Acquired Sociopathy: 
A Neuropsychological Study of Executive Dysfunction in Violent Offenders

Luke Broomhall
University of Western Sydney, Australia, and Department of Correctional Services, NSW, Australia

The current research investigated the extent of executive function deficits in a population of 25 violent offenders. The population was separated into primarily instrumental and primarily reactive offenders based on their offence characteristics. Each group was then administered neuropsychological measures which were considered sensitive to executive function impairment. It was hypothesised that there would be evidence of executive dysfunction in the sample and that in comparison with the primarily instrumental group, the primarily reactive group would show significant impairment on the executive function measures. The results supported these hypotheses; the primarily reactive group was significantly impaired on tasks that assessed higher-order executive functions. The primarily instrumental group was largely intact on executive function measures, although it showed a tendency to be selectively impulsive on several executive function measures depending on how important the task was judged to be. These results suggested that primarily reactive offenders may have difficulty controlling their behaviour (acquired sociopathy) while primarily instrumental offenders may choose not to control their behaviour (selective impulsivity) and may not benefit from behaviourally based treatment. In order to effectively assess and treat violent offenders, consideration of type of violence and integrity of executive function may be important to improve outcomes.

Violent and aggressive behaviour presents a significant and ongoing challenge in modern society. Research into the antecedents of violence and aggression indicates that there are many factors which contribute to the development of these behaviours. It is important to note that while there are general predictors of violent and aggressive behaviour, no single theory can account for causation in all situations. Human behaviour can be seen as being governed by the interaction of factors as diverse as genetic predisposition, early behavioural experience, acquired brain damage, psychiatric disorder, learned behaviour patterns and situational occurrences. Violence occurs in a social context and factors such as emotional stress, poverty, alcohol and other drugs, emotional, sexual and physical abuse are often involved. It is accepted that the causes of violence are multi-faceted and that neurological deficit may be a factor in only a small percentage of those who offend. However, given that the brain is seen as the ‘organ of behaviour’ and that violence — like any behaviour — ultimately derives from the normal or abnormal operations of the brain, the aspects of brain structure and function relevant to violent behaviour deserve closer examination.

While it is not possible to conclude that a traumatic brain injury or any organic impairment invariably leads to aggression and violence, or indeed
that all criminals have neurological dysfunction, it is a link which has attracted a significant body of research. While neurological dysfunction is reported at a rate of 1% to 2% of western industrialised populations, studies indicate that anywhere between 10% and 67% of offenders have some form of neurological dysfunction (Miller, 2002).

Martell (1992) researched a population of 50 male offenders from a maximum-security state hospital for mentally disordered offenders for evidence of organic brain disorder. The research revealed that 64% of the sample had multiple indicators of organic dysfunction and that 84% of the sample had at least one indicator of organic dysfunction. A history of severe head injury, defined as involving a loss of consciousness, was present in 22% of the 50 subjects and 45% of these had evidence of multiple head injuries. Of these, 75% had been charged with murder, manslaughter or attempted murder and the remainder with violent sex offences (Martell, 1992).

Martell (1992) concluded that these findings supported a link between impaired brain functioning and violent behaviour, although more careful studies were required to investigate this link further, specifically, the role of localised brain dysfunction in violent behaviour. These findings also informed treatment in a forensic setting; that brain dysfunction can have a significant impact on treatment and lack of attention to brain integrity can result in counter-productive, iatrogenic outcomes.

Blake, Pincus and Buckner (1995) investigated neurologic abnormalities in 31 individuals awaiting trial or sentencing for murder. Their previous research had indicated that a limbic seizure or temporal lobe-mediated event was a contributing factor in violent offending. In each case the investigators sought to obtain EEG, MRI or CT and neuropsychological testing. Neuro-psychological testing included the Wisconsin Card Sort (WCST), the Halstead–Reitan Battery (including parts A and B of the Trail Making Test) and a measure of IQ. The results revealed that 97% had abnormalities that reflected brain dysfunction and that only 9 of the 31 had any evidence of temporal lobe abnormality. The researchers did, however, find a high frequency of frontal signs; frontal lobe dysfunction described as a lack of inhibitory effect upon other cortical areas, particularly those that regulate emotional responses and the ability to make rational decisions that respect social convention (Blake, Pincus, & Buckner, 1995).

The specific combination of behavioural deficits observed in an individual after a frontal lesion is dictated by the site, size, laterality and nature of the lesion and can also be mediated by the pre-existing personality and age of the individual. Blumer and Benson (cited in LaPierre, Braun, & Hodgins, 1994) characterised differences in behaviour as pseudo-psychopathic and pseudo-depressed. The researchers contended that behavioural changes observed in pseudo-depressed individuals were related to lesions to the dorsolateral pre-frontal cortex, while in individuals who presented with traits of pseudo-psychopathy, it was the orbito-frontal cortex that had sustained damage.

The theoretical understanding of the effects of frontal lobe (particularly orbito-frontal) dysfunction led researchers to investigate its links to violent behaviour. Gorenstein (1982) compared 20 male psychopaths to 23 normal controls and found that the psychopathic group made significantly more perseverative errors on the Wisconsin Card Sorting Test (WCST). The conclusion reached was that there was a relationship between frontal lobe dysfunction and psychopathy. However, the research used self-report measures to separate ‘psychopaths’ from ‘normals’ with no reliability quotients. Hare (1984) attempted to replicate Gorenstein’s research using his own Psychopathy Checklist (PCL) and the same neuropsychological tests. Hare found no significant differences in perseverative errors on the WCST and concluded that psychopathy was not linked to frontal lobe dysfunction.

While acknowledging the lack of convincing evidence for the link between psychopathy and frontal dysfunction, LaPierre, Braun and Hodgins (1994) sought to improve research methodology in this area. The researchers reasoned that previous studies had been too broad and they sought to test a more specific hypothesis of localised orbito-frontal deficit in psychopathy. The similarities between orbito-frontal dysfunction and psychopathy were stated as striking. Both showed a preoccupation with sexual matters, lack of social and ethical judgment, high irritability, behavioural disinhibition and a neglect of long-term consequences of their actions (LaPierre, Braun, &
Hodgins, 1994). The researchers chose a visual go/no-go discrimination task in which commission errors had been shown to relate to ventral frontal systems. The second assessment method chosen was the Porteus Maze Test, specifically the number of response errors (pencil lifts, wall traversals), which was related to ventral frontal integrity. The third measure selected was the Modular Smell Identification Test for differentiating orbito-frontal dysfunction. Perseverative errors on the WCST were chosen as the frontodorsolateral measure rather than orbito-frontal as research (a PET study conducted by Rezai et al., cited in LaPierre, Braun, & Hodgins, 1994) had indicated that the WCST activates the dorsolateral frontal cortex most selectively.

Subjects were administered Hare’s PCL. Psychopaths (n = 30) were differentiated as scoring > 30 and non-psychopaths (N = 30) as < 20 on this measure. Results indicated that criminal psychopaths were significantly impaired on measures of ventral frontal functioning compared with non-psychopathic criminals. However, the two groups performed similarly on the dorsolateral functioning task. While the research indicated concordance with Hare’s (1982) findings, it raised the issue that the measure (perseverative errors on the WCST) used in Gorenstein (1982) and Hare for frontal functioning was more related to dorsolateral than orbito-frontal functioning. LaPierre, Braun and Hodgins (1994) concluded that specific tests of orbito-frontal functioning could differentiate psychopaths from non-psychopaths, although further clarification was required. Indeed the researchers stipulated that ventral frontal dysfunction was not exclusively involved in the complex phenomenon of psychopathy. Nonetheless, it began to appear that psychopathic individuals who do not have demonstrable brain lesions by standard criteria might closely resemble patients who have structural damage in the orbito-frontal region.

Of particular relevance in a forensic setting to criminal investigation, treatment and recidivism in psychopathy is the distinction drawn between ‘instrumental’ and ‘reactive’ forms of violence. In general, instrumental or proactive violence occurs when the injury to a person is committed secondary to the acquisition of some other external goal (Woodworth & Porter, 2002). In such situations the violence may occur while the individual makes planned efforts to obtain money. Reactive violence is where an individual uses aggression and violence either to defend themselves against a threat or in reaction to a perceived environmental/interpersonal stressor. There is evidence to suggest that instrumental aggression is related to Hare’s (1990) Factor 1 psychopathy while reactive aggression is related to Hare’s Factor 2 psychopathy (Woodworth & Porter, 2002).

Cornell et al. (1996) assessed 106 violent and non-violent offenders from a medium security forensic facility to investigate whether violent offenders who committed acts of instrumental, goal-directed violence could be distinguished from those who committed reactive aggression in response to provocation. The researchers defined instrumental violence as that which was goal-driven and required planning without provocation, usually toward a stranger. Reactive violence was defined as an absence of planning or goals and instead involved an interpersonal dispute with the victim (Cornell et al., 1996). The results of the study found that instrumental violent offenders had higher scores on Hare’s Psychopathy Checklist — Revised (PCL-R) and could be distinguished from reactive violent offenders who had lower PCL-R scores. They concluded that there was a link between instrumental violence and psychopathy and that the presence of instrumental violence could be an additional trait in psychopathy. They concluded further that reactive violence is the most basic form of criminal violence where instrumental violence could be seen as a marker for the development of a more pathological development in the ability to use violence for goal-directed purposes (Cornell et al., 1996).

A further study separated a forensic population with charges such as murder and manslaughter into reactive and instrumental categories based on offence typology (Raine et al., 1998). Offenders were distinguished by whether their offences exhibited controlled, purposeful aggression in pursuit of a specific goal from spontaneous, emotion-charged aggression. After positron emission tomography (PET) brain scan studies with these individuals, the researchers found that reactive murderers had significantly lower prefrontal metabolic activity compared with control subjects, while instrumental murderers metabolic prefrontal activity resembled those of control subjects (Raine et al., 1998). It appears from this research that instrumental psychopathic
(Factor 1) individuals do not present with abnormal prefrontal metabolism, whereas reactively aggressive murderers present with reductions in prefrontal cortex activity, particularly in the orbito-frontal cortex.

The type of behavioural changes described above after prefrontal (particularly orbito-frontal) damage lead Damasio and colleagues (1994) to describe ‘acquired sociopathy’ as being quite different from developmental psychopathy. Acquired sociopathy presents with reactive, emotionally driven violence toward a person familiar to the perpetrator and is related to emotional inhibitory dyscontrol (as described above in orbito-medial dysfunction). Acquired sociopathy then is more related to Factor 2 psychopathy. Developmental psychopathy by contrast is goal-directed motor behaviour that involves the neural systems of the temporal, pre-motor cortices and the amygdala. This is more related to Factor 1 psychopathy.

Bechara, Damasio, Damasio and Anderson (1994) stated that there was no satisfactory neuropsychological probe to investigate deficits in real-life decision-making following damage to the ventromedial prefrontal cortex. The researchers developed a novel task to simulate real life decision-making processes (the Bechara Gambling Task) (BGT), which uses uncertainty of premises and outcomes as well as reward and punishment to test if individuals displayed sensitivity to future consequences.

Blair (2002) noted in describing the Bechara Gambling Task that while it had yielded positive results with ventromedial patients, it had not been tested on individuals with violent and aggressive behaviour. However, in 2002, Mitchell, Colledge, Leonard and Blair used the BGT with a population of psychopathic and non-psychopathic offenders. The researchers found that of the forensic sample of 31 offenders those with high PCL-R scores tended to sample disadvantageously compared with the comparison group. However, it was acknowledged by the researchers that these findings are in contrast to other studies where high PCL-R scores were not significantly different to normal controls on the BGT (Mitchell, Colledge, Leonard, & Blair, 2002). As such one of the purposes of the current research is to investigate whether the Bechara Gambling Task can differentiate reactive violent offenders (acquired sociopathy) from instrumental violent offenders (developmental psychopathy). While the Bechara Gambling Task is promising in this area, other well-validated tests which have been tested on a forensic population will also be used to distinguish between the two groups.

Only well-researched and validated tests were considered for application in this research and the rationale for selection based on a meta-analytic review by Morgan and Lilienfeld (2000). The researchers identified six neuropsychological measures that were viewed as sensitive to ventromedial dysfunction. Two of these tests were the Stroop Colour Word Test and the Controlled Oral Word Association Test (COWAT).

The first hypothesis of the current research is that the research population of violent offenders will exhibit evidence of impaired performance on neuropsychological measures sensitive to executive dysfunction. Accurate diagnosis of possible neurological impairment could have important implications in treatment settings and in the assessment of future recidivism.

It is further hypothesised that reactive violent offenders will perform poorly on neuropsychological measures considered to be sensitive to executive (particularly orbito-frontal) dysfunction. By contrast, it is hypothesised that instrumental violent offenders will return significantly higher scores on these tests than reactive violent offenders. The research will test this hypothesis using a structured clinical interview to differentiate offenders into two groups based on offence characteristics, primarily reactive violence and primarily instrumental violence. The differentiation process will follow Cornell et al.’s (1996) rating criteria and findings that primarily instrumental offenders had significantly higher PCL-R scores than reactive violent offenders.

Executive dysfunction will be assessed using three measures considered to be sensitive to executive dysfunction taken from the Delis–Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001). The D-KEFS is a battery of nine neuropsychological tests all normed on the same standardisation sample of 1700 individuals. The D-KEFS Colour Word Interference Test is similar to the Stroop Colour Word Test and the D-KEFS Verbal Fluency Test is similar the COWAT. The D-KEFS Design Fluency Test was chosen as it is a non-verbal analogue of the D-KEFS Verbal Fluency Test, which may be useful given the sample population of violent offenders who may have language impairment.
The third hypothesis of this research is that reactive violent offenders will sample significantly disadvantageously on the Bechara Gambling Task compared with instrumental violent offenders. Given the theoretical underpinnings and conjecture regarding the Bechara Gambling Task, this research aims to clarify whether the test can show a significant difference between instrumental and reactive violent offenders and in which direction. The D-KEFS tests will be used as a comparison; if the D-KEFS tests are sensitive to executive dysfunction and differentiate between reactive and instrumental violent offenders, it is expected that the Bechara Gambling Task will also differentiate between the two groups in the same direction. While a measure of intelligence will be administered, given previous research findings (Lezak, 1995) it is not expected that the instrumental and reactive groups will differ significantly in level of IQ.

Method

Participants

Participants were 25 men who were incarcerated in New South Wales. The participants were housed in the Metropolitan Special Programs Centre (MSPC), Long Bay Correctional Centre after being referred to the Violent Offender Therapeutic Program (VOTP). Inmates can request entry into the VOTP or can be referred by psychologists due either to a history of violence pre-sentence or while incarcerated.

It was explained that participation in the research was voluntary and would not affect individual status or their record with the institution. Participants did not receive any financial reward or any other gain for their participation in the research. Each participant was presented with a participant information sheet and asked to sign their consent to take part in the research after the method and purpose was explained. Four from the original pool of 30 inmates declared that they preferred not to take part in the research and one transferred before testing could commence, giving a sample of \( N = 25 \).

The mean age of the participants was 33.6 years (range 23 to 55 years). The mean age for the reactive group \( (N = 12) \) was 31.92 years (range 23 to 43 years) and the mean age for the instrumental group \( (N = 13) \) was 35.15 years (range 25 to 55 years).

Materials

Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999)

The WASI was used as it is a standardised, normed, and validated short form of the Wechsler Adult Intelligence Scale. It also provided a reliable and valid estimate of verbal, performance and general intellectual functioning.

The WASI measures several facets of intelligence, such as verbal knowledge, visual information processing, spatial and nonverbal reasoning, and crystallised and fluid intelligence. The WASI consists of four sub-tests — Vocabulary, Block Design, Similarities and Matrix Reasoning (Wechsler, 1999): Vocabulary measures expressive vocabulary, verbal knowledge and fund of information. For this sub-test, participants were required to define words that are orally presented. Block Design measures spatial visualisation, visual-motor coordination, abstract conceptualisation and perceptual organisation by requiring participants to replicate modelled or printed two-dimensional geometric patterns within a specified time by using two-colour cube patterns. Similarities measures verbal concept formation, abstract reasoning ability, and general intellectual ability. For this measure a pair of words was presented orally and participants asked to explain the similarity between the object or concept that the two words represented. Matrix Reasoning measures nonverbal fluid reasoning by requiring participants to complete a missing portion of an abstract, gridded pattern by indicating the correct completed pattern from five possible choices.

The Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001)

The D-KEFS is a set of nine standardised tests for assessing executive functions in children and adults. The nine tests measure a range of verbal and non-verbal executive functions, with each test designed to stand alone or be administered with others from the battery. Each of the nine tests was standardised on over 1700 children and adults aged 9 to 89 years.

Three sub-tests from the D-KEFS were chosen based on three criteria. First, that each involved a
switching component of the task testing the ability to set shift. Second, that the test was one of the six identified by the meta-analysis of Morgan and Lilienfeld (2000) as a well-validated measure of executive function. Third, that the test was portable and able to be administered in a short time frame. Based on these criteria, the following tests were included:

**The D-KEFS Verbal Fluency Test.** The D-KEFS Verbal Fluency Test is modelled on the COWAT by Benton (cited in Morgan & Lilienfeld, 2000). The Verbal Fluency Test is comprised of three conditions, letter fluency, category fluency and category-switching. In the letter fluency condition, the participant is asked to name in 60 seconds as many words as they can that begin with a specified letter over three trials (F, then S then A). In category fluency the participant is asked to say in two trials of 60 seconds as many words as they can that belong to a designated category (animals, boys names). In the category switching component, participants are asked to alternate between saying words from two semantic categories (fruits/furniture) as quickly as possible in 60 seconds. Morgan and Lilienfeld (2000) reported that based on several studies using PET and fMRI, verbal fluency tests activate the left frontal cortex in participants.

**The D-KEFS Design Fluency Test.** The D-KEFS Design Fluency Test was developed as a non-verbal analogue to the Verbal Fluency Test. It was chosen in this study to counter the possible discrepancy between verbal and non-verbal IQ in a forensic population. The Design Fluency Test comprises three conditions. In the first the participant is presented with rows of boxes each containing an array of filled dots. The participant is given 60 seconds and asked to connect the dots in different designs using four straight lines. In the second condition, each response box has five filled and five non-filled (empty) dots. The participant is asked to inhibit connecting the filled dots and connect the empty dots, again given 60 seconds to create as many different four line designs as they can. The final condition is the switching condition. Each response square has five filled and five empty dots and the participant is asked draw different designs in 60 seconds using four straight lines and alternating between empty and filled dots. Delis, Kaplan and Kramer (2001) report that the Design Fluency task has proven sensitive to right frontal lobe impairment.

**The D-KEFS Colour Word Test.** The D-KEFS Colour Word Test is based on the Stroop Interference Test. There are four conditions to the D-KEFS Colour Word Test. In the first, the participant is presented with colour patches and asked to name the colour. In the second condition, the participant is asked to read names of colours written in black ink. In the third condition the participant is presented with names of colours written in a different coloured ink (e.g., ‘red’ in blue ink) and asked to name the colour, not the word. This represents the original interference task in the Stroop. Delis and Kaplan (2001) have added a further interference task where participants are asked to switch between naming the word and naming the colour. The Stroop Interference Test had been found in PET analysis to activate the right frontal area (Morgan & Lilienfeld, 2000).

**The Bechara Gambling Task**

The Bechara Gambling Task was administered in computerised format with a schedule of reinforcement similar to that described by Bechara, Damasio, Damasio and Anderson (1994). The task is a card game where participants make selections from four decks (A, B, C and D) presented on the computer screen. With each selection the computer emits a sound similar to a slot machine and a message is displayed on the screen with an amount of money the participant had won or lost, which is tracked by a green bar above the decks. The participant is told that the aim of the task is to maximise profit on a loan of play money and that they are free to switch between one deck and another as often as they wish. It is made clear to the participant that some decks are worse than others and that they can win if they stay away from the worse decks. The task consists of 100 card selections, after which the computer tells the participant the game is completed. The participant is not informed of the number of card selections.

Decks A and C have a higher frequency of punishment but the punishments are of a lower amount. Decks B and D have a lower frequency of punishment but these are of a higher amount. Overall, decks A and B are disadvantageous and will result in a sizeable net loss. Over the course of selections on deck A, the participant earns $1000 but five unpredictable losses ranging from $150 to $350 result in a $1250 loss. On deck B the participant earns $1000 but there is one loss of $1250. Decks C and D are advantageous in that while the
participant earns $500, losses are smaller ($25 to $75 in deck C and one $250 loss in deck D) and result in an overall profit of $250.

Procedure
The classification of ‘reactive’ and ‘instrumental’ violent offenders followed the procedure undertaken by Cornell et al. (1996). The characteristics of the violence perpetrated by the offenders was coded on the basis of pertinent information from their clinical interview. Only the most recent violence was taken into consideration. The initial rating was performed by the principal investigator and the inter-rater reliability undertaken by a Senior Forensic Psychologist in the Violent Offender Therapeutic Program. The second rater was not aware of the principal investigator’s ratings.

Each act of violence was coded, based on Cornell et al.’s (1996) Likert-type scale of 1–4 along the following criteria:

1. Primarily reactive.
In order for violence to be rated as purely reactive, there had to be an obvious lack of planning and a high degree of impulsivity or spontaneity. Generally it would be clear for purely reactive violence that there was no apparent goal other than to physically harm the victim following a verbal altercation. For example an argument in a bar that ended in a physical fight, perhaps between two people known to each other.

2. Reactive/instrumental.
This classification would be reached if the violence occurred as an impulsive, spontaneous act as described above, and the perpetrator decided to rob the victim because the opportunity presented itself. For example, where a spontaneous, unplanned fight erupted between two people and the perpetrator decided to take the victim’s wallet. However, the primary motivation to the assault was not to take the wallet.

3. Primarily instrumental.
For a violent act to be classed as purely instrumental, it should be clear that the perpetrators intent was goal-orientated, planned and not an impulsive reaction to situational factors. There should be no evidence of any particular situational provocation. For example, where a person planned and carried out violence against another purpose to gain drugs, money or revenge and was not particularly emotionally aroused when they carried out the act.

4. Instrumental/reactive.
This category would show elements of both instrumental and reactive violence, although the primary intent of the commission of the act was to obtain some type of external goal. For example, where a person had sought to commit an armed hold-up (an instrumental act) and due to unplanned circumstances during the act, committed violence against a person who was not obeying instructions. Participants were rated as primarily reactive if they met either of the criteria for 1 or 2 and primarily instrumental if they met criteria for either 3 or 4.

Results
Reactive Versus Instrumental — Inter-rater Reliability
Of the 25 participants in this research, 12 (48%) were rated as primarily reactive in their offence type while 13 (52%) participants were rated as primarily instrumental in their offence type. The inter-rater reliability check was conducted on 10 of the 25 participants chosen at random for dual coding by the principal researcher and Senior Forensic Psychologist. Calculating Cohen’s Kappa revealed an excellent level of agreement between the two raters for classifying the offenders as primarily reactive or primarily instrumental in their offence type, kappa = 0.776, \( p < .00005 \) (95% confidence interval, .656–.896). As the kappa is positive, the agreement between the raters is positive.

Bechara Gambling Task (BGT)
The total sample population (\( N = 25 \)) was separated into primarily reactive (\( n = 12 \)) and primarily instrumental (\( n = 13 \)) offence type as described above. Each group was then examined on number of choices from the disadvantageous decks (A and B) and then from the advantageous decks (C and D). Results for the first comparison (reactive vs. instrumental on disadvantageous decks A and B) revealed the reactive mean score of 61.25 (\( SD = 19.391 \)) and an instrumental mean score of 41.077 (\( SD = 16.034 \)). For the following comparison (reactive vs. instrumental on advantageous decks C and D), the reactive mean score was 39.250 (\( SD = 18.864 \)) and the instrumental mean score equal to 58.923 (\( SD = 16.034 \)).
A multivariate 2 × 2 analysis of variance (MANOVA) with repeated measures on decks revealed a significant interaction for group by deck; $F(1, 23) = 8.02, p < .009$. This interaction is shown in Figure 1.

Each group (reactive and instrumental) was then compared with population data from Bechara, Damasio, Damasio and Anderson’s (1994) research on the Bechara Gambling Task. The population consisted of a group of normal control subjects ($N = 44$); a group of brain damaged (occipital, temporal and dorsolateral frontal regions) patients ($N = 9$); subject patient ‘EVR’ who was known to have orbito-frontal impairment; and ‘EVR-type’ — a group ($N = 6$) who were also known to have orbito-frontal impairment. Following Bechara, Damasio, Damasio and Anderson (1994), the mean total number of selections from the disadvantageous decks (A and B) was subtracted from the mean total number of selections from the advantageous decks (C and D). Figure 2 illustrates the differences between the groups on this task; positive scores reflect advantageous courses of action while negative scores reflect disadvantageous courses of action.

Figure 2 reveals that while the normal and brain damaged groups performed advantageously, this was quite different to EVR and EVR-type subjects. A one-way ANOVA revealed that the difference between the normal and EVR type groups was highly significant, $F(1,50) = 74.8, p < .001$. The present study makes additional comparisons in comparing the reactive and instrumental groups to the normal sample. Figure 2 reveals that the instrumental group performed somewhat advantageously (Mean = 17, $SD = 3.07$), although the group did not choose as advantageously as the normal controls (Mean = 38, $SD = 2.67$). The difference between the normal and instrumental group was significant, $t = 3.02 (32), p < .005$.

When the reactive group mean from the present study was compared to the normal group mean, it appeared that the reactive group performed disadvantageously compared with the normal group and more like EVR and EVR-type. The difference between the reactive group and the normal group was highly significant, $t = 7.25 (31), p < .0001$. 

![Figure 1](image_url)

Bechara gambling task: Reactive versus instrumental group means.
Wechsler Abbreviated Scale of Intelligence (WASI)

The WASI was administered to all 25 participants, who were then separated in primarily instrumental and primarily reactive groups as to their offence type as described above. The Full Scale IQ (FSIQ) mean score for the primarily reactive group was 95.833 (SD 10.302). The FSIQ mean score for the primarily instrumental group was 102.307 (SD 11.622). Levene’s Test for Equality of Variances was not significant (F = 1.089, p = .308). It was revealed by t test that there was no significant difference between the two groups on FSIQ (t = –1.469, p = .155 two-tailed). Further, that there was no significant difference on FSIQ between either of the two groups and the normal population.

The Performance IQ (PIQ) mean score for the primarily reactive group was 101.167 (SD 9.833) and for the primarily instrumental group 106.231 (SD 11.622). Levene’s Test for Equality of Variances was not significant (F = 1.519, p = .230) and the difference between mean scores for the groups was not significant (t = –1.263, p = .219, two-tailed). Further, that there was no significant difference on FSIQ between either of the two groups and the normal population.

The Verbal IQ (VIQ) mean score for the primarily reactive group was 91.167 (SD 11.792) and for the primarily instrumental group 98.231 (SD 15.433). Levene’s Test for Equality of Variances was not significant (F = 1.519, p = .230) and the difference between mean scores for the groups was not significant (t = –1.278, p = .214). However, the difference between the mean scores of the reactive group on VIQ and PIQ was statistically significant, t (22) = 2.26, p < .05. The mean score difference of 10 points was above the number required (8.51) for statistical significance at the .05 level for the age range 17 to 89. The difference between VIQ and PIQ for the primarily instrumental group was not statistically significant.

Delis–Kaplan Executive Function System — Verbal Fluency Test (D-KEFS-VF)

The mean scores, standard deviations and results of t tests of group differences on the D-KEFS-VF are presented in Table 1. Of the 15 comparison scores of the D-KEFS-VF, those which measure higher-order executive functions (repeated errors, set loss errors and switching accuracy) were of particular importance.
interest. There was a significant difference in mean scores between the primarily reactive and primarily instrumental groups on four of the 15 comparison scores, which are reported in Table 1. The four comparison measures that revealed a significant mean score difference between the primarily reactive and primarily instrumental groups were Category Switching—Switching Accuracy ($p < .005$), Interval 1 Responses ($p < .05$), Set Loss ($p < .05$) and Per Cent Switching Accuracy ($p < .005$).

In comparison with the normal population, the instrumental group were not significantly impaired on any of the measures of D-KEFS — VF. However, the reactive group means were below the normal population means on four measures: Category Switching—Switching Accuracy, $t (22) = 2.27$, $p < .05$, Interval 1, $t (22) = 2.18$, $p < .05$, Set Loss, $t (24) = 2.87$, $p < .001$ and Per Cent Set Loss, $t (24) = 3.43$, $p < .0002$.

Delis–Kaplan Executive Function System — Design Fluency Test (D-KEFS-DF)
The mean scores, standard deviations and results of $t$ tests of group differences on the D-KEFS-DF
are presented in Table 2. Of the 10 comparison scores of the D-KEFS-DF, those which measure repeated errors, set loss errors and switching accuracy were of particular interest. There were no significant mean score differences between the primarily reactive and primarily instrumental group on any of the D-KEFS-DF comparison measures, although one (Primary Contrast Measure 1) approached significance, \( p = .058 \).

In comparison with the normal population, the instrumental group were not significantly impaired on any of the measures of D-KEFS — DF. However, the reactive group means were below the normal population means on one measure, Primary Contrast, \( t (24) = 2.89, p < .01 \).

**Delis–Kaplan Executive Function System — Colour Word Test (D-KEFS-CW)**

The mean scores, standard deviations and results of \( t \) tests of group differences on the D-KEFS-CW are presented in Table 3. Of the 12 comparison scores of the D-KEFS-CW, those which measure repeated errors, set loss errors and switching accuracy were of particular interest. There was a significant difference in mean scores between the primarily reactive and primarily instrumental groups on five of the 12 comparison scores, which are reported in Table 3. The five comparison measures which revealed a significant mean score difference between the primarily reactive and primarily instrumental groups were Inhibition/Switching, \( p = .000 \), Primary Contrast 2, \( p < .05 \); Optional Contrast 1, \( p < .01 \), Optional Contrast 2, \( p < .006 \), and Error Analysis 2 — Inhibition/Switching, \( p < .05 \).

In comparison with the normal population, the instrumental group was significantly impaired on one of the measures of D-KEFS — CW; Error Analysis 1, \( t (24) = 2.95, p = .007 \). The reactive group means were below the normal population means on six measures which are presented in Table 4. The six measures which revealed impaired performance in the reactive group compared with the normal population measured higher-order executive

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**Table 2**

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<th>Instrumental</th>
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Note. * \( p < .05 \); ** \( p < .01 \).

\( t \) tests formula for unequal variance are marked with a cross.

Levene’s Tests For Equality of Variances evaluated.
functioning such as inhibiting responses, changing and maintaining set.

Figure 3 presents a comparison of group means over the four main sub-tests of the D-KEFS-CW. The reactive and instrumental groups did not differ significantly from the standardisation sample on the two baseline measures (Colour Naming and Word Reading). However, the reactive group did differ significantly (as reported above) from the standardisation sample on the Inhibition and Inhibition/Switching measures of this test. This would indicate that reactive offenders exhibit executive function deficits and that such impairments are not due to deficits in basic skills such as reading.
Discussion

The conclusion that ‘the evidence for the association between specifically violent criminal behaviour and frontal lobe dysfunction is weak at best’ (Kandel & Freed, 1989) is not supported by the results of this investigation into executive dysfunction in violent offenders. The results of this research clearly supported the first hypothesis that a sample of violent offenders would exhibit evidence of impaired performance on neuropsychological measures sensitive to executive dysfunction. The data gathered suggested that there were violent offenders in the sample who were significantly impaired on tests of executive function compared with the standardisation sample.

While support for the first hypothesis is encouraging and supports earlier findings (see Blake, Pincus, & Buckner, 1995; LaPierre, Braun, & Hodgins, 1994; Martell, 1992; Miller, 2002; Mitchell, Colledge, Leonard, & Blair, 2002), it did not provide the depth of understanding required to inform adequate prediction of future dangerousness, assessment or treatment of individuals who commit violent crime.

Earlier research (e.g., LaPierre, Braun, & Hodgins, 1994) into executive dysfunction in violent offenders used the PCL-R to differentiate ‘psychopaths’ (> 30) and ‘non-psychopaths’ (< 20). This research followed Cornell et al. (1996) and Woodworth and Porter (2002) in classifying violent offenders as ‘primarily reactive’ or ‘primarily instrumental’ in their offence type. Both researchers had found that primarily reactive violence was significantly related to Factor 2 psychopathy while primarily instrumental violence was significantly related to Factor 1 psychopathy. This method of separating the concept of violence into these well-founded categories rather than using the PCL-R provided more of an insight into the construct of psychopathy related to executive dysfunction than was initially envisaged.

The second hypothesis of this research was that the primarily reactive group would show significantly greater impairment on tests sensitive to executive dysfunction compared with the primarily instrumental group. This hypothesis was clearly supported given the results of the three tests from the Delis–Executive Function System (D-KEFS).

<table>
<thead>
<tr>
<th>Table 4</th>
<th>DKEFS Colour Word: Mean Scores on Variables and Results of Tests of Equivalence of the Reactive Group Versus Standardisation Sample</th>
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<tr>
<td>Tasks</td>
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<td>Error analysis 1 inhibition</td>
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<td>SD</td>
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Note. *p < .05; **p < .01; ***p < .001.
D-KEFS Verbal Fluency (D-KEFS-VF) was chosen as it is an updated version of the COWAT, reported in the meta-analytic review by Morgan and Lilienfeld (2000) to be sensitive to executive dysfunction. For D-KEFS — VF the authors added a cognitive switching task to the original COWAT in order to produce a more sensitive measure to executive dysfunction. The results indicated that on the first two conditions (Letter Fluency and Category Fluency) there was no significant difference between the two groups and also no significant difference between either of the groups and the standardisation sample. This would indicate that any differences between the groups or either group and the standardisation sample on the higher-order executive function conditions was not due to either a limited vocabulary or poor spelling skills. It was important to note that there was no significant impairment on any of the D-KEFS VF measures for the primarily instrumental group compared with the standardisation sample. There was, however, a difference between the groups on four comparison measures and between the primarily reactive group and the standardisation sample on four comparison measures.

Category Switching—Switching Accuracy on the D-KEFS-VF examines the respondent’s ability to generate words from two different semantic categories and to shift back and forward between the categories when retrieving words. The ability to shift set (also called cognitive flexibility) is considered one of the functions of the frontal lobes. A deficit in this area may indicate impairment in the ability to constantly change response given the environmental demands faced by the individual. The primarily reactive group was significantly impaired on this measure compared with both the primarily instrumental group and the standardisation sample. Delis, Kaplan and Kramer (2001) noted that individuals who are impaired on this switching task may also be impaired in their Per Cent Switching Accuracy comparison measure. This research found that this was the case for primarily reactive violent
offenders in this study, who were significantly impaired on this measure compared with the primarily instrumental group. It was likely given these results that the primarily reactive violent offenders in this research had a deficit in cognitive flexibility, while the primarily instrumental group showed no such deficit in cognitive flexibility. The implication is that primarily reactive violent offenders have difficulty responding flexibly to environmental demands.

The primarily reactive group also showed significant deficit compared with both the primarily instrumental group and the standardisation sample on number of responses on Interval 1. This is the first 15 seconds of generating responses across each sub-test. This result might suggest that compared with the normal population, the primarily reactive group experienced significant difficulties in initiation of verbal responses while the primarily instrumental group showed no such impairment. Impaired initiation was one of the five general groups of behavioural disturbance associated with executive dysfunction noted by Lezak (1995).

The primarily reactive group also showed impaired functioning compared with both the primarily instrumental group and standardisation sample on the Set Loss measure of D-KEFS-VF. A Set Loss error on D-KEFS-VF is where the respondent violates criterion rules of the test, such as words that begin with letters other than the designated letter (e.g., dog’ during the F condition); words that begin with the target letter but violate the rule that there are no names of people, places or numbers; or grammatical variants (e.g., fast, faster, fastest) that are clearly defined rule violations. Given that the primarily reactive group means were not significantly impaired compared with the standardisation sample on the baseline measures (Letter Fluency, Category Fluency), it was unlikely that the impaired performance on Set Loss was due to verbal learning disability or low pre-morbid intellectual function. Rather, the result indicates that the primarily reactive group displayed an impaired capacity to maintain set when faced with multiple competing demands. The primarily instrumental group did not display this impairment.

D-KEFS — Design Fluency (D-KEFS-DF) was chosen as a non-verbal analogue to the Verbal Fluency test. The D-KEFS-DF calls on the executive functions of initiation, problem-solving abilities, fluency in creating visual patterns, inhibiting previously drawn responses and observing the rule restrictions of the task. Conditions 1 (Filled Dots Only) and 2 (Empty Dots Only) provide a baseline measure for basic visual attention, motor speed and non-verbal creativity. On Conditions 1 and 2 both the primarily reactive and primarily instrumental groups showed intact performance compared with the normal population. This would indicate that both groups were intact on these baseline measures and any impairment on Condition 3 (Switching) was not due to these basic skills.

Condition 3 (Switching) required the participant to follow rules (different designs, four lines only) while switching from filled dots to empty dots. Participants who showed normal performance on Conditions 1 and 2 but impaired performance on Condition 3 may reflect a deficit primarily in cognitive flexibility, a fundamental executive function (Delis, Kaplan, & Kramer, 2001). The primarily instrumental group showed normal scores on Conditions 1 and 2 and normal scores on Condition 3. This would indicate no impairment in cognitive set shifting. The primarily reactive group, however, returned a significantly lower mean score on the Primary Contrast measure (Primary Contrast is the comparison of Conditions 1 and 2 with Condition 3) than the standardisation sample. This would indicate a degree of impairment in the primarily reactive group in cognitive flexibility.

Given that the D-KEFS-DF is a non-verbal analogue of the D-KEFS-VF, and on this task there were a number of measures on which the primarily reactive group appeared impaired, we might expect more significant results on D-KEFS-DF. One possible reason that there was only one rather than four significant differences between the primarily reactive group and the standardisation sample might be in the verbal capabilities of the primarily reactive group. While WASI FSIQ, PIQ and VIQ scores for the primarily reactive group were in the average range, there was a significant difference between their PIQ and VIQ group mean scores (10 points). It is possible that this strength in non-verbal compared with verbal tasks might account for a better performance by the primarily reactive group on D-KEFS-DF compared with D-KEFS-VF.

D-KEFS Colour Word Interference Test (D-KEFS-CW) is based on the Stroop Colour Word Test. The Stroop has three conditions, the
first two testing basic colour naming and word reading (in black ink) skills. The third condition asks respondents to inhibit over-learned responses by naming the dissonant colour in which the word is printed (Delis, Kaplan, & Kramer, 2001). The D-KEFS-CW adds a fourth condition to the original Stroop Colour Word Test, Inhibition/ Switching. This condition provides a means of evaluating both inhibition and cognitive flexibility.

The D-KEFS-CW provided perhaps the strongest distinction between the primarily reactive group and the standardisation sample and also between the primarily reactive group and the primarily instrumental group. Figure 3 presents each group in comparison with the standardisation sample. From these results it was apparent that the groups did not perform significantly differently on the first two baseline conditions. This would indicate that each group did not suffer from deficits in basic skills of colour naming and word reading. While the primarily instrumental group did not perform significantly worse than the standardisation sample on Condition 3 (Inhibition), the difference between the primarily reactive group and the standardisation sample was significant. This would indicate the possibility that the primarily reactive group difference was related to an executive function deficit in verbal inhibition (Delis, Kaplan, & Kramer, 2001).

It was Condition 4 (Inhibition/Switching) of the D-KEFS-CW that provided the most significant difference on any D-KEFS measure. The completion times of the primarily instrumental group did not differ significantly from the standardisation sample, but a standardised group mean of 5.33 (SD 2.38) for the primarily reactive group was significantly different (p = .0002) to the standardisation sample mean. This result would suggest that the primarily reactive group/standardisation sample difference was related to an executive function deficit in verbal inhibition and cognitive flexibility. The remaining significant results for the primarily reactive group (Primary Contrast 2, Optional Contrast 1, Optional Contrast 2) give each separate interpretation of the above results.

While it was expected that the primarily reactive group would show impairment, a surprise finding was that on a supplementary measure — Error Analysis 1 (Condition 3 Inhibition) — the primarily instrumental group appeared significantly impaired in comparison with the standardisation sample. This was the only D-KEFS higher-order executive function measure in which this result was identified for the primarily instrumental group. This error analysis measure sums both corrected and uncorrected errors committed by participants on Condition 3, Inhibition. While 65.7% of the normal population committed at least one error on this measure (Delis, Kaplan, & Kramer, 2001), given that the completion times for this measure were in the normal range, the result would indicate that the primarily instrumental group had significant difficulties in impulsivity and self-monitoring. That is, the primarily instrumental group could work quickly but at the expense of not being able to inhibit incorrect responses. On the following more complex executive function task (Condition 4, Inhibition/Switching), the primarily reactive group again committed a significant number of errors compared with the standardisation sample. However, the primarily instrumental group produced significantly fewer errors on Condition 4 than Condition 3 and performed more like the standardisation sample.

Before providing a more thorough analysis of these results in relation to theories of executive function and violence, it is appropriate to examine the findings from the third hypothesis of this research regarding the relatively untested (with a forensic population) measure, the Bechara Gambling Task (BGT).

The third hypothesis of this research — that reactive violent offenders will sample significantly disadvantageously on the Bechara Gambling Task compared with instrumental violent offenders — was supported. The results indicated that the D-KEFS tests were sensitive to executive dysfunction, were able to differentiate between reactive and instrumental violent offenders and it was expected that the Bechara Gambling Task will also differentiate between the two groups in the same direction. The results supported this hypothesis and provided further information regarding the two groups in comparison with a normal control group.

Figure 1 illustrates the significant interaction between the primarily reactive and primarily instrumental groups on the BGT. The results indicated that the primarily reactive group sampled significantly more cards from the disadvantageous decks (A and B) compared with the primarily instrumental group. The primarily instrumental group sampled significantly more
cards from the advantageous decks (C and D) than the primarily reactive group. This result would appear to indicate that the primarily reactive group were significantly impaired on this test. The BGT involves a long series (100 card selections) of card selections and according to the authors of the test it is not possible to keep track of their net gains or losses as they play (Bechara, Damasio, Damasio, & Anderson, 1994). As such, the participants must rely on their ability to develop an estimate of which decks are risky and which are not in the long run. Participants’ performance on the test is comparable to their real-life ability to make advantageous choices, particularly in social or personal matters. In these personal or social matters — like the BGT — the exact future outcome of a particular course of action is not possible to calculate and choices must be made on approximations. The implications of this research with violent offenders on the BGT are that in comparison to the primarily instrumental group, the primarily reactive group was more guided by their immediate prospects and generally insensitive to future consequences of their actions.

While the primarily reactive group performed poorly on the BGT, it is in comparison with the normal sample group where the results for the primarily instrumental group become clearer. Figure 2 shows the performance of the primarily reactive and primarily instrumental groups from this study compared with the performance of normal controls, brain damaged (other than frontal), EVR (a patient known to have orbito-frontal lesions) and EVR-type (patients with orbito-frontal lesions; Bechara, Damasio, Damasio, & Anderson, 1994). The results indicate that the primarily reactive group sampled in an overall disadvantageous way and that there was a significant difference between the primarily reactive group and the normal control group. Further, that the primarily reactive group sampled disadvantageously to a similar degree found in the performance of the orbito-frontal patients. This result might suggest the possibility that reactive violent offenders are impaired in their ability to see the future consequences of their immediate actions similar to that shown by patients with orbito-frontal lesions.

More importantly, the results indicate that while the primarily instrumental group performed more advantageously than the primarily reactive group, they were significantly impaired on the task compared with the normal sample. One possible explanation for this significant difference was that while the primarily instrumental group were able to see the future consequences of their actions, they were still enticed by the high-risk decks into making some risky choices. It is possible that the primarily instrumental group understood the task and were able to make advantageous choices, but perhaps did not care about the consequences of choosing disadvantageously, thus significantly lowering their scores in comparison to the normal sample.

Contrary results had been found through previous research using the BGT with psychopathic offenders (see Blair, 2002; Mitchell, Colledge, Leonard, & Blair 2002). Several studies had found that the BGT did not adequately differentiate psychopaths from non-psychopaths, while Mitchell, Colledge, Leonard and Blair (2002) found that psychopathic offenders (PCL-R > 30) sampled disadvantageously on the measure compared with non-psychopathic offenders. Mitchell, Colledge, Leonard and Blair (2002) contend that the procedures used by the studies that did not find a significant difference between the psychopathic and non-psychopathic groups did not follow that used by the original study of Bechara, Damasio, Damasio and Anderson (1994). Specifically, that these studies did not explicitly state that some decks involved more loss than others and that participants could win more money overall if they avoided these decks (Mitchell, Colledge, Leonard, & Blair, 2002).

The current research did inform each participant that some decks involved more loss than others and that participants could win more money if they avoided these decks. The results supported Mitchell, Colledge, Leonard and Blair’s (2002) research in that there was a significant difference between primarily instrumental group and the non-psychopathic sample. However, in separating the primarily instrumental group and the primarily reactive group, further conclusions about the group differences were drawn. Mitchell, Colledge, Leonard and Blair (2002) raised the theory that psychopathic individuals had impaired performance on the BGT due to interconnections between the orbito-frontal cortex and the amygdala. Studies have shown that patients with amygdala lesions show impaired aversive conditioning as do psychopathic individuals (Bechara et al., 1995; Blair, 2002). These studies indicate that
the amygdala was activated in neuro-imaging studies in response to sad or fearful images and that psychopathic individuals show impaired processing of these sad or fearful images.

While further research involving more thorough neuro-imaging techniques in conjunction with the neuro-psychological tests would be required, the current research raises the possibility that primarily instrumental violence is related to Factor 1 psychopathy and impaired amygdala functioning. It was observed through clinical interview that many primarily instrumental violent offenders in this research were raised in domestic situations involving significant exposure to physical violence. It is possible that through over-exposure to violence both directly (being physically assaulted) or indirectly (watching the physical assault of a family member) and an innate survival mechanism causes the individual to become less responsive (emotionally and physically) to situations involving fear or distress. It is possible that over time, the individual becomes ‘immune’ to physical violence in order to survive, but that this leads to amygdala impairment through lack of behavioural reinforcement. In turn, the individual is then unaffected by emotional distress in others, which enables them to carry out violent acts on others without emotional pain, guilt or remorse. This may lead then to the concept of ‘developmental psychopathy’. This possibility is strengthened by evidence indicating that orbito-frontal dysfunction observed in adult psychopaths may develop as secondary consequences to early amygdala dysfunction (Mitchell, Colledge, Leonard, & Blair, 2002).

The contention of this research given the results of the groups on the BGT was that primarily instrumental violence was related to Factor 1 psychopathy, possible amygdala dysfunction and understanding but choosing not to control behaviour. In contrast, this research suggests that primarily reactive violence was related to Factor 2 psychopathy, possible orbito-frontal dysfunction and not being able to control impulsive behaviour (acquired sociopathy). It is important then to review the results from the well-researched and tested executive function tests from the D-KEFS to examine whether this possibility is consistent with the results.

As discussed, the primarily reactive group displayed higher-order executive deficits in tasks that tapped skills such as cognitive flexibility, capacity to maintain set, initiation and verbal inhibition on the D-KEFS-VF, D-KEFS-DF and D-KEFS-CW. These deficits in the ability to change behaviour in response to environmental changes in combination with difficulties in verbal inhibition could present significant difficulties in a complex social situation. When faced with a social situation involving conflict the individual may become confused by multiple environmental changes (e.g., different arguments about the right or wrong of previous actions), say something inflammatory and provoke or be provoked into physical violence. By the coding definition used in this research the violence committed by the primarily reactive group was defined by a high level of spontaneity, lack of planning and no apparent external goal apart from the harm of the victim following a provocation or conflict. As such, it would appear possible that reactive violent offenders, due to possible orbito-frontal dysfunction in combination with numerous social and psycho-social influences, display a type of ‘acquired sociopathy’.

In contrast, the primarily instrumental group did not show impaired functioning on the D-KEFS measures tapping higher-order executive functioning. Their group results in domains such as cognitive flexibility, capacity to maintain set and initiation were similar to that of the standardisation sample. However, the primarily instrumental group did show impairment on the D-KEFS-CW errors committed during Condition 3, Inhibition. While their completion time was not significantly below the standardisation sample, the number of errors committed suggested that the group was prepared to work quickly at the expense of not being able to inhibit incorrect responses. This result displays a tendency to impulsivity. If this group displayed impulsivity in this task, then why did they not display impulsivity in similar tasks on D-KEFS-VF, D-KEFS-DF? Indeed, why was it that the primarily instrumental group on D-KEFS-CW Condition 4, a more complex Inhibition/Switching task (which tapped the same inhibition ability), were able to significantly improve their performance to resemble that of the standardisation sample?

The distinct possibility in response to these perceived inconsistencies was that this pattern was indicative of selective impulsivity. That is, primarily instrumental violent offenders behave in a less impulsive and reactive manner when the stakes are high, for example the possibility that they might be
caught (or that they realised their poor performance on a test). Woodworth and Porter (2002) found in their study into instrumental and reactive violence that primarily instrumental violent offenders were more likely to resist an impulse to kill someone when caught in an emotion-driven situation. Their conclusion was that impulsive behaviour seen in psychopaths outside of the commission of serious crime ‘... may not be simply uncontrollable or reflect an inability to consider the consequences but rather may be a function of not caring to control or inhibit the behaviour’ (Woodworth & Porter, 2002).

Two results in particular from the present research supports the theory of selective impulsivity; the primarily instrumental group sampled somewhat advantageously on the BGT but not as poorly as the primarily reactive group nor as well as the normal controls. As stated, this led to the conclusion that the primarily instrumental group understood the task but were prepared to take the risk of sampling from the high-risk decks because there was no perceived importance in the task. Second, that the primarily instrumental group displayed poor inhibition control on Condition 3 of the D-KEFS-CW, but chose to improve for Condition 4, which tapped the exact same executive function. The suggestion here was that the primarily instrumental group chose speed of response over accuracy on Condition 3, but found they had made significant errors. It is possible that due to egocentricty (a Factor 1 trait) the primarily instrumental participants were motivated to improve their performance. As such they may have engaged techniques to limit their impulsivity and improve their error scores without sacrificing time on Condition 4.

LaPierre, Braun and Hodgins (1994) concluded that specific tests of orbito-frontal functioning could differentiate psychopaths from non-psychopaths, although further clarification was required. This research raises the possibility that a reason LaPierre, Braun and Hodgins (1994) and other researchers found significant differences in executive functioning between psychopaths and non-psychopaths was due to a higher proportion of Factor 2 psychopathy in their samples that was not accounted for. LaPierre, Braun and Hodgins (1994) commented that previous research had been too broad in defining frontal functioning. The present research would indicate that future research would benefit from separating samples into three groups: non-psychopath, Factor 1 psychopath (instrumental) and Factor 2 psychopath (reactive). Further, future research examining amygdala functioning in primarily instrumental offenders may yield information to inform assessment and treatment of Factor 1 psychopathy.

This research had a strength beyond that it appears to be the first to use the BGT on an Australian forensic population of violent offenders. In not administering the PCL-R to define psychopathy, it was discovered that previous research had found that ‘violence’ had elements of both instrumental and reactive behaviour that equated with Hare’s Factor 1 and Factor 2 psychopathy, respectively. This then allowed conclusions to be drawn regarding neuropsychological deficit based on type of violence rather than ‘psychopathy’ as a unified construct.

However, the research also had several weaknesses. It is acknowledged that brain–behaviour relationships are difficult to exclusively define based solely on neuropsychological testing. It is with a great degree of caution that any relationship between type of violence and neurological dysfunction is drawn and future research would be enhanced by the inclusion of neuro-imaging techniques. A further weakness of this research is that it only examined neuropsychological dysfunction and did not take into account prevalent psycho-social factors such as alcohol and drug use and their effects. It was noted in several clinical interviews in this research that offenders were under the influence of drugs or alcohol at the time of their offence. Future research would benefit from taking this into consideration as a possibly significant variable.

The results of the current research have implications for both assessment and treatment of violent offenders. Assessment of violent offenders for treatment programs would benefit from examining executive function impairment and streaming those with such impairment and particularly reactive violent offences into specific, targeted treatment programs. While impaired executive function presents a therapeutic challenge for any clinician, it is not the case that individuals with such deficits are untreatable. Behaviourally based programs incorporating a ‘stop, think, do’ approach and insight and awareness training into the behavioural and personality manifestations of the impairment and assessment for and compliance with pharmacotherapy can have beneficial results with this population. However, given the results of this research and others (Martell, 1992;
Woodworth & Porter, 2002), the value of placing a primarily instrumental violent offenders with Factor 1 traits into a behaviourally based program (such as ‘anger management’) is questionable. Such programs teach the individual how to control their behaviour, while this research suggests that these individuals do not care to control their behaviour and as such may not benefit from this type of treatment.

In conclusion, the current research separated violent offenders into primarily instrumental and primarily reactive based on their offence characteristics. Each group was then administered a series of neuropsychological measures that were sensitive to executive function impairment. The results indicated that the primarily reactive group was significantly impaired on tasks that involved higher-order executive functions such as verbal inhibition, maintenance of set, cognitive flexibility and the ability to see future consequences. The primarily instrumental group were largely intact on executive function measures, although showed a tendency to be selectively impulsive depending on how important the task was judged to be. These findings led to the conclusions that primarily reactivly violent offenders had difficulty controlling their behaviour (acquired sociopathy) while primarily instrumental violent offenders could choose whether to control their behaviour (selective impulsivity). In order to accurately assess and treat violent offenders, adequate assessment of type of violence and integrity of executive function is an important element to successful outcomes. Future research would benefit from separating violent offenders into three groups (non-psychopathic, primarily instrumental and primarily reactive) and examining the impact of drug and alcohol use at the time of offence.

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