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Acquired Brain Injury in the Victorian Prison System

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Acquired Brain Injury in the Victorian Prison System

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Acquired Brain Injury in the Victorian Prison System

Foreword

I am pleased to present the fourth paper in the *Corrections Research Paper Series, Acquired Brain Injury in the Victorian Prison System*.

The series presents analysis and interpretation of a range of contemporary correctional topics and is a valuable resource for those with an interest in correctional trends and issues. I trust you will find this fourth paper informative.

The paper explores the prevalence of acquired brain injury (ABI) in the Victorian prison population and tests an ABI screening tool to assist with the identification of brain injury among prisoners. The findings clearly indicate that individuals with ABI are substantially overrepresented in the Victorian prison population – an important finding for correctional administrators to consider.

I have been pleased by the positive feedback to the series so far, and welcome any comments you might have regarding this paper or other areas for further research.

ROBERT J HASTINGS APM

Commissioner
Corrections Victoria

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Executive Summary

This research set out to gain an understanding of the prevalence of acquired brain injury (ABI) among Victorian prisoners and to test an ABI screening tool to assist with identification of brain injury in this population. The study employed a three-stage process of initial screening, clinical interview and comprehensive neuropsychological assessment. One hundred and ten adult male prisoners and 86 adult female prisoners took part in the initial screen, with 74 males and 43 females completing the neuropsychological assessment.

Individuals with an ABI appear to be substantially overrepresented in the Victorian prison population. Comprehensive neuropsychological assessment indicated that 42 per cent of male prisoners and 33 per cent of female prisoners from Stage Three had an ABI. This compares with an estimated prevalence of ABI among the general Australian population of two per cent (Australian Institute of Health and Welfare, 2007). Of prisoners assessed as having an ABI, six per cent of males and seven per cent of females were rated as having a severe ABI, which is consistent with figures for the general population.

Drug and alcohol use appeared to be the main cause of ABI among prisoners, while in the general population traumatic head injury is the most common cause. Prisoners also reported substantially higher rates of drug and alcohol use than are typically reported in the community, as well high rates of co-morbid psychiatric conditions. These findings point to the need for a coordinated and multi-disciplinary approach to addressing the therapeutic needs of prisoners with an ABI.

The nature of cognitive deficits identified in the current study also suggests that prisoners with a severe ABI are likely to have difficulty functioning in a prison environment, and may require specific assistance from correctional staff as well as altered approaches to the delivery of offending behaviour programs.

In light of the study findings, Corrections Victoria is currently developing a comprehensive service model and has also implemented a specialist, multi-focused pilot across part of the prison and community correctional service to work with offenders with an ABI.

These findings point to the need for a coordinated and multi-disciplinary approach to addressing the therapeutic needs of prisoners with an ABI.

1 Introduction

1.1. Background

Acquired Brain Injury (ABI) is an injury to the brain which results in deterioration in cognitive, physical, emotional or independent functioning. ABI can occur as a result of trauma, hypoxia (lack of oxygen to the brain), infection, tumour, substance abuse, degenerative neurological diseases or stroke. The impairments to cognitive abilities may be either temporary or permanent and may cause partial or total disability or psychosocial maladjustment (Department of Human Services and Health, 1994).

In Australia and internationally, prisoners with a disability are commonly identified as requiring differential treatment, and many correctional agencies have specific policies and practices for disabled prisoners, most notably those with an intellectual, psychiatric or physical disability. However, correctional agencies have not historically identified ABI as an issue of specific concern and there is limited understanding of its prevalence or impact in the correctional system. In part, this is due to the difficulty of assessing offenders for ABI given the time and cost associated with comprehensive neuropsychological assessment. This is certainly the case in Victoria where the safety of prisoners with an intellectual or psychiatric disability has been systematically considered and, with the advent of successive disability action plans, targeted measures to address re-offending among these groups have been implemented. As in other jurisdictions, however, Victoria does not systematically identify and respond to prisoners with an ABI. Nevertheless, ABI has important implications for offender management and, in particular, the responsivity of offenders to forensic treatment. Consequently, accurate identification of ABI can be crucial for effective correctional management and rehabilitative and reintegration efforts.

Corrections Victoria commissioned *arbias* Ltd., in conjunction with La Trobe University, to examine the potential prevalence of ABI within the Victorian prison system, as well as the nature and aetiology of the brain injury. The 2005 *Acquired Brain Injury Screening and Identification Pilot Project* employed a three-stage approach of initial screening, clinical interview and neuropsychological assessment. The initial screen involved the *arbias* Acquired Brain Injury Screening Tool, followed by a clinical interview for prisoners who reported at least one trigger item for an ABI on the tool, as well as a random sample of ten neuropsychological assessments.

The Pilot Project concluded that the prevalence of ABI from all aetiologies in the male prison population was likely very high. However, it was noted that the sensitivity and specificity of the screening tool could not be assessed in full, as only individuals who were identified as potentially having an acquired brain injury were referred from screening to subsequent assessments. Furthermore, as only male prisoners were used as participants, data also needed to be gathered on female prisoners. It was recommended that future research assess the true and false negative rates of the screening process, as well as the true and false positive rates, by using participants who screened negatively as a control group.

The current research extends the original *Acquired Brain Injury Screening and Identification Pilot Project* in that both female and male prisoners were recruited as participants, and all participants were given a full neuropsychological assessment (whether they screened positive or negative for a potential ABI). The aims of the study were to evaluate the efficacy and validity of a three-stage screening process to identify prisoners with an ABI and to provide acquired brain injury prevalence data for prisoners. As in the Pilot Project, the three-stage process included screening with the *arbias* Acquired Brain Injury Screening Tool; conducting a full clinical interview; and conducting a comprehensive neuropsychological evaluation.

This paper summarises the main findings from the research. The full report of the study findings prepared by *arbias* and La Trobe University is available on request from Corrections Victoria.

1.2. Prevalence

The reported prevalence rate of ABI in the Australian community is 2.2 per cent (Australian Institute of Health and Welfare, 2007). Internationally more than 9.25 million people are held in penal institutions (Walmsley, 2006), yet there is limited empirical data concerning the prevalence of ABI in correctional populations.

The majority of studies exploring the prevalence of ABI among prison populations have considered Traumatic Brain Injury (TBI) as the cause of ABI, while overlooking other significant causes such as alcohol and substance use and hypoxic brain injury. These mainly international studies found percentage rates of TBI in prisoners ranging from 33 per cent to 100 per cent (Slaughter et al., 2003; Barnfield & Leatham, 1998; Bach-Y-Rita & Veno, 1974; Turkstra, Jones & Toler, 2003; Hawley & Maden, 2003; Butler & Milner, 2003; Schofield et al., 2006a; Lewis, Pincus, Feldman, Jackson & Bard, 1986; Schofield et al., 2006b; Sarapata et al., 1998).

However, there are a number of methodological shortcomings which limit the usefulness of these findings. All but a few studies of TBI prevalence in offender populations have relied upon self-administered instruments that attempt to map recall of injuries and subsequent symptoms onto differing clinical definitions of TBI severity (Diamond, Harzke, Magaletta, Cummins & Frankowski, 2007). Instruments and resulting data have been limited in scope, and have not been sufficient to assess questions regarding the frequency and severity of head injury and subsequent psychological and behavioural difficulties, including criminal behaviour (Diamond et al., 2007). There is also evidence that TBI is under-reported by prisoners (Iverson et al., 1993). Turkstra et al. (2003) highlighted that those who suffer from mild brain injuries often do not report for medical treatment, resulting in a lowered reporting of brain injuries in hospital data, which ultimately results in lowered reporting of ABI in both the general population and the prison population. Furthermore, neurological impairment itself may undermine the ability to accurately report symptoms of brain injury (Daoust et al., 2006).

The Acquired Brain Injury Screening and Identification Pilot Project, which to date is the only Australian study to examine ABI from all aetiologies among a correctional population, indicated that there may be a considerable number of male prisoners with an ABI in the Victorian correctional system – potentially up to 65 per cent of the male prison population (*Arbias* unpublished).

1.3. Female Offenders and ABI

The majority of prisoner research, including the issue of brain injury, focuses on men, with limited research focusing solely on female offenders. Therefore, little is known about brain injury among female prisoners and what impact, if any, it may have on their offending and likelihood of imprisonment. The minimisation of neuropsychological distress among female prisoners (Daoust, Loper, Magaletta & Diamond, 2006), as well as the comparatively low female prisoner numbers in comparison to male prisoners (typically women comprise about seven per cent of the total prison population in Victoria), may in part account for this paucity of research into ABI.

Women are generally less likely to offend than men and, according to Butler, Allnutt, Cain, Owens and Muller (2005) when women do offend they are more likely to be suffering from a mental illness. Given the significant co-occurrence of ABI and mental illness (Butler et al., 2005), this is suggestive of the potential significant presence of ABI among female offenders.

While risk factors for ABI between males and females in the general population are comparable, battered women syndrome is one risk factor unique to females. Clinicians are frequently unaware of the incidence of head injury

sustained by women with a history of domestic violence (Jackson, Philp, Nuttrall & Diller, 2002) and battered women frequently demonstrate "neurological signs that appear to have been caused by repeated head injuries" (Walker, 1991, cited in Jackson et al., 2002). This indicates that clinicians should pay particular attention to a history of domestic violence in assessing ABI among women, particularly among female prison populations where past experiences of domestic violence may be especially high (Johnson, 2004).

1.4. ABI and Offending

While there is evidence of heightened rates of brain injury in prison populations, Miller (1999) states that brain injury should not be considered the sole cause of offending, nor should it be concluded that all offenders are neurologically damaged in some way. Many individuals who have an ABI, whether diagnosed or not, maintain a law abiding lifestyle and do not come into contact with the criminal justice system.

Nevertheless, the diffuse pattern of ABI can lead to a variety of disorders of cognition and behaviour that may predispose individuals to offending (Miller, 1999). Clinically significant frontal lobe dysfunction is associated with aggressive dyscontrol (Brower & Price, 2001), impulsivity (Turkstra et al., 2003), impairments in social behaviour (Blair & Cipolotti, 2000; Turkstra et al., 2003) and judgement (Iverson et al., 1993), overreaction to provocative stimuli and decreased conflict resolution skills (Turkstra et al., 2003). The changes commonly described include apathy, a failure to exercise foresight or to take account of the likely consequences of actions, a tendency to persist in courses of action that have ceased to be appropriate, irritability, grandiose and unrealistic ideas, and poor anger control. It is these cognitive and behavioural changes that may result in individuals committing offences.

The type and severity of the brain injury also play a crucial role not only in the predisposition to offend, but also in the person's insight and awareness of their deficits, which in turn impacts on their ability to understand any link between their brain injury and offending. The difficulty sometimes associated with a brain injury is that the person may not recognise the loss in their psychological functioning (Sarapata, Herrmann, Johnson & Aycock, 1998). This has implications for their progression through the criminal justice system as well as for their engagement in rehabilitation. Impaired cognition may diminish appreciation of the legal consequences of one's behaviour (Kelly & Winkler, 2007), and the head-injured individual may seem unresponsive to a judge and/or jury because they have greater difficulty understanding the proceedings than non-head-injured individuals. It is possible that this perception of the head-injured individual may lead to imprisonment more often than for non-head-injured individuals (Sarapata et al., 1998).

Comorbidity is also an issue of relevance to offender populations. The chronic use of alcohol and illicit substances tends to result in measurable neuropsychological impairments (Barnfield & Leatham, 1998). Prisoners often report high rates of lifetime harmful use or dependency on alcohol or drugs (Duffy, Linehan & Kennedy, 2006) and the risk of cognitive damage among these prisoners is heightened. Psychiatric disturbance following TBI is also common in both the acute and chronic stages of recovery, with an incidence of major depression after TBI of 27 to 77 per cent reported (Kennedy et al., 2005). This high incidence of depression, coupled with higher than average rates of ABI and substance use among prisoners, highlights the complicated health issues associated with prison populations.

... clinicians should pay particular attention to a history of domestic violence in assessing ABI among women, particularly among female prison populations where past experiences of domestic violence may be especially high...

1.5. Assessment of ABI

The very nature of brain injury presents challenges to the systematic identification of ABI in a correctional environment. No individual test can measure all aspects of brain functioning; hence no single measure has yet been found that will universally differentiate brain-impaired from non-brain impaired individuals (Iverson et al., 1993). Indeed diagnosis is often complicated by high levels of reported alcohol and substance use, particularly among offender populations (Barnfield & Leatham, 1998). Neuropsychological assessment is considered to be the best way to identify cognitive functioning problems (Spreen & Strauss, 1998). However, the cost of neuropsychological assessments, and the time required to undertake them, makes systematic assessment difficult in correctional settings (Iverson et al., 1993; Walker et al., 2003).

Screening offenders for ABI, using structured non-clinical instruments rather than comprehensive neuropsychological assessment, may prove to be the most cost effective way to commence the process of diagnosis in this population. Screening for ABI at reception into the correctional system would add another layer to the current risk assessments already conducted, such as suicidality, mental illness, violence and substance use, and would enable early identification of offenders with possible ABI to inform case planning and decision making.

The early identification of an ABI has a number of likely benefits for correctional agencies and the community more broadly. Consistent with "What Works", the international body of evidence that articulates the key principles for effectively addressing re-offending and the rehabilitative effort in Western correctional jurisdictions (Andrews & Bonta 1998), specialised interventions are required for individuals with neuro-behavioural impairment, as they present differently from individuals with other learning disabilities. Early identification could inform offender assignment and management, thereby advancing rehabilitation efforts during imprisonment (Diamond et al., 2007) and enabling more effective intervention with a high risk group (Schofield et al., 2006b).

The current study was intended to address the methodological limitations associated with the 2006 Pilot Study and to test an ABI screening tool to provide an estimate of the prevalence of ABI in the Victorian prison system.

Neuropsychological assessment is considered to be the best way to identify cognitive functioning problems (Spreen & Strauss, 1998). However, the cost of neuropsychological assessments, and the time required to undertake them, makes systematic assessment difficult in correctional settings.

2 Method

2.1. Study Design

The research aimed to evaluate the efficacy and validity of a three stage screening process to identify prisoners with an ABI and to provide ABI prevalence data for prisoners. The three stages utilised were:

Stage One:

arbias ABI Screening Tool used to indicate the possible presence of ABI

Stage Two:

Corrections Victoria clinical interview used to verify risk factors and refer to neuropsychological assessment

Stage Three:

Comprehensive neuropsychological evaluation used to provide an objective validation of the sensitivity/specificity of the screening tool and clinical interview for identifying ABI.

It was hypothesised that a risk-factor based checklist, combined with a follow-up clinical interview, would represent an accurate initial screening for the presence of ABI and that a validated risk-factor based screening tool would allow an estimation of the prevalence of ABI among prisoners.

2.2. Stage One (Screening Tool) Methodology

Participants

One hundred and forty-six adult male prisoners who were received into the Melbourne Assessment Prison (MAP) for assessment and orientation between November 2007 and March 2008 were invited to participate in the study. Of these individuals, 110 male prisoners (75 per cent of the group approached) consented to participate in the study. One hundred and forty-nine female prisoners who entered the Dame Phyllis Frost Centre (DPFC) between December 2007 and March 2009 were invited to participate in the study. Of these individuals, 86 female prisoners (58 per cent of the group approached) consented to participate.

Participants were recruited from sentenced prisoners only, with male prisoners needing to be sentenced to a minimum of six months and female prisoners a minimum of four months in prison.

Participants were excluded from the study if they had been registered as having an intellectual disability; if they required acute psychiatric treatment; or if they presented with a Culturally and Linguistically Diverse (CALD) background that would necessitate the use of an interpreter.

Materials and procedures

Stage One of the study involved participant recruitment and administration of the Acquired Brain Injury Screening Tool (the ABI Screening Tool). Participants were recruited through the Sentence Management Unit (SMU) services at MAP and DPFC. Prior to commencement of the study, the Manager of Information, Education and Research Services at *arbias* Ltd. provided a training seminar for staff from SMU on an Introduction to Acquired Brain Injury, and training on administration of the ABI Screening Tool.

Staff from SMU invited the prisoners to participate in the study during their initial Risk and Need Assessment and provided them with written information about the study and informed consent. The informed consent sheet covered participation in all three stages of the project. After written consent to participate in the study was obtained, staff members from SMU administered the ABI Screening Tool to participants on an individual basis.

The ABI Screening Tool was developed for Corrections Victoria by *arbias* Ltd and La Trobe University. The ABI Screening Tool screened for risk of acquired brain injury from a variety of causes through asking a series of questions to elicit relevant information. Questions were organised under eight subheadings, which related to history of alcohol use, drug use, assaults, motor vehicle accidents, suicide attempts, stroke, amateur/professional boxing, and psychiatric conditions.

Questions about alcohol and substance use history related to the type, duration and frequency of use. For alcohol use, the amount consumed was also elicited. Where there was a positive history of substance use, history of overdose and overdose-related resuscitation was sought.

Questions about assaults, motor vehicle accidents, suicide attempts and amateur/professional boxing related to the number of times the person had experienced each of these events, the nature of injuries sustained, whether injuries were associated with loss of consciousness and the estimated duration of loss of consciousness, whether hospital admission was necessary and the length of the hospital stay. For amateur/professional boxing, further specific questions related to the duration of involvement in competition and the number of times the person had been knocked out.

The stroke ABI indicator was explored by asking whether the person had suffered a stroke. Finally, psychiatric history was collected through questions about diagnosis of any psychiatric conditions and involvement with any treatment services.

The information gathered from these questions was used to determine whether the individual presented with risk of ABI from alcohol use, substance use, traumatic brain injury, hypoxia and/or stroke. Traumatic brain injury was screened for by motor vehicle accident, assault and boxing histories, while hypoxic brain injury was screened for by drug overdose and suicide attempt history. Judgments about whether ABI risk indicators were reported were made by reference to pre-determined criteria.

2.3. Stage Two (Clinical Interview) Methodology

Participants

For the male sample, participants were 109 prisoners recruited following completion of the ABI Screening Tool at Stage One of the research project (one prisoner who consented to participate was excluded due to non-completion of Stage One). Of these 109 participants, 7 participants withdrew their consent to participate in the clinical interview and one participant could not be seen due to behavioural problems. A further 11 participants were released from prison on parole or following successful appeal against conviction, before they could be seen for the clinical interview. Therefore, a total of 90 male participants completed the Stage Two clinical interview.

For the female sample, participants were 86 prisoners recruited following completion of the ABI Screening Tool at Stage One of the research project. Of these 86 participants, 23 participants withdrew their consent to participate in the clinical interview, two were deemed to require an interpreter and consequently excluded from the study, and one was diagnosed with an intellectual disability. A further four participants were released from prison on parole or following successful appeal against conviction, prior to the interview being conducted. Therefore, a total of 56 female participants completed the Stage Two clinical interview.

Materials and procedures

Clinical interviews were conducted at prisons as soon as possible following Stage One of the research project. Interviews were conducted by *arbias* staff members with professional training and experience in ABI. Interviews were conducted on an individual basis and the average duration of the clinical interview was one hour.

The clinical interview format used for the current study was based on the interview format developed by Corrections Victoria and *arbias* Ltd. during the Pilot Project. Minor modifications to the pilot study interview were made by *arbias* researchers prior to commencement of the study. The interview followed a semi-structured format and elicited information on demographic information and personal history, medical history, psychiatric history, alcohol and substance use history, history of contact with treatment and community support services, early developmental and school history, occupational history, current physical functioning, and self-reported cognitive difficulties.

2.4. Stage Three (Neuropsychological Assessments) Methodology

Participants

Participants were male and female prisoners who had completed both Stage 1 (ABI Screening Tool) and Stage Two (clinical interview) of the research project. Of the 90 male participants who completed both stages of the project, five withdrew consent at the time of the assessment, and 11 were released on parole before assessments could be conducted. A total of 74 male participants completed the Stage Three neuropsychological assessments.

Of the 53 female participants who completed Stages One and Two of the research, nine withdrew consent at the time of the assessment and one was released on parole before the assessment could be conducted. A total of 43 female participants completed the Stage Three neuropsychological assessments.

Materials and procedures

A comprehensive neuropsychological test battery was used for standardised data collection and to provide samples of a broad range of behaviour and assessment of the major cognitive functions. The test battery included some of the most commonly used measures in clinical practice and research and is presented in Table 1. The neuropsychological tests were selected on the basis of their extensive development, psychometric properties and sound normative sample data.

Table 1 Neuropsycholoical tests used in Stage Three

Wechsler Adult Intelligence Scale – Third Edition (WAIS-III)
Wechsler Memory Scale Third Edition (WMS-III)
Controlled Oral Word Association Test (COWAT)
Trail Making Test
Stroop Colour and Word Test (SCWT)
Rey Complex Figure Test (RCFT)
Rey Auditory Verbal Learning Test (RAVLT)
Test of Memory Malingering (TOMM)
Depression Anxiety Stress Scales – 21 (DASS-21)

Neuropsychological assessment findings included the profile of cognitive strengths and weaknesses on formal testing, behavioural observations during the assessment and consideration of background history including ABI risk factors. All of this information was considered when presenting a clinical opinion about whether or not a participant presented with an ABI.

With regard to ABI diagnosis, different types of brain injuries are often associated with different neuropsychological profiles. In general, however, ABI tends to cause impairment in one or more of the following areas: problem-solving and reasoning; new learning and memory; attentional functions; and higher-level executive skills. Impairment in a particular cognitive skill was determined when performance fell below normal limits for age expectations, that is, greater than 1.5 standard deviations below the mean score for age, and when the impairment was demonstrated with consistency under different testing conditions. Furthermore, the pattern of cognitive strengths and deficits had to be consistent with an ABI.

ABI was not diagnosed when the cognitive deficits could be wholly explained by factors such as medication side-effects, physical problems, emotional disturbance, intellectual background, and limited history of education. Some individuals diagnosed with ABI presented with these issues; in these instances, the cognitive deficits had to be greater than expected after taking into account the contribution from these factors.

The ABI diagnoses were based on independent evaluation of the evidence by two clinical neuropsychologists at *arbias* Ltd.

3 Results

3.1. Stage One: ABI Screening Tool

The screening tool was completed by 109 males and 86 females. The number of risk factors that an individual could report on the ABI Screening Tool ranged from zero to eight. Using the presence of one or more risk factors as an indicator of potential ABI, the initial screen indicated that up to two-thirds of male prisoners and three-quarters of female prisoners in the Victorian correctional system may have an ABI. Female prisoners were much more likely to have endorsed three or more risk factors than males (34 per cent compared with 23 per cent). Only a minority of both samples reported five or more risk factors (3.7 per cent of males and 6.9 per cent of females).

Table 2 presents the number and percentage of male and female participants who met the criteria for each type of potential ABI risk factor. The cumulative percentage was inflated due to more than one ABI risk factor being reported by some participants.

Table 2 Percentage of male and female participants who met criteria for ABI risk indicators

ABI Indicator Type	Males (n=109)		Females (n=86)	
	N	Percentage	N	Percentage
Alcohol	27	24.8%	13	15.1%
Drug	45	41.3%	53	61.6%
Traumatic Brain Injury				
Motor Vehicle Accident	11	10.1%	15	17.4%
Assault	17	15.6%	20	23.3%
Boxing	4	3.7%	1	1.2%
Hypoxic Brain Injury				
Overdose	28	25.7%	40	46.5%
Suicide Attempt	23	21.1%	21	24.4%
Stroke	1	0.9%	2	2.3%

Males and females produced slightly different profiles of potential sources of brain injury. Females were much more likely than males to screen positive for drug use (61 per cent versus 41 per cent), hypoxic brain injury due to overdose (46 per cent versus 26 per cent) and traumatic brain injury due to assault (23 per cent versus 16 per cent). In contrast, males were much more likely to identify alcohol as being a potential source of acquired brain injury (25 per cent versus 15 per cent). Due to the low numbers of prisoners endorsing stroke as a risk factor for ABI it was removed from further analyses and presentation of results.

For males who reported a single ABI risk factor, drug use was the most frequently reported indicator (42 per cent), followed by alcohol use (31 per cent). Interestingly, only nine per cent of females reported alcohol as a single risk factor, while reported drug use as a single risk factor was similar to males (45 per cent). Of significance is the near total lack of reporting of TBI as a single risk factor/trigger in male prisoners (only eight per cent) compared to female prisoners who reported TBI as a single trigger for ABI in 45 per cent of cases. This finding highlights that when TBI is identified as a risk factor for ABI for male prisoners it is usually in conjunction with another risk factor.

For the male sample, 19 individuals reported two ABI risk factors. The most common combinations within this subgroup were drug use and overdose with resuscitation (n=7, 37 per cent), followed by alcohol use and suicide attempt and drug use and suicide attempt (16 per cent). It was noted that 63 per cent (n=12) of this subgroup of the male sample reported drug use with another indicator, whereas a relatively smaller 21 per cent (n=4) reported alcohol use with another indicator.

For the female sample, 23 individuals reported two ABI risk factors with the most common combination being drug use and overdose involving resuscitation (n=15, 65 per cent), followed by alcohol use and drug use (n=3, 13 per cent) and drug use and suicide attempt (nine per cent). Almost the entire subgroup of the female sample - 95 per cent (n=22) - reported drug use with another indicator, whereas a smaller proportion (n=3, 13 per cent) reported alcohol use with another indicator. TBI was reported by only nine per cent of female prisoners who reported two triggers during screening for ABI.

Although the combinations of types of ABI indicators for participants who reported three or more triggers differed somewhat between genders, drug use was common to both males and females. Within the male sample, drug use was reported in 88 per cent of cases where three or more indicators were endorsed (most frequently in combination with drug overdose and alcohol use), while in the female sample drug use was reported in 81 per cent of cases (most frequently with drug overdose and attempted suicide).

Females were much more likely than males to screen positive for drug use...In contrast, males were much more likely to identify alcohol as being a potential source of acquired brain injury

3.2 Stage Two: Clinical Interview

The clinical interview was conducted with participants whether or not they screened positive at the screening stage. Ninety males and 56 females participated in the clinical interview stage. The main aim of the interview was to obtain further information regarding the potential triggers of an ABI. The clinical interview also sought important socio-demographic data, necessary for the interpretation of the Stage Three neuropsychological assessments. A selection of the information collected from the clinical interview stage is presented in this section. The entire results from Stage Two can be obtained from the full report.

A judgment of whether a person met the criteria for having an acquired brain injury during Stage Two was made on the basis of several factors assessed during the clinical interview, including background history and the person's clinical presentation (for example, evidence of chronic impairment or behavioural difficulties and individual report). On this basis, 54 per cent of males and 79 per cent of females had indicators of ABI.

Socio-demographic information

Table 3 presents selected socio-demographic and prison history characteristics of the male and female samples who participated in Stage Two of the study.

Table 3 Selected socio-demographic and prison history characteristics

	Males (n=90)			Females (n=53)		
Variable	M	SD	Range	M	SD	Range
Age	34.5	11.6	20-68	33.0	7.9	21-61
	Males (n=90)			Females (n=53)		
	N	Percentage		N	Percentage	
Aboriginal/Torres Strait Islander	8	8.9%		2	3.8%	
Born in Australia	74	82.2%		40	75.5%	
Unemployed	38	42.2%		29	54.7%	
Prior imprisonment	46	51.1%		31	58.5%	

The average age of male prisoners who were interviewed as part of Stage Two (clinical interview) was 34.5 years compared with 33.6 years for all male prisoners received into prison during 2007-08 (Corrections Victoria, 2009), while the average age for females who completed Stage Two of the research was 33.0 years compared with 33.8 years for female prisoners received into prison during 2007-08 (Corrections Victoria, 2009).

Approximately 6 per cent of all prisoners (5.7 per cent males, 8.9 per cent females) received into prison in 2007-08 (Corrections Victoria, 2009) identified themselves as Indigenous, compared to 8.9 per cent of males and 3.8 per cent of female prisoners who completed a Stage Two clinical interview. Thus, Indigenous females were slightly underrepresented and Indigenous males were slightly overrepresented in the Stage Two samples.

Of the prisoners who completed a Stage Two clinical interview, 82.2 per cent of males and 75.5 per cent of females reported being born in Australia compared with 79.1 per cent of male prisoners and 81.5 per cent of female prisoners received into prison during 2007-08 (Corrections Victoria, 2009).

Approximately three-quarters (75.7 per cent) of male prisoners and 53.9 per cent of female prisoners received into prison during 2007-08 were unemployed, compared with 42.2 per cent of males and 54.7 per cent of females completing a Stage Two clinical interview (unpublished Corrections Victoria data).

Finally, 51.1 per cent of males and 58.5 per cent of females completing a Stage Two clinical interview had served a prior term of imprisonment, compared with 55.1 per cent of male and 52.9 per cent of female sentenced receptions during 2007-08 (unpublished Corrections Victoria data).

These findings demonstrate that, with the exception of males' employment status, prisoners completing Stage Two were broadly representative of prisoners received into prison during the period in which the study took place.

Physical and mental health information

Over 50 per cent of male and female prisoners reported a medical history involving neurological complications. These neurological complications included epilepsy, head injury, loss of consciousness for other reason, migraine, neurological illness, brain tumour, and neurodegenerative disorder.

A previous diagnosis of learning disability/intellectual disability was reported by less than two per cent of male and female prisoners, which is comparable to the three per cent found by the Victorian Prisoner Health Study (Deloitte Consulting, 2003).

At least one psychiatric diagnosis (either current or past) was reported by 63 per cent of male prisoners and 79 per cent of female prisoners. Further, more than one-quarter (27 per cent) of male prisoners and 23 per cent of female prisoners reported three or more psychiatric diagnoses. Depression and anxiety were the most frequently reported psychiatric illnesses among male and female prisoners in the current study. However, female prisoners reported significantly higher rates of depression than males in the current sample, while males reported much higher rates of secondary psychosis (usually drug induced) than females. It should be noted that while prisoners were asked if the diagnosis was made formally by a medical specialist, no medical records were sought in corroboration.

Finally, approximately 50 per cent of males and 65 per cent of females reported being hospitalised from factors that could result in an ABI. TBI from either assault or a motor vehicle accident was reported by approximately 30 per cent of prisoners, with prisoners reporting drug overdose in nearly 20 per cent of hospital admissions. The only significant gender difference was that female prisoners were more likely than males to be admitted to hospital as a result of an attempted suicide. It should be noted that hospital records were not sought during this stage of the research.

Substance use information

A full drug and alcohol history was taken for prisoners who participated in Stage Two. Information gathered included age at first use, age of first regular use, frequency of regular use, and duration of regular use for alcohol and eight common substances. A brief summary of the findings is presented here, and the complete results can be found in the full report. Table 4 presents alcohol and drug use rates for male and female prisoners.

Women were much more likely to report substance use than males in all categories, apart from alcohol use, and particularly in the categories of ecstasy, opiates and benzodiazepine use.

Substance use generally started at a young age (15 or 16 for alcohol and cannabis, late teens and early twenties for other substances), and the majority of participants who reported using a particular substance did so on a regular basis and for an extended period of time. Forty-four per cent of male prisoners and 34 per cent of female prisoners who consumed alcohol did so daily, while approximately 70 per cent of both male and female prisoners reported using cannabis daily/most days.

Although half of male and female amphetamine users used daily/most days, over 20 per cent of female users had done so for more than 10 years compared with only eight per cent of male prisoners. The use of amphetamines by females in the current study was slightly lower than found in previous studies (Butler & Milner, 2003).

Table 4 Alcohol and drug use rates for male and female prisoners

	Males (n=109)		Females (n=86)	
	N	Percentage	N	Percentage
Alcohol	86	95.6%	50	94.3%
Cannabis	68	75.6%	44	83.0%
Amphetamines	47	52.2%	37	69.8%
Cocaine	19	21.1%	20	37.7%
Hallucinogens	16	17.8%	12	22.6%
Ecstacy	28	31.1%	29	54.7%
Opiates	36	40.0%	34	64.2%
Inhalants	10	11.1%	34	18.9%
Benzodiazepines	32	35.6%	33	62.3%

Male prisoners also reported using cocaine regularly at an earlier age than female prisoners (22 years versus 28 years). For males who used cocaine there was a strong association between age of first use and age of first regular use, indicating that once males in the current sample used cocaine they tended to do so on a regular basis.

Over 50 per cent of female prisoners who completed a Stage Two clinical interview reported previous ecstasy use, which was significantly higher than that reported by males (31 per cent). Although females reported a higher rate of ecstasy use, males reported using regularly at an earlier age (19 years versus 22 years) and using much more regularly than females, with 83 per cent of females who started using ecstasy reported never using regularly compared with 53 per cent of males.

Opiates were the fourth highest reported substance used by prisoners after alcohol, cannabis and amphetamines, and a high proportion of users did so daily/ most days (89 per cent of males and 94 per cent of females). The risk of opiate use and overdose is high, and this increases with length of time used. Indeed, those who reported using opiates for longer than eight years accounted for nearly two-thirds of all prisoners reporting overdose involving resuscitation.

Identified inhalant use among male and female prisoners was relatively small (11 per cent and 19 per cent respectively). Of concern though, is the early age of both first inhalant usage (15 years for males and 14 years for females) and regular usage (16 years for males and 14 years for females) given the detrimental effects of inhalant usage on a developing brain.

Finally, female prisoners reported using benzodiazepines at higher rates than male prisoners (62 per cent compared with 35 per cent). Approximately 30 per cent of prisoners who used benzodiazepines reported never using them regularly; however, if they did use regularly, they were more likely to do so on a near daily basis. Females reported much longer use than males, with 42 per cent reporting five or more years of use compared to 25 per cent of male benzodiazepine users.

Assessment of ABI: screening versus clinical interview

Table 5 presents a summary of identified ABI risk factors for male and female prisoners between screening and clinical interview.

Table 5 Percentage breakdown of risk factors screen vs. interview for interviewed participants

	Males (n=90)				Females (n=53)			
	Screening		Interview		Screening		Interview	
Alcohol	24.4%	(22)	18.9%	(17)	20.8%	(11)	11.3%	(6)
Substances								
Cannabis	24.4 %	(22)	22.2%	(20)	32.1%	(17)	35.9%	(19)
Amphetamines	10.0 %	(9)	7.8%	(7)	18.9%	(10)	13.2%	(7)
Cocaine	1.1 %	(1)	0.0%		0.0%		0.0%	
Opiates	20.0 %	(18)	14.4%	(13)	43.4%	(23)	41.5%	(22)
Benzodiazepines	2.2 %	(2)	3.3%	(3)	13.2%	(7)	18.9%	(10)
Other	1.1 %	(1)	1.1%	(1)	0.0%		1.9%	(1)
Drug overdose with resusitation	26.7 %	(24)	21.1%	(19)	50.9%	(27)	47.2%	(25)
Assault	20.0 %	(18)	7.8%	(7)	20.8%	(11)	9.4%	(5)
Motor-vehicle accident	11.1 %	(10)	12.2%)	(11	20.8%	(11)	13.2%	(7)
Attempted suicide	17.8 %	(16)	13.3%	(12)	32.1%	(17)	24.5%	(13)
Boxing	2.2 %	(2)	1.1%	(1)	0.0%		0.0%	

When comparing the breakdown of risk factors from the screen to the risk factors identified in the interview, there was no significant change in risk factor rate in the areas of substance use, drug overdose or attempted suicides. There was, however, a significant decrease in participants identified as potentially having an alcohol related brain injury (males declined from 24 per cent to 19 per cent and females declined from 21 per cent to 11 per cent); from assault (males declined from 20 per cent to 8 per cent and females declined from 21 per cent to 9 per cent); and from motor vehicle accidents (females declined from 21 per cent to 13 per cent). Therefore, the clinical interview was effective in reducing potential false positive prevalence rates from the screen. This is likely to be best explained by the clinical interviewer having more time and expertise to elicit relevant information about substance use and head injury factors, when compared to the basic criteria as set out in the screening tool.

3.3. Stage Three: Neuropsychological Assessment

Neuropsychological assessment indicated that 31 males and 14 females, representing 42 per cent of male and 33 per cent of female prisoners who completed Stage Three, had an ABI.

A summary of the neuropsychological test results for male and female prisoners with and without an ABI is presented in this section. The complete results, including prisoners' scores on the individual neuropsychological tests, can be found in the full report.

Neuropsychological test results

Male and female prisoners without an ABI performed within the average range on all of the neuropsychological tests, indicating no areas of impairment or significant strengths and weaknesses. This is an important finding as it indicates that the majority of prisoners have intact cognitive functions similar to the general population.

In contrast, both male and female prisoners with an ABI demonstrated a wide range of cognitive impairments. Clear gender differences were also apparent in the profile of impairments for prisoners with an ABI. Females performed more poorly than males on tests of perceptual and spatial ability, complex visual memory and spatial working memory. Furthermore, they performed more poorly than males on two educationally-based tasks (general knowledge and mental arithmetic), despite having better overall education. On the basis of these results, the neuropsychological test data was analysed separately for males and females.

Using a conservative significance level of .01 (to account for multiple test comparisons and to make the results more meaningful clinically), male prisoners with an ABI demonstrated lower performances than males without an ABI in the areas of verbal intellectual and executive functions, complex processing speed, working memory, higher attention skills, new learning and memory. No significant differences were found in the areas of basic processing speed and basic perceptual abilities.

Although males' deficits in the areas of verbal intellectual and executive functions, complex processing speed, working memory, and higher attention skills would be considered 'mild' (approximately one standard deviation below the mean), impairments in the areas of new learning and memory would be considered 'moderate' to 'severe' (approximately two standard deviations below the mean). It should also be noted that male prisoners with an ABI had significantly lower educational achievement, which may account for some of the lower performances in the areas of verbal intellectual abilities.

Again, using a conservative significance level of .01, female prisoners with an ABI demonstrated significantly lower performances than females without an ABI in the areas of perceptual intellectual and executive functions, complex processing speed, working memory (especially spatial), higher attention skills and more complex new learning and memory (especially visual). No significant differences were found in the areas of verbal intellectual and executive skills, basic processing speed and basic new learning and memory.

It should be noted that the majority of areas of impairment for female prisoners with an ABI would be considered 'mild' (approximately one standard deviation below the mean), apart from spatial working memory and some aspects of visual memory, which would be considered 'moderate' to 'severe' (approximately two standard deviations below the mean).

Table 6 shows the percentages of male and female prisoners with an ABI identified as having a mild, moderate or severe ABI on formal neuropsychological assessment.

Table 6 Severity of ABI for male and female prisoners

	Males (n=31)	Females (n=14)
Mild	55%	72%
Moderate	39%	21%
Severe	6%	7%

Only a small proportion of male and female prisoners with an ABI were assessed as having a severe ABI (six per cent and seven per cent respectively), which is consistent with the prevalence of severe ABI in persons with an ABI in the general population (typically reported as around five per cent; Australian Institute of Health and Welfare, 2007). Over half of both female and male prisoners were rated as having a mild ABI (55 per cent and 72 per cent respectively), although females were more likely to have a mild ABI than males. While the prevalence of mild ABI in female prisoners was similar to that seen among people with ABI in the general population (reported as around 70-80 per cent), male prisoners were more likely to have a moderate ABI (39 per cent) than is found in the general population.

Evaluation of the *arbias* screening tool for identifying ABI

Table 7 shows the numbers of male and female prisoners identified as potentially having or not having an ABI at Stage One (screening) and the number of male and female prisoners assessed as having or not having an ABI at Stage Three (neuropsychological assessment). This, and the following, table include only prisoners who completed all three stages of the study.

It can be seen that there was a significant decline in the proportion of prisoners who potentially had an ABI at screening compared with those who actually had an ABI on assessment (Males – 65 per cent at screening down to 42 per cent at assessment; Females - 81 per cent at screening down to 33 per cent at assessment).

This is not a surprising result, as the 'triggers' used in the screening tool for identifying a potential ABI were set below the level generally thought to be the threshold at which an ABI may occur. For example, the screening threshold for male alcohol consumption was drinking six standard drinks per day for eight years, whereas the threshold is generally seen as eight standard drinks per day for 10 years. One of the attributes of a screening tool is that it is 'over-inclusive', so that potential positive cases are not missed. This may result in a large number of 'false positive' screens. It is more concerning if there are a large number of 'false negative' cases which would indicate that the screen is not successfully identifying clients with a brain injury.

Table 7 Number of male and female prisoners identified as potentially having an ABI at stage one (screening) and actually having an ABI at stage three (assessment)

	Males (n=74)		Females (n=43)	
	No ABI	ABI	No AB	ABI
Screening	26	48	8	35
Assessment	43	31	29	14

Table 8 Number of male and female prisoners identified as potentially having an ABI at stage one (screening) and stage three (assessment)

	Males (n=74) Screen		Females (n=43) Screen	
	No ABI	ABI	ABI	No ABI
Assessment ABI	25	6	14	0
Assessment No ABI	23	20	21	8
	X2 = 5.82	p<.05	X2 = 4.94	p<.05
	Males – true positives – 52%		Females – true positives – 40%	
	Males – true negatives – 77%		Females – true negatives – 100%	
	Males – false positives – 48%		Females – false positives – 60%	
	Males – false negatives – 23%		Females – false negatives – 0%	

Table 8 presents the sensitivity and specificity analysis of the ability of the screening tool to predict whether a prisoner had an ABI or not.

The analyses for both male and female prisoners were statistically significant at the .05 level, indicating that the screening tool was useful in predicting whether a prisoner had an ABI or not. This was particularly so for female prisoners where there were no false negatives, which meant that all prisoners with an ABI were identified by the screening tool. The screening tool was less accurate for male prisoners as there was a 23 per cent 'false negative' rate, indicating that one in four male prisoners with an ABI was missed by the screen.

The possible reasons for the differing sensitivity of the screening tool for males and females are explored further in the discussion section.

The current study employed a three-stage approach of initial screening, clinical interview and neuropsychological assessment to provide an indication of the prevalence of ABI among the Victorian prison population. In addition, the study evaluated the efficacy and validity of the three-stage screening process to identify prisoners with an ABI.

4 Discussion

4.1. Prevalence, Severity and Causes of ABI among Prisoners

On the basis of comprehensive neuropsychological assessment, 42 per cent of male prisoners and 33 per cent of female prisoners in the current study were assessed as having an ABI. This compares with an estimated prevalence of ABI among the general Australian population of two per cent (Australian Institute of Health and Welfare, 2007). Thus, individuals with an ABI appear to be substantially overrepresented in the Victorian prison population.

In terms of the severity of ABI, only a small proportion of male and female prisoners with an ABI were rated as having a severe ABI (six per cent and seven per cent respectively), which is consistent with figures for the general population; reported as around five per cent of individuals with an ABI (Australian Institute of Health and Welfare, 2007). The prevalence of mild (72 per cent) and moderate (21 per cent) ABI in female prisoners was also similar to that in general ABI populations (mild ABI generally reported as around 70-80 per cent). However, the prevalence of moderate ABI in male prisoners (39 per cent) was greater than in general ABI populations (reported as around 15-25 per cent).

Overall, male and female prisoners with an ABI produced significantly different cognitive profiles. Females tended to present with more impairments in spatial abilities, complex attention and working memory, while male prisoners had more widespread and generalised impairments in all areas, apart from basic processing speed and basic perceptual abilities. This was an unexpected and interesting finding that could not be explained by age, education or mood symptoms. It is likely that the females' cognitive profile was the result of substance use, in particular, benzodiazepine use. In contrast, the males' impairment profile more resembled that seen in alcohol related brain injury and traumatic brain injury. This finding indicates that male and female prisoners with an acquired brain injury are likely to present with different cognitive and behavioural impairments and may require different management strategies.

With respect to the role of benzodiazepine use in the differing profiles for males and females, female prisoners tended to have a higher rate of substance use than males in nearly all categories (other than alcohol), but had particularly high use of benzodiazepines, opiates and amphetamines. While visuo-spatial problems are not commonly reported among opiate and cocaine users, difficulties with spatial abilities and working memory are reported in scientific literature with regard to long-term benzodiazepine use (Barker, Greenwood, Jackson & Crowe, 2004; Davis, Liddiard & McMillian, 2002).

The role of drug and alcohol use in prisoners' ABI is one of the most striking findings of the current research. Indeed, reported rates of substance use among prisoners in the current study are considerably higher than those for the general Australian population across all substance categories (Australian Institute of Health and Welfare, 2008). Further more, while drug and/or alcohol use were the most common risk factors for ABI for both male and female prisoners, among the general population traumatic head injury (for example, as a result of an accident, sporting injury or assault) is by far the most frequent cause of ABI (Australian Institute of Health and Welfare, 2007).

4.2. Methodological Considerations

The current study set out to address the methodological limitations of the 2007 Pilot Project, in that both male and female prisoners were investigated, and all prisoners were given a neuropsychological assessment, whether they screened positive or negative for having a potential ABI.

The main methodological concern for the current study was the participant drop-out rate. The drop-out rate of male prisoners (82 per cent of male prisoners clinically interviewed went on to complete the neuropsychological assessment) was mainly due to prisoners being released before the neuropsychological assessment could be completed. However, there was almost a 50 per cent drop-out rate from the screening stage to the neuropsychological assessment stage for female prisoners. This was largely due to female prisoners withdrawing from the project at the time of neuropsychological assessment. The reasons for their decision to withdraw are not known. However, a significant proportion of female prisoners who withdrew had screened positive on the initial screening and it is therefore possible that the prevalence rate found based on formal neuropsychological assessment is lower than the true prevalence rate within the female prisoner population. It should be noted that the problem of low participation and high drop-out rates in research with female prisoners is not unique to this study; other researchers in Victoria have faced similar issues with this cohort.

4.3. Evaluation of the *arbias* Screening Tool for Identifying ABI

Screening tools are intended to be 'over inclusive' to ensure that there is a low false negative rate. In this case the screen was intended to identify prisoners who warranted further investigation. The purpose of the clinical interview and neuropsychological testing were to refine possible ABI factors obtained from the screening and to obtain an actual rate of prevalence, rather than an estimated one.

Formal analysis of the sensitivity of the screening tool indicated that it was able to identify potential ABI at a statistically significant level. There were no false negatives in the female sample, but there was a false negative rate of almost one-quarter in the male sample, indicating that a considerable number of male prisoners were being missed at the screening stage. This was most likely due to male prisoners having a cognitive impairment and therefore being unaware, or unable to remember, parts of their background history which might result in a positive trigger. It was noted that new learning and memory problems were the most significantly impaired cognitive skill for males (moderate to severe impairment), and this is likely to have made their histories somewhat unreliable.

In respect of false positives, while the prevalence of ABI for males fell somewhat between the screen and the assessment (from 65 per cent to 42 per cent) it reduced drastically for females (from 81 per cent to 33 per cent). The likely reason for the decline is due to gaps in information regarding thresholds of drug use (including length of use and amount used) for individual drug groups. These gaps in information are particularly relevant for female prisoners, given their higher rates of drug use than male prisoners in almost all drug categories (except alcohol). Although the threshold of use for alcohol both in terms of amount used and length of time used is well known, it is much less clear for other drugs. While part of the screening process required a person to have used a substance for eight years or more, no restrictions were placed on the amount of the substance used, as this is not known. Therefore, it seems likely that the high number of females who screened as potentially positive to having an ABI due to substance use did not actually have one because they did not use enough of the substance on each occasion.

The lack of knowledge generally about 'safe levels' of illicit substance use makes it very difficult to refine the screening tool with regard to drug use. It does mean that, while screening for alcohol, traumatic brain injury and hypoxic brain injury is relatively accurate in terms of the possibility of the presence of an ABI, there are considerable issues about accuracy regarding drug use. As a consequence, if a person screens positive for a potential ABI due to substance use, this needs to be investigated more fully.

Together these findings illustrate both the importance of not relying solely on screening and the usefulness of the clinical interview and formal neuropsychological assessment in identifying ABI among prisoners.

Although prisoners with a mild to moderate ABI may function relatively well in prison, issues associated with their injury are likely to become more apparent following release.

4.4. Implications for Policy and Practice within the Victorian Prison System

The study findings regarding the prevalence and causes of ABI, as well as the profile of cognitive deficits seen among prisoners, have a number of implications for Corrections Victoria.

Management of prisoners with an ABI

In respect of the management of prisoners with an ABI, the highly structured routine of a prison environment may enable individuals with an ABI to function reasonably well, particularly those with a mild injury. However, prisoners with severe cognitive problems may present management challenges to prison staff and are likely to require extra support to be able to function effectively in the prison environment. Indeed, a Corrections Victoria pilot program has found that a significant number of prisoners with severe ABI are placed in prison management regimes. These represent restricted environments (i.e. reduced out of cell hours and loss of privileges) that are generally imposed as a result of behaviour that poses a risk to the good order of the prison.

The nature of cognitive deficits identified in the current study suggests that prisoners with a severe ABI are likely to have difficulty understanding and following instructions, especially if they are complex or require immediate action. As a result, these prisoners require support strategies from prison staff such as repetition, reminders, writing things down, avoiding complex instructions and giving prisoners more time to process information.

Additionally, gender differences in the profile of cognitive deficits seen in prisoners with an ABI indicate that female prisoners may require more assistance to engage with staff, while males may have more difficulty moderating their behaviour. These same considerations apply equally to best practice with prisoners with an ABI re-entering the community on parole and for offenders placed on community-based dispositions. Together these findings illustrate the need for staff training in identifying and appropriately responding to prisoners' ABI-related behaviour problems. Such efforts would be substantially aided by the inclusion of ABI-specific behaviour management plans in relevant prisoners' individual files.

Although prisoners with a mild to moderate ABI may function relatively well in prison, issues associated with their injury are likely to become more apparent following release. This can impact on their ability to meet parole conditions and, without appropriate support, may also increase the likelihood of further offending. Thus, identifying mild and moderate ABI among prisoners is relevant in ensuring post-release referral and support even though they may not require specialist responses while in prison.

Treatment needs of prisoners with an ABI

The current study also suggests that the treatment needs of prisoners with an ABI require special consideration. Given that the current study strongly indicated that the use of substances (alcohol and other drugs) is the main cause of brain injury among prisoners, access to drug and alcohol treatment services is especially important for this cohort; particularly given the potential for further cognitive deterioration if substance use continues post-release. The significant number of psychiatric diagnoses reported by prisoners in the current study, coupled with high rates of substance use, further indicates that a multi-disciplinary approach is likely to be required to adequately address prisoners' therapeutic needs and reduce the likelihood of prisoners returning to prison after release.

Prisoners with moderate to severe cognitive problems may also require altered approaches to the delivery of standard offending behaviour programs offered in prison (such as programs addressing violent or sexual offending) if they are to be effective. Although intellectual functioning was intact in prisoners with an ABI, and thus comprehension of program concepts is unlikely to be problematic, the severe deficits in new learning and memory identified indicate that individuals may have difficulty retaining program content from session to session. This is problematic in programs that take a building block approach to content delivery. For these prisoners, slower program delivery along with significant repetition may be necessary. The limited availability of places in such altered programs necessarily limits the ability of some ABI prisoners to participate in offending behaviour programs. Further, a number of prisoners with severe ABI may only be able to undertake one-on-one, rather than group, programs, which do not fit within the 'what works' program philosophy and are not systematically offered by Corrections Victoria.

Prisoners with an ABI may also require access to therapy to assist with learning to manage their cognitive problems (such as learning compensatory strategies for memory), as well as to explore and address any relationship between their cognitive problems and offending.

Screening and assessment of ABI in the Victorian prison system

Applying the ABI prevalence rate identified in the current study to the Victorian prison population as a whole indicates that, as at 30 June 2010, approximately 1,774 male prisoners and 103 female prisoners potentially had an ABI (106 and seven of whom respectively were likely to have a severe ABI). The size of the ABI cohort among prisoners in Victoria illustrates the impracticality of relying on formal neuropsychological assessment, which is time consuming and expensive, and the need for a valid screening process to identify this cohort within the correctional system.

Nevertheless, the high false positive rate for females and the false negative rate for males mean that the ABI screening tool in its current form has a number of limitations. There is a clear need for further refinement of the tool and for the process of identification of ABI within the prison system to include effective clinical review and referral for further assessment (potentially including comprehensive neuropsychological assessment in some cases).

Rather than adding the ABI screening tool to the suite of assessments conducted within prisons, Corrections Victoria is working on mapping items from the tool to items on the *Victorian Intervention Screening and Assessment Tool* (VISAT), Victoria's current correctional risk and need assessment instrument. This will enable prisoners with a potential ABI to be identified and, where appropriate, referred for further investigation without adding to the burden of existing assessment within the prison system.

In light of the study findings Corrections Victoria is currently developing a comprehensive service model and has also implemented a specialist, multi-focused pilot across part of the prison and community correctional service. The pilot includes four broad components – assessment, training, secondary consultation, and targeted case management – and is overseen by a specialist ABI clinician. It is hoped that the pilot will be able to be implemented state-wide in the future.

4.5. Conclusions and Future Research

The prevalence rates found in the current study indicate that persons with an ABI represent a significant proportion of the Victorian prison population and are substantially overrepresented compared with the prevalence of ABI among the general population. Although the proportions of male and female prisoners with a severe ABI were relatively small, these individuals require specific attention within the correctional system. The severe cognitive and behavioural deficits identified in these individuals have significant implications not only for offender management and therapeutic interventions during their time in prison, but also in terms of their need for support and assistance upon release.

Although the proportions of male and female prisoners with a severe ABI were relatively small, these individuals require specific attention within the correctional system. The severe cognitive and behavioural deficits identified in these individuals have significant implications not only for offender management and therapeutic interventions during their time in prison, but also in terms of their need for support and assistance upon release.

In particular, the study findings indicated that drug and alcohol use was the main cause of brain injury among prisoners, while in the general community traumatic head injury is the most common cause. Prisoners also reported substantially higher rates of drug and alcohol use than are typically reported in the general community, as well high rates of co-morbid psychiatric conditions. These findings point to the need for a coordinated and multi-disciplinary approach to addressing the therapeutic needs and day-to-day management of prisoners with an ABI.

It is not currently clear whether there is a relationship between the presence of an ABI and re-offending. If there is, then implementing appropriate support structures and services for prisoners with an ABI may result in a reduction in further offending and a reduction in returning to prison. Not only would this have significant psycho-social benefits for the individual, but it would also potentially have a significant cost-saving benefit (for example, keeping people in the community rather than in prison). Areas that may require attention include accommodation and employment, given that these were areas of concern raised during the interview stage (such as, high levels of accommodation problems and lack of employment prior to imprisonment), as well as on-going drug and alcohol treatment in the community.

While the study findings provide significant new information on the prevalence and causes of ABI among prisoners, and also point to important considerations in the management of ABI within the prison system, additional information is needed in a number of areas. La Trobe University and *arbias* Ltd are undertaking further analysis of the study dataset to explore the relationship between ABI and particular types of offending (for example, violent or sexual offending). In addition to this work, research on thresholds for harmful substance use, both in respect of length and amount of use, is needed and would assist in refining the screening tool to improve its performance for female prisoners. Research on the association between ABI and recidivism is also needed, as is research identifying effective interventions to address offending behaviour among this group of individuals.

5

Endnotes and References

Endnotes

1 Corrections Victoria Disability Frameworks 2007-2009 and 2010-2012

2 *Acquired brain injury: Screening, identification and validation in the Victorian correctional system.*

3 Traumatic Brain Injury refers to injuries due to head trauma caused by, for example, a motor vehicle accident, sporting injury or assault.

4 For example, the AIHW (2008) reported that eight per cent of males and 12 per cent of females aged 14 years and over had never used alcohol compared with only four per cent and six per cent of male and female prisoners respectively. Similarly, 30 per cent of Australians aged 14 years and over reported having ever used cannabis compared with 76 per cent and 83 per cent of male and female prisoners respectively, while only two per cent of Australians aged 14 years and over reported having ever used heroin compared with 40 per cent and 64 per cent of male and female prisoners respectively.

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