MAST	STAI
TRAILS	.57***	-.33*-.23		-.11	-.15	.09	-.05
MATRICES	-.39**	.32*	.00	-.02	.27	-.50***	
	.14						
WILLIAM'S	.28*	-.29*	.06	.13	-.14	.15	.18

Note: $P < .05 = *$

$P < .01 = **$

$P < .001 = ***$

neuropsychological measures were all significantly correlated with each other (See Table 3).

As can be seen from Table 4 the overall MANCOVA comparing groups on the three neuropsychological measures (the effects of Age, Education, and MAST having been removed) failed to reach acceptable levels of significance. A significant within cells regression was obtained ($P < .001$, Wilks) suggesting that the assumption of homogeneity of variance had been violated. Further analyses revealed that this was due to the effect of age. However, the interactions were found to be orthogonal. None were disordinal within the age range. Since the groups maintained their relative rank order throughout the age range, on the neuropsychological measures, it was considered legitimate to include age within the MANCOVA (Pedhazur, 1982).

It was predicted that prisoners would score significantly lower on the neuropsychological measures when compared to normal controls. It was also predicted that there would be no statistically significant differences between the groups of prisoners on any of the neuropsychological measures. In order to test these hypotheses one-way contrasts were conducted on each of the neuropsychological measures (Table 5). These contrasts represent simple one-way comparisons not controlling for the effects of age, education and MAST.

Table 3
Correlations Between Neuropsychological Measures

	Trails	Matrices	Williams
Trails	1.0	-.55***	.49**
Matrices	-.55***	1.0	-.46**
Williams	.49**	-.46**	1.0

Note: $P < .05 = *$

$P < .01 = **$

$P < .001 = ***$

Table 4

MANCOVA on Neuropsychological Measures using Age,
Education, and Mast as Covariates (Approx
F=.957(Wilks), P>.05)

<u>Variable</u>	<u>Sex Offend</u>	<u>Prison Cont</u>	<u>Norm Cont</u>	<u>Univariate</u>
TRAILS(Secs)	128.5(+65.46)	105.36(+53.2)	87.39(+22.73)	F=1.38
Matrices	28.60(+4.03)	29.27(+5.1)	31.92(2.69)	F=.76
Williams	20.60(+8.80)	20.10(+7.8)	13.62(+7.53)	F=2.40

Table 5
Contrasts

TRAILS:

Sex Offenders vs. Prison Controls, $t=.64$

Sex Offenders vs. Normal Controls, $t=.1.85$

Prison Controls vs. Normal Controls, $t=1.27$

MATRICES:

Sex Offenders vs. Prison Control, $t=-.02$

Sex Offenders vs. Normal Controls, $t=-2.39^*$

Prison Controls vs. Normal Controls, $t=-1.90$

WILLIAM'S:

Sex Offenders vs. Prison Controls, $t=-.05$

Sex Offenders vs. Normal Controls, $t=2.30^*$

Prison Controls vs. Normal Controls, $t=2.34^*$

Note: $P<.05=^*$

Results indicated that, as predicted, on all three neuropsychological measures the two groups of prisoners did not differ significantly from each other. On both the Coloured Progressive Matrices and Williams Verbal Learning Test subjects in the SO condition differed significantly from subjects in the NCON condition. No significant differences were found between any of the groups on Trail Making. Figure 2 shows the differences between the groups on the three neuropsychological tests.

Discriminant Function Analyses

A set of discriminant function analyses were conducted in order to determine whether the groups could be differentiated on the basis of their test results (See Tables 6-8). The results indicated that, when all variables were included in the analysis, 82% of all subjects could be correctly classified into the three groups of sex offenders, prison and normal controls. When a discriminant function analysis was run, using only the background variables, however, 77% of the subjects could still be correctly classified into the three groups. However, only 64% of the subjects could be correctly classified on the basis of neuropsychological test performance alone.

Repeaters Versus Non-Repeaters

Subjects in both SO and PCON groups were divided

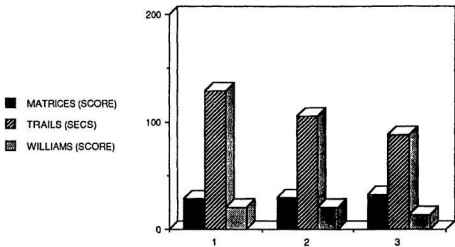


Figure 2: Means by Group for Neuropsychological Measures (Group 1=Sex Offenders, Group 2=Prison Controls, Group 3=Normal Controls)

Table 6
Discriminant Function Analysis on All Variables*

<u>Actual Group</u>	<u>No of Cases</u>	<u>SO</u>	<u>Predicted Group</u>	
			<u>PCON</u>	<u>NCON</u>
<u>Group</u>				
SO	10	80%(8)	20%(2)	0%(0)
PCON	11	9.1%(1)	72.7%(8)	18.2%(2)
NCON	13	7.7%(1)	0%(0)	92.3%(12)

Percent of "Grouped" Cases Correctly Classified: 82.35%

*Variables included in the analysis were Age, Education, HADA, HADD, NART, MAST, STAI, Trail Making, Coloured Progressive Matrices, and Williams Verbal Learning Test. Two individuals did not complete the NART and one subject did not complete the Coloured Progressive Matrices and are therefore excluded from the analyses.

Table 7
Discriminant Function Analysis on Background
Variables*

<u>Actual Group</u>	<u>No of Cases</u>	<u>Predicted Group</u>		
		<u>SO</u>	<u>PCON</u>	<u>NCON</u>
<u>Group</u>				
SO	11	81.8%(9)	9.1%(1)	9.1%(1)
PCON	11	9.1%(1)	63.6%(7)	27.3%(3)
NCON	13	7.7%(1)	7.7%(1)	84.6%(11)

Percent of "Grouped" Cases Correctly Classified: 77.14%

*Variables included in the analysis were Age, Education, HADA, HADD, NART, MAST, and STAI. Two individuals did not complete the NART and are therefore not included in the analyses.

Table 8
Discriminant Function Analysis on Neuropsychological
Measures*

<u>Actual Group</u>	<u>No of Cases</u>	<u>Predicted Group</u>		
		<u>SO</u>	<u>PCON</u>	<u>NCON</u>
Group				
SO	11	54.5%(6)	18.2%(2)	27.3%(3)
PCNON	12	25.0%(3)	50%(6)	25%(3)
NCON	13	0%(0)	15.4%(2)	84.6%(11)

Percent of "Grouped" Cases Correctly Classified: 63.89%

*Variables included in the analysis were Coloured Progressive Matrices, Trail Making, and Williams Verbal Learning Test. One individual did not complete the Coloured Progressive Matrices and was therefore excluded from the analyses.

into repeater and non-repeater groups. SO subjects were divided into repeater and non-repeater groups on the basis of whether they had offended against only one victim (N=6), or against two or more victims (N=6). Subjects in the PCON condition were classified as repeater or non-repeater on the basis of whether they had been imprisoned once (N=5) or two or more times (N=7). A priori analyses on the three neuropsychological variables revealed that the groups did not differ significantly on any of the neuropsychological test measures.

DISCUSSION

The purpose of the present investigation was to attempt an independent replication of the findings of Yeudall et al.(1986) (Cited in Flor-Henry, 1987); namely, that sex offenders would differ from normal controls on neuropsychological measures believed to reflect dominant frontal and temporal lobe functioning (i.e., Coloured Progressive Matrices, Trail Making B, and Williams Verbal Learning Test). Second, it was hypothesized that offenders in general (i.e., sex offenders and non-sex non-violent offenders) would score lower than normal controls on these neuropsychological measures, but that there would be no significant differences between groups of offenders. Third, it was hypothesized that repeat offenders would evidence lower scores on the neuropsychological measures relative to non-repeaters, irrespective of the type of offence committed.

When the effects of the background variables were not considered, the results provided some support for the first two predictions. A priori analyses revealed that subjects in the SO group scored significantly lower when compared to normal controls on two of the three neuropsychological measures administered (i.e., Coloured Progressive matrices, Williams Verbal Learning Test). These results demonstrate that, even though the subject sample was small, we could

replicate the findings of Yeudall et al. (1986) regarding neuropsychological dysfunction in sex offenders. With reference to the second prediction it was observed that on all three neuropsychological measures the two groups of prisoners did not differ significantly from each other. On only one of the neuropsychological measures, however, (Williams Verbal Learning) did prison controls score significantly lower than NC subjects.

When a MANCOVA was conducted, partialling out the effects of the background variables which were significantly associated with the neuropsychological measures, all the observed differences between the groups failed to reach accepted levels of significance. It is true that sex offenders scored lower than normal controls on two of the neuropsychological measures, but this was accounted for by differences between groups in terms of age, level of education, and alcoholism (as measured by the MAST). These findings were highlighted by the discriminant function analysis which showed that a greater percentage of the variance in predicted group membership could be accounted for by the background variables (77%) than by the neuropsychological measures (64%).

With reference to the third hypothesis, no statistically significant differences were observed between repeat and non-

repeat offenders. This may have been due, at least in part, to the small number of subjects in the repeat and non-repeat groups.

The findings of the present investigation are important for a number of reasons. First, many of the studies related to neuropsychological performance in sexual offenders have used control groups consisting of normal subjects. Further, these studies have, for the most part, failed to use covariance procedures, or have not controlled for potentially important variables such as alcohol history (e.g., Scott et al., 1984; Tarter et al., 1983).

As noted above, Yeudall et al. (1986) found significant differences between a heterogeneous group of sex offenders and normal controls on Trail Making B, Coloured Progressive Matrices, and Williams Verbal Learning Test. These authors corrected scores on the neuropsychological measures for both age and sex. The findings of the present investigation failed to replicate those of Yeudall et al. (1986). It is true that a priori analyses revealed significant differences between sex offenders and normal controls on both Coloured Progressive Matrices and Williams Verbal Learning Test. Yet, these differences failed to reach acceptable levels of significance when a MANCOVA was conducted, controlling for the effects of age, education, and alcohol history. Further, even the a priori

analyses, which did not control for these factors, failed to reveal any differences between sex offenders and non-violent non-sex prison controls.

Had Yeudall et al. (1986) controlled for the effects of variables significantly associated with performance on neuropsychological tests, or used non-sex offenders as controls, it is possible that their findings would have been more similar to those of the present investigation. A second difference between the two studies was that groups in the present investigation did not differ in terms of intelligence as estimated by the National Adult Reading Test (NART). Yeudall et al. (1986) not only obtained significant differences between groups on the Coloured Progressive Matrices, Trail Making B, and Williams Verbal Learning Test, but also on measures of intelligence (Personal Communication, Yeudall, June, 15, 1989). For example, sex offenders scored three standard deviations below control means on Verbal IQ. It is interesting to note that the observed differences between groups in intelligence were not reported by Flor-Henry (1987); this is particularly worthy of note since significant differences in IQ between sex offenders and controls are a well documented phenomena (Marshall & Barbaree, 1988). Further, this omission is most surprising since many neuropsychological tests are highly correlated with measures

of intelligence. It must, moreover, be noted that the Coloured Progressive Matrices is generally considered to be a measure of intelligence (Raven, 1962). It may well be that the observed differences reported by Yeudall et al.(1986) were simply due to preexisting differences in intelligence between the groups rather than any specific fronto-temporal dysfunction. If this were the case, one would perhaps have expected NART scores to be significantly correlated with the neuropsychological measures in the present study; however, no significant correlations were observed (See Table 2).

A further question which arises with reference to this study is whether the Coloured Progressive Matrices, Trail Making B, and Williams Verbal Learning Test are truly measures of dominant frontal and temporal lobe functioning as Flor-Henry (1987) suggests. The Coloured Progressive Matrices, as noted above, was designed as a measure of general intelligence (Raven, 1962). It taps a number of functions, not the least of which is visual-spatial functioning, and attention/concentration. Visual-spatial functioning is generally considered as largely lateralized in the non-dominant hemisphere in the parietal lobe (Peck et al., 1987). Moreover, disorders of attention/concentration may stem from damage to several areas of the brain, and not only the dominant frontal and temporal lobes. Trail Making B taps similar

functions, and, as such, tests the functioning of diverse regions of the brain. However, it is also a measure of motor performance, an activity in which the frontal lobe is involved (Peck et al., 1987). Williams Verbal Learning Test is primarily a measure of verbal recall. As such it may be sensitive to damage in the medial and ventral temporal lobe of the dominant hemisphere (Peck et al., 1987).

According to the above discussion, it becomes evident that at least two of the neuropsychological measures administered (Coloured Progressive Matrices, Trail Making B) tap functions associated with a number of diverse regions of the brain. Therefore, it is unlikely that these measures specifically reflect only dominant frontal and temporal lobe functioning. It may also be somewhat naive to think of specific neuropsychological tests as mapping only onto specific isolated brain regions. Neuropsychological tests may well tap functions specific to various parts of the brain. To think of the brain as composed of four separate and distinct lobes does not make much sense anatomically, physiologically, or psychologically.

The concept of specific neuropsychological tests that map onto specific neural areas has a long history, and is derived largely from lesion studies. For example, military personnel with damage to the frontal lobe were observed to

perform poorly on such tests as word fluency; therefore, word fluency performance became associated with the frontal lobes (Lezak, 1983). However, recent advances in technology have allowed observation of the living brain as a subject is performing a cognitive task. Investigations using such techniques (e.g., Positron Emission Tomography or PET scan) have suggested that many of our long-held views of brain/behaviour relationships (derived from lesion studies) may have to be revised. For example, Parks et al. (1988) using PET imaging during word fluency challenge, reported greater activation of the temporal rather than the frontal lobes.

Many systems extend through various parts of the central nervous system. As well, functioning in one part of the brain may have effects on other parts. Further, studies using PET scans suggest that neural networks are involved in neuropsychological test performance (Posner et al., 1988) and that these systems involve many diverse regions of the brain.

It should also be recalled that O'Carroll (1989a) failed to replicate the results of Yeudall et al. (1986) with reference to the three neuropsychological measures discussed.

Nonetheless, several studies did find neurophysiological as opposed to neuropsychological differences between sex offenders and controls (e.g., Flor-Henry et al., 1986a,b; Graber

et al., 1982; Hucker et al., 1986) thus providing some support for Flor-Henry's (1980, 1987) theory.

An interesting study by Hucker et al. (1986), methodologically similar to the present study, compared heterosexual, homosexual, and bisexual pedophiles to non-violent non-sex prison controls. All subjects completed the Luria-Nebraska Neuropsychological test battery and the Wechsler Adult Intelligence Scales. Computed Tomography (CT) scans were also taken of all subjects. Results indicated that pedophiles tended to have lower IQ's than controls and showed significantly more impairment on all measures. Results were found to be relatively unaffected by history of alcohol and drug abuse, or age. When all cases over 40 years of age were excluded from the analyses, no significant differences were found in age, education, or IQ, but the Reitan impairment index remained significant. These findings do not suffer from any of the flaws discussed with reference to the study of Yeudall et al. (1986). In fact, it is the most comprehensive study that could be located relating to neuropsychological impairment in sex offenders: A homogeneous group of sex offenders was used; as well, great care was taken so as to control for the effects of variables that might have influenced neuropsychological test performance. Even when the effects of such variables were

eliminated, significant differences were obtained between pedophiles and prison controls. These results are clearly quite different from those obtained in the present study.

There are several possible reasons for this discrepancy. First, Hucker et al. (1986) used a much more extensive battery of tests than was used in the present investigation. These tests provided a much more sensitive index of neuropsychological functioning than could have been obtained by the three measures employed in the present study. However, it should be emphasized that the present study was specifically a hypothesis-testing exercise, attempting to replicate the findings of Yeudall et al.(1986). Too many studies in the past have given as many tests as possible or administered neuropsychological test batteries to experimental and control groups and then write about the few measures that differentiate groups as indicative of etiology.

A second difference between the present study and that reported by Hucker et al. (1986) was that all of the subjects in the latter study had been specifically referred for treatment and were seeking clinical attention. As well, many of the subjects tested by Hucker et al. (1986) had not been convicted of any sexual offence. In fact, Hucker et al. (1986) note that most of their subjects "were seen pre-trial or pre-sentence" (p. 441). All subjects in the present study had been convicted

prior to being tested. Further, none were assessed because they were seeking treatment. Whether these factors had any bearing on the results is, however, unclear.

Perhaps the most important difference between the present study and that reported by Hucker et al. (1986) is in relation to the presence of violent behavior among experimental groups. Twenty-one percent of the homosexual and 33% of the bisexual pedophiles had a history of violence in the study reported by Hucker et al. (1986). None of the subjects in the present study had any history of violence. This is of importance, since violence has been linked with brain pathology and neuropsychological impairment (e.g., Bryant et al. 1984; Langevin, 1990; Spellacy, 1978). Therefore, this is a potentially important difference between the two studies; perhaps Hucker et al. (1986) found neuropsychological dysfunction to be associated with violence rather than pedophilia?

One finding of the present study which is similar to those of Hucker et al. (1986) involves the age of sex offenders. Sex offenders were found to be significantly older than controls both in the present study as well as in the study reported by Hucker et al. (1986). Other researchers have reported similar findings (e.g., Glaser, 1988). It may be that such findings are not coincidental. It is possible, for example,

that only sex offenders with a long history of offending (who may therefore be older than a general prison population) are sentenced whereas first or second time sex offenders are given the opportunity to receive treatment. It is also possible that the more victims an individual has offended against the greater the likelihood of his being caught particularly as victims approached adulthood and may have felt able to report the abuse.

The present study differs from both the study of Yeudall et al. (1986) and Hucker et al. (1986) with reference to diagnosis of experimental subjects. In both the latter studies, groups of sex offenders diagnosed as having a particular paraphilia were tested. None of the subjects in the present investigation met DSM-111-R criteria for any paraphilia. However, Yeudall et al.(1986) did not specify how their diagnoses were reached. In short, it is not clear whether Yeudall et al. (1986) actually tested individuals who met the DSM criteria for paraphilia. Further, it is not clear whether these individuals had committed any additional crimes either of a sexual or a non-sexual nature. As previously noted, this is important because violent crimes have been linked with neuropsychological impairment (e.g., Spellacy, 1978).

In the study by Hucker et al. (1986) patients were diagnosed as pedophilic using a combination of criminal

history, self-report, and phallometric testing. Although the authors attempted to describe the manner in which diagnoses were obtained, the reader is not provided with information regarding DSM diagnoses, or criteria for their particular diagnosis of pedophilia. It is unclear, for example, to say that "self-report" was used as a basis for diagnosis; it leaves such questions as, "What did they report?" unanswered.

Such details are important in that differences may exist between a person arrested for sexual assault of a minor (i.e., a criminal code violation) and a pedophile (i.e., a psychological/psychiatric diagnosis). These terms are not synonymous. For example, it is possible for an individual to meet the criteria for a diagnosis of pedophilia and never have actually engaged in sexual activity with a minor, and reciprocally someone who clearly has sexually assaulted a child may not fulfill DSM-111-R criteria for pedophilia.

As noted above, none of the subjects in the present investigation met DSM-111-R criteria for any paraphilia including pedophilia, despite the fact that they were convicted child molesters. None of the subjects admitted to experiencing recurrent intense sexual urges and fantasies involving a prepubescent child or children over a six month period. There are several possible reasons for this occurrence. First, in spite of the fact that all subjects were informed that none of

the data collected could be used in a court of law, and that a letter from the Attorney General's office had been obtained to this effect, a number of the subjects may have been fearful about divulging information which could be potentially damaging if revealed in court, and therefore were "faking-good." The fact that several subjects in the SO group claimed that they had not masturbated for many years, and that others blamed their victims for what had happened (e.g., she came into my bed and initiated sexual activity) suggests that subjects in the SO group may have been "faking-good". Further, several of the subjects in the SO condition were appealing their convictions and may have been particularly nervous about revealing potentially damaging information. Also among the subjects who declined to be tested, a number claimed to be innocent in spite of overwhelming evidence to the contrary.

The issue of "faking-good" among sex offenders has been raised by a few authors (e.g., O'Carroll, 1989b); but, in general, it has received little attention in the literature. Marshall and Barbaree (1988), for example, found that many of the child molesters in their study had lied regarding relapse. Clearly, the issue of "faking-good" is an important one. In all likelihood, a number of subjects in the present study may have met DSM-111-R criteria for pedophilia. However, since we were dependent upon self-report information offered by the

subject, and since none of the subjects admitted to fantasizing or having recurrent urges about children, we were unable to diagnose any individual in the SO condition as a pedophile according to DSM-11-R criteria .

Nonetheless, this does not explain the observed differences between the present study and that of Abel et al. (1988), who found that the majority of their sex offenders met criteria for the diagnosis of a variety of paraphilias. One reason for this disparity may relate to the fact that subjects in the Abel et al. (1988) study were highly selected. Abel et al. (1988) state that "all subjects reported recurrent, repetitive urges to carry out these deviant sexual behaviors; subjects were not included simply because they had committed the behavior" (p. 155). In short, only subjects who met one of the basic criteria for the diagnosis of many of the paraphilias were tested, namely, those having recurrent urges to engage in the behavior. The present study employed an unselected group of sexual assaulters against minors. All subjects who met the recruitment requirements, and who agreed to participate, were tested. It was felt that this was important so as to avoid a select sample which may be atypical of sex offenders. It may be that our results differ from those of Yeudall et al. (1986) and Abel et al. (1988) because we did not test individuals

diagnosed as having one or more paraphilias whereas the latter authors did.

The results of the present study cast doubt on yet another theory as to the etiology of the paraphilias. Although the initial results reported by Flor-Henry (1987) were very promising, the findings of the present study suggest that it is not just sex offenders who differ from normal controls; rather, it is offenders in general who may differ from normal individuals in terms of neuropsychological performance. Further, these differences may be accounted for by background variables such as age, education and alcohol history. It may well be that the sexual deviations are complex multidetermined behaviours that defy simple explanations. In order to account for such behaviour a multi-faceted perspective is necessary. Marshall (1989) points out that such factors as failure to achieve age-appropriate intimate relationships and loneliness may well be crucial in the development of the sexual deviations; unfortunately, most authors tend to pay little attention to such potentially important factors.

Limitations of the Study

There are a number of limitations to the present study. First, the subject sample was small. Had a larger sample been tested, for example, it is possible that differences between

repeat and non-repeat offenders would have been obtained. Significant differences were, however, obtained on univariate analyses, where sexual offenders differed from normal controls on two of the three neuropsychological measures. These initial findings largely replicated the results of Yeudall et al. (1986). Second, a more complete survey of drug use would have proved useful. As part of the procedure, subjects were given the Michigan Alcoholism Screening Test (MAST)(Selzer, 1971). Although important, a more complete assessment is necessary in order to rule out the possibility that the consumption of other drugs influenced the results. It would also have been useful to have administered neurophysiological measures (e.g., Electroencephalographic recordings) as several authors have found differences between sex offenders and controls on such measures (e.g., Flor-Henry, 1986a,b). It would also have been interesting to compare a group of "admitters" (i.e., men who fulfilled DSM-111-R criteria for pedophilia) versus "non-admitters". However, that was not possible in the present study as none "admitted" to fantasizing or having sexual urges about children.

Conclusions

The results of the present study failed to replicate the findings of Yeudall et al.(1986). A homogeneous group of sex offenders was compared to a group of non-violent, non-sex

prison controls and a group of normal controls. The measures administered included the three neuropsychological tests (Coloured Progressive Matrices, Trail Making B, Williams Verbal Learning Test) which were found to best discriminate between sex offenders and normal controls in the study conducted by Yeudall et al. (1986). Although differences were found between sex offenders and normal controls on neuropsychological tests, these differences were found to be the result of between-group differences in background variables. These findings lend further support to the results reported by O'Carroll (1989a) who failed to find differences between a heterogeneous group of sex offenders and psychologically distressed (anxious) or normal control groups on these same neuropsychological measures.

Directions for Future Research

As noted above, the present investigation is the first to employ groups of both normal and prison controls in this research area. The results suggest the importance of using prison controls in studies on sex offenders. A priori analysis showed that there were no differences between groups of prisoners but that sex offenders differed from normal controls. These results are in accordance with the literature, where significant differences tend only to be found between sex offenders and normal controls.

Studies using normal controls have typically observed differences between groups of sex offenders and controls. Previously, authors have speculated on neuropsychological dysfunction and its possible role in the genesis of the paraphilias. The present results suggest that it is prisoners in general (i.e., non-specific offenders), and not simply sex offenders, who differ from normal controls. Further, these differences are attributable to background variables such as age, education, and alcohol history. It should be remembered that in the present study, sexual offenders were significantly more depressed and anxious relative to normal controls, but not significantly different on these measures when compared with prison controls. Glaser (1988) has provided evidence to the effect that sex offenders, in fact, are quite similar to other prisoners both demographically and in terms of criminal history. Further, with exception to Hucker et al. (1986), those studies using prison controls have tended to find no statistically significant differences on neuropsychological measures between groups (e.g., Langevin, 1985; Tarter et al., 1983). Our results are in accord with these findings as well.

A useful additional direction for future research would be use of covariance procedures. Prisoners tend to have backgrounds which differ from those of normal controls; this must, therefore, be considered in the analysis. Surprisingly

few studies have made adequate use of these procedures. Simply correcting neuropsychological test scores for age and sex, as some studies have done (e.g., Yeudall et al. 1986) is not sufficient; at the very least, information on intelligence, education, alcoholism and mental state must be collected.

Last, it is important that homogeneous groups of sex offenders be used. Simply testing individuals with a history of one or more sexual offences without regard for their criminal histories may result in extremely heterogeneous groups of subjects being tested. There may well be differences between an individual who has been convicted only of offences against minors versus an individual with a history of violent crime who has one conviction of a sexual nature. To place such individuals in the the same group, as many researchers have done, may produce uninterpretable results.

Only by conducting methodologically sound studies will we be in a better position to understand and consequently treat individuals suffering from these puzzling conditions. Admittedly, there are many obstacles to overcome in conducting such research, not the least of which is subject noncompliance; however, solutions must be found if we are to gain a greater understanding regarding the etiology of the paraphilias.

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APPENDIX A**Structured Sexual History Interview**

1. Date of birth
2. Age
3. Place of birth
4. Marital status
5. Offence
6. Conviction
7. Sentence-NO. of Months/Years
8. Do you believe that you were properly convicted (i.e., did you do it...etc).
9. When was your first sexual experience-at what age?
10. Was it with a boy or a girl, man or a woman?
Obtain some description of the first sexual experience
11. Have you ever had sexual intercourse with a woman?
what age Yours, Hers?
12. Have you ever had sexual intercourse with a man?
What age Yours, His?
13. Have you ever been involved in other kinds of sexual activity, such as fondling, etc. With your own sex person (man/woman) or opposite sex?
14. What is your sexual preference? Who do you like to have sex with?

15. What type of sexual activity do you prefer? Inquire about increasing sexual activity from looking, fondling to intercourse.
16. Were you ever sexually abused as a child?
17. At what age?
18. By whom? Male or female-How old was he or she?
19. What was the nature of the abuse? What did he/she do to you?
20. Did you report it to anyone? Tell anybody about it then or since then?
21. Do you still think about it?
22. Has it harmed you? In what way?
23. Do you like children?
24. Are you attracted to children?
25. Are you sexually attracted to children?
26. Male or Female?
27. Of what age?
28. Do you like a child's body to look like a child or to look like an adult?
29. Do you like to see pubic hair?
30. Does the presence of pubic hair turn you off, turn you on?
31. What kind of activity do you prefer with a child-Inquire about looking, fondling.....masturbating, oral sex, intercourse, etc.

32. What kind of sexual activity have you been involved in with a child?

(Above questions are specific to pedophilia and hebophilia)

33. What other kind of sexual activity turns you on? Thinking about it or doing it, looking through windows, etc.= voyeurism.

-Rubbing or touching against a person, man woman, child

=Frotteurism

-Showing your genitals to strangers

=Exhibitionism

-Touching, looking at or wearing objects (e.g., bra, panties, etc.).

=Fetishism

34. Do you masturbate?

35. How often do you like to have sex or masturbate or both- once a month, once a week, once a day or more often (e.g., two or three times a day).

APPENDIX B**Consent Form**

I realize that my participation in this study is voluntary, and that I am free to stop at any time. The procedure will involve approximately a half hour and will require the completion of various questionnaires as well as some tests involving memory and object manipulation. I also realize that the results from my tests will be treated with the utmost security; nobody other than the person conducting the study will be aware of how any particular individual performed. I am also aware that any future psychiatric or psychological treatment which I will receive will be unaffected by whether I decide to participate in the present investigation.

Date:

Subject's Signature:

Experimenter's Signature:

APPENDIX C
Demographic Questionnaire

Name: _____

Age: _____

Occupation(if applicable): _____

Marital Status:

Married _____ Single _____ Divorced _____ Other (please specify) _____

Education: Please check the highest level which you have completed.

Elementary School _____

High School Diploma (if you have not completed high school please specify the last grade attended) _____

University Degree (please specify the degree) _____

Medical History: Please list any medical treatment which you have obtained, relating either to past/present conditions, other than minor ailments (e.g., colds) including any psychiatric/psychological treatment.

APPENDIX D

The Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983)

Doctors are aware that emotions play an important part in most illnesses. If your doctor knows about these feelings he will be able to help you more.

This questionnaire is designed to help your doctor know how you feel. Ignore the numbers printed on the left of the questionnaire. Read each item and underline the reply which comes closest to how you have been feeling in the past week.

Don't take too long over your replies; your immediate reaction to each item will probably be more accurate than a long thought out response.

I feel tense or "wound up":

Most of the time

A lot of the time

From time to time, occasionally

Not at all

I still enjoy the things I used to enjoy:

Definitely as much

Not quite so much

Only a little

Hardly at all

I get a sort of frightened feeling as if something awful is
about to happen:

Very definitely and quite badly

Yes, but not too badly

A little, but it doesn't worry me

Not at all

I can laugh and see the funny side of things:

As much as I always could

Not quite so much now

Definitely not so much now

Not at all

Worrying thoughts go through my mind:

A great deal of the time

A lot of the time

From time to time but not too often

Only occasionally

I feel cheerful:

Not at all

Not often

Sometimes

Most of the time

I can sit at ease and feel relaxed:

Definitely

Usually

Not often

Not at all

I feel as if I am slowed down:

Nearly all the time

Very often

Sometimes

Not at all

I get a sort of frightened feeling like "butterflies" in the stomach:

Not at all

Occasionally

Quite often

Very often

I have lost interest in my appearance:

Definitely

I don't take so much care as I should

I may not take quite as much care

I take just as much care as ever

I feel restless as if I have to be on the move:

Very much indeed

Quite a lot

Not very much

Not at all

I look forward with enjoyment to things:

As much as ever I did

Rather less than I used to

Definitely less than I used to

Hardly at all

I get sudden feelings of panic:

Very often indeed

Quite often

Not very often

Not at all

I can enjoy a good book or radio or TV programme:

Often

Sometimes

Not often

Very seldom

APPENDIX E

Spielberger State Self-Evaluation Questionnaire

(Spielberger, Gorsuch, Lushene, 1970)

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

Note: All statements are followed by the following four options: Not at all, Somewhat, Moderately so, Very Much So.

I feel secure

I am tense

I am regretful

I feel at ease

I feel upset

I am presently worrying over possible misfortunes

I feel rested

I feel anxious

I feel comfortable

- I feel self-confident
- I feel nervous
- I am jittery
- I feel "high-strung"
- I am relaxed
- I feel content
- I am worried
- I feel over-excited and "rattled"
- I feel joyful
- I feel pleasant

APPENDIX F**Michigan Alcoholism Screening Test (Selzer, 1971)**

Questions.....Yes.....No

1. Do you feel that you are a normal drinker?
2. Have you ever awakened the morning after some drinking the night before and found that you could not remember part of the evening before?
3. Does your wife (or parents) ever worry or complain about your drinking?
4. Can you stop drinking without a struggle after one or two drinks?
5. Do you ever feel bad about your drinking?
6. Do friends or relatives think you are a normal drinker?
7. Do you ever try to limit your drinking to certain times of the day or to certain places?
8. Are you always able to stop drinking when you want?
9. Have you ever attended a meeting of Alcoholics Anonymous (AA)?
10. Have you gotten into fights when drinking?

11. Has drinking ever created problems with you and your wife?

12. Has your wife (or other family member) ever gone to anyone for help about your drinking?

13. Have you ever lost friends or girlfriends/boy-friends because of drinking?

14. Have you ever gotten into trouble at work because of drinking?

15. Have you ever lost a job because of drinking?

16. Have you ever neglected your obligations, your family or your work for two or more days in a row because you were drinking?

17. Do you ever drink before noon?

18. Have you ever been told you have liver trouble, Cirrhosis?

19. Have you ever had delirium tremens (DTs), severe shaking, heard voices or seen things that weren't there after heavy drinking?

20. Have you ever gone to anyone for help about your drinking?

21. Have you ever been in a hospital because of drinking?

22. Have you ever been a patient in a psychiatric hospital or on a psychiatric ward of a general hospital where drinking was part of the problem?

23. Have you ever been seen at a psychiatric or mental health clinic, or gone to a doctor, social worker or clergyman for help with an emotional problem in which drinking had played a part?

24. Have you ever been arrested even for a few hours because of drunk behavior?

25. Have you ever been arrested for drunk driving or driving after drinking?

APPENDIX G**The National Adult Reading Test (Nelson, 1982)**

Note: Subjects will be asked to pronounce the following words.

CHORD

ACHE

DEPOT

AISLE

BOUQUET

PSALM

CAPON

DENY

NAUSEA

DEBT

COURTEOUS

RAREFY

EQUIVOCAL

NAIVE

CATACOMB

GAOLED

THYME

HEIR

RADIX

ASSIGNATE

HIATUS

SUBTLE

PROCREATE

GIST

GOUGE

SUPERFLUOUS

SIMILE

BANAL

QUADRUPEL

CELLIST

FACADE

ZEALOT

DRACHM

AEON

PLACEBO

ABSTEMIOUS

DETENTE

IDYLL

PUERPERAL

AVER

GAUCHE

TOPIARY

LEVIATHAN

BEATIFY
PRELATE
SIDEREAL
DEMESNE
SYNCOPE
LABILE
CAMPANILE



