Women in Prison with Traumatic Brain Injury (TBI): Prevalence, Mechanism and Impact on Mental Health.

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INTRODUCTION: The number of offenders in the New Zealand prison systems is increasing at a rapid rate. More interestingly, the female offender population is growing almost twice as fast as their male counterparts. However, very little research focusses solely on incarcerated females. Previous research with male offenders suggests that those who are incarcerated are more likely to have experienced a traumatic brain injury (TBI) in their lifetime when compared to the general population. Other research shows that an individual who presents with a TBI is more likely to suffer from both mental health issues and issues with sleep. The current study aims to look at these variables within a New Zealand female prison population, and has three main hypotheses: The sample of participants from the prison population will present with show high levels of TBI incidents; mental health issues (such as depression, anxiety and stress) will correlate strongly with TBI and; participants who experience their first TBI at a young age will present with higher levels of mental health issues than those who received their first injury at a later age.

METHOD: The participants were recruited from all security levels at Christchurch Women's Prison. Each participant answered a battery of questionnaires including the Achenbach System of Empirically Based Assessment-Adult Behaviour Checklist (ASEBA), the Depression, Anxiety and Stress Scale (DASS-21), the Pittsburgh Sleep Quality Index (PSQI), the Ohio State TBI Identification Method, and the Weschler Abbreviated Scale of Intelligence (WASI).

RESULTS AND DISCUSSION: We found that 94.7% of participants presented with at least one TBI, and 96 injuries were reported in 36 participants. Mental health and sleep issues showed varying levels across participants, and the when compared to other studies' samples it was found that the participants in the current study presented with similar levels as other individuals who were incarcerated. One exception to this was depression, where the current sample was significantly more depressed than the male participants they were compared to. When the participants were split into younger (<9yrs of age at first injury) and older (9 years and older at first injury), several differences in mental health problems were evident including anxiety, stress and thought problems. This suggests that the earlier TBI is associated with an increased risk for adverse outcomes. More detailed information regarding female offending populations is essential for to the production of programmes aimed at reducing problems that may increase recidivism.

1.1. - Offenders

Criminal behaviour, defined as illegal activity, occurs frequently in most countries around the world (Williams, Cordon, Mewse, Tonks & Burgess, 2010). Predicting who is likely to commit these offenses to more accurately target preventions strategies aimed at reducing illegal activity can be difficult. A reduction of criminal behaviour is necessary to increase the safety of the general population and to improve the quality of life for those at risk of offending.

Prevalence rates for criminal behavior varies greatly across countries. For example, Williams et al. (2010) reported that in the United States 760 people per 100 000 are incarcerated for criminal behaviour at one time, in the United Kingdom 151 per 100 000 people and Iceland has the lowest number of offenders per 100 000 people with a mere 41 per 100 000 (Williams et al., 2010). Differences in reported criminal behavior is likely due to differing laws and penalties across countries. Another potential reason for the variation of prevalence rates may be a country's differing attitudes to rehabilitation of incarcerated offenders (in the case of our research offender population is used to describe a population of people that were serving a criminal sentence in a prison facility) and the focus on reducing recidivism.

Recidivism can be reduced via a number of methods. For example, Emilsson, Gudjonsson, Sigurdsson, Baldurssson, Einarsson, Olafsdottir and Young (2011) report about a cognitive behaviour therapy (CBT) program presented to offenders in Iceland called Reasoning and Rehabilitation for Attention Deficit, Hyperactivity Disorder (R&R2ADHD) which targets antisocial behaviours which has proven to be effective in reducing recidivism. Meta-analyses have been conducted on other CBT

programmes (Lipsey, Landenberger and Wilson, 2007) and they have also been found to have a positive effect on recidivism.

The offender population in developed countries is predominantly male. For example, in the USA females account for only19 percent of arrests and 5.7 percent of the incarcerated population in 1992 (Flowers, 1995). This has resulted in most research into the area of offending targeting male offenders. Although the research on male offenders is clearly important, it is not always representative of the attitudes or behaviours of female offenders, and it is essential that we also have an accurate understanding of why females offend as it is likely that prevention programs will be more effective if they are tailored specifically to female offenders rather than using a program that is tailored to male offenders.

1.1.1 - Changing Demographics of Offender Populations

Although female offenders only make up a small proportion of the entire prison population, this proportion has increased substantially over the last few decades. One study measured a 25.6% increase of general crime in female offenders, and an 83% increase in violent crime (Piquero & Chung, 2001) while another from the USA suggests an increase of 182% over a ten year period (Brewer-Smyth, Burgess & Shultz, 2004). A similar increase was found in New Zealand (Corrections, 2009), the proportion of female offenders increased 297% between 1986 and 2009, while prison sentences for females increased from 4% to 5.9%.

1.1.2 - Lack of Generalization

Due to the lack of research on incarcerated females very little is known about the population, therefore rehabilitation programmes are based on research that is focused on the male population. There are several reasons for why the research on males cannot be generalized to females, the most important of these being that while incarcerated females and males face different challenges. For example, Kingi (2000) reports that because the incarcerated female population is small there are fewer correctional facilities dedicated to housing them; therefore incarcerated females are more likely to be imprisoned far from home which can lead to difficulties in maintaining relationships with family and friends, relationships which are important when it reaches time to reintegrate back into society (Kingi, 2000). Research also shows that males and females may offend for different reasons. There are several theories about what contributes to the likelihood of someone offending. These theories are different for male and female. For example, Bennett, Farrington and Huesmann (2005) report that male crime theories are based on more social influence, education and employment disadvantage whereas female theories focus on personal maladjustment, biological and/or psychological make-up.

Scott, McKinlay, McLellan, Britt, Grace and MacFarlane (2014) report that long-term psychological sequelae of events was different for males and females, with males significantly more likely to externalize their behaviour and act out, whereas females were more likely to suffer from internalizing disorders such as anxiety and depression. This is important to note because it can have an effect on how they react to rehabilitation programmes that are put in place.

Another important reason to study females is because traditionally they are the caregivers of their children. Offending can have an influence on how these children are being raised, for example, once a mother is convicted of a crime and incarcerated her children are likely to be moved into the care of a different family member or foster care which can affect the children.

1.1.3 - Risk Factors for Offending in Females

The following research will discuss both risk factors and predictor variables in relation to each section, therefore an explanation of the two before going any further. Risk factors are attributes that when expressed a person is at risk of developing a behaviour, such as offending, and/or illness. Whereas a predictor variable, predicts whether or not a person is very likely to present with the behaviour and/or illness.

Although there is a shortage of research on female offenders, some of the studies have looked at identifying several risk factors which may result in offending behaviour. For example, Bennett, Farrington and Huesmann (2005) concluded that low intelligence and poor academic achievement are two of the many risk factors, associated with offending. They also concluded that several family factors such as low parental supervision or having a criminal parent could contribute to the likelihood of a person offending. The researchers also identified several peer factors that may influence offending behaviour, for example, an association with delinquent peers (Bennett, Farrington and Huesmann, 2005). McKinlay, James and Grace (2013) identified several risk factors for reoffending in a study on New Zealand juveniles. For example age of first intake into the system, prior court appearances, and prior

dealings with police officers (including those that did not end in an arrest) were all identified as static (unable to be changed) risk factors of reoffending.

In an overview of prior research McKinlay et al. (2013) also recapped several dynamic risk factors, (those that are able to be pinpointed and potentially changed via intervention), for example leisure activities, parental supervision and peer affiliation (Schmidt, Hoge, & Gomez, 1996). In addition to risk factors, there are several studies that identify common attributes in multiple offenders. Examples of these attributes were outlined by Kingi (2000), who reported that incarcerated females in New Zealand, not unlike their overseas counterparts, generally had little or no work experience, and the majority were welfare dependent before sentencing. A high proportion were single parents who lived with family or in rental accommodation. In addition, the female prison population also has a higher level of illicit substance use than the general population (Barnfield & Leathem, 1998). Kingi (2000) also noted that female offenders from New Zealand were young, serving comparatively short sentences and criminally unsophisticated when compared to male offenders. One attribute that both imprisoned men and women share is that it is likely that they have a history of TBI.

1.2. - Traumatic Brain Injury

1.2.1. - Prevalence, Definition and Cause

Traumatic Brain Injury (TBI) is one of the leading causes of death and disability in the world (Perrin, Stevens, Cabrera, Jimenez-Maldonado, Martinez-Cortes & Arango-Lasprilla, 2013). One American study cites an average of 250 per 100 000 people reporting a TBI (Frankowski, Annegers & Whitman, 1985). Another study

based in the United States reported more than two million people experience a TBI every year, and 300 000 of these people require hospitalization (Silver, Kramer, Greenwald & Weissman, 2001). Barnfield and Leathem (1998) found similar proportions of TBI in a general New Zealand population. A number of issues that can affect prevalence estimations, for example, confusion over definition. There are several definitions used throughout the research, some of these include a definition for mild TBI, while others do not. The definition used by the National Head Injury Foundation (1985) is

> *"an insult to the brain, not of a degenerative or congenital nature, but caused by an external force, that may produce a diminished or altered state of consciousness."*

Most research studying TBI asks participants how the injury or injuries occurred. Morrell, Merbitz, Jain, and Jain (1998) reported that closed head trauma, or TBI, is most commonly caused by car accidents, falls or from the impact of an object to the head. Luiselli, Arons, Marchese, Potoczny-Gray and Rossi (2000) also list these as the most common way to obtain an injury to the head but also include athletic injuries. Other causes for a TBI include open head injuries where the skull is penetrated; these include such incidents as gunshot wounds and aggressive fighting (Rose & Johnson, 1996; Morell et al, 1998; & Luiselli et al, 2000).

1.2.2 - Outcomes of a TBI

The outcomes of a TBI range from being very severe to almost non-existent, with the most severe consequence being death. Approximately 90% of TBI sufferers have experienced a mild TBI (mTBI; McKinlay, Grace, Horwood, Fergusson, Ridder and

MacFarlane, 2008). While most mild TBI sufferers do not receive any medical treatment (Barnfield & Leathem, 1998) these injuries can result in behaviour and cognition changes such as ADHD, and conduct disorder which are particularly relevant when examining an offender population. One of the most common misconceptions about mTBI is that the adverse effects are short term. One explanation for this misconception is that most research into mTBI is focused on children. Children's brains are still developing and have less consolidated skills (McKinlay, 2014) this gives little support to rehabilitation of skills needed in life. Due to the variability of age that certain behaviours first occur it is difficult to determine the full disruption of an injury until later in life when the expected skills do not appear. Very little research has been done on long term outcomes of a mTBI, McKinlay (2014) however, reviews several articles that do look at long term outcomes of a childhood mTBI. Eight of 11 of these research articles found adverse outcomes in a follow-up years after a mTBI. Of the three that did not find adverse outcomes, the follow-up period was shorter than the others, suggesting that more adverse outcomes occur later in life.

People, who have had multiple mild TBIs or a more severe TBI which required hospitalization, may experience several adverse outcomes associated with their injury (Saunders, Selossie, Hill, Nicholas, Horner, Corrigan & Lackland, 2009). These injuries may include both physical and cognitive difficulties. The cognitive injury that occurs may depend on which area of the brain took the impact of injury. There are several areas of the brain that may be affected. The area that is damaged will heavily depend on where the initial impact of the injury occurs. Scott et al. (2014)

report that the frontal lobe is extremely vulnerable, and is one of the main areas injured during a TBI (Hawley, 2003). Deficits often occur in cognition and/or personality and behavior, with the most common of these outcomes a change in behaviour. The deficit in cognition can result in individuals finding they have difficulty in processing information, learning, perception, concentration, planning, memory and attention (Barnfield & Leathem, 1998). The change in behaviour can also result in increased anxiety and irritability (Barnfield & Leathem, 1998). The damage caused by a TBI does not always cause instantaneous deficits. The initial damage caused by an injury is not always the only damage to occur, and secondary damage can occur from complications if the TBI is severe enough (Rose & Johnson, 1996). The deficit needs to be addressed and catered for when looking at the rehabilitation of the prison population. If this is not recognized then the way a prisoner responds may be taken as unwillingness to change when in fact it may be inability to learn or understand what is expected.

1.2.3 - Risk factors

Research has identified several populations where TBI is more prevalent. Some of these populations include ethnic minorities, people who have a lower socio-economic status (SES), and people who have mental health issues (Morrell, et al., 1998; and Turkstra, Jones & Toler, 2003). These are similar to the populations at risk of offending. Substance use and abuse has also been found as a risk factor for a TBI. While these groups all have higher rates of TBI compared with the general population, in the case of lower SES and mental health issues it is not always possible to determine which occurred first. However, Scott et al., (2014) argued that

mental health issues are often a result of a TBI. This is important because it shows the effect of TBI, and during rehabilitation this can be focused on in an attempt to minimize the occurrence of mental health issues after an injury occurs.

While there are several risk factors which can predict the likelihood of TBI, other research shows that TBI can also be a predictor of adverse outcomes in later life. For example, van Vliet-Ruissen, McKinlay and Taylor (2014) found evidence that a history of TBI can increase the likelihood of women to engage in substance abuse and present with increased mental health issues. Moreover history of a TBI event was associated with increased risk of criminal offending, these issues were more prevalent when the individual presented with multiple TBIs. Another study (Corrigan & Deutschle, 2008) suggests that individuals who suffer a TBI in childhood or adolescence were twice as likely to suffer from mental health issues in adulthood, when compared to the general population. TBI also correlates highly with the misuse of drugs and alcohol (Corrigan & Deutschle, 2008). The participants from Corrigan and Deutschle (2008) with multiple TBI indicated they started using drugs and alcohol, on average, 5 years earlier than participants with no TBI. According to cohort data presented by McKinlay, Corrigan, Horwood, and Fergusson (2014), pre injury risk factors in young children include gender, a negative parenting style of the maternal parent, number of adverse life events and depressive symptoms. Risk factors for TBI are not always causal, from the research cited above it is clear that several factors are correlated with TBI however it is possible that there is a third moderating factor influencing these. For example, parenting style may moderate the relationship between alcohol use and TBI, young people who have

little or no parental supervision may be more likely to participate in activities which could result in TBI and alcohol use.

1.3 - Mental health and TBI

Development of a mental illness following a TBI is common; these mostly consist of mood disorders, with the most frequently reported being depression with one study citing that it occurs in 22-50% of TBI survivors (Underhill, Lobello, Stroud, Terry, Devivo & Fine, 2003). This is extremely high when compared to the prevalence rate of the general adult population of 9.5% (Underhill et al., 2003). Scott et al. (2014) found that females who had experienced a TBI were more likely to report a major depressive disorder than males who had experienced a TBI. This difference was significant in a group with moderate/severe injuries. Due to the link between TBI and depression being so pronounced the following paragraphs will explore the factors surrounding this link and the outcomes of patients who suffer from both of mental illness and a TBI.

1.3.1 - Predictor Variables

In persons with depression, there are several clear predictor variables found in most patients. Examples of these are SES, age, gender and ethnicity (Hibbard, Ashman, Spielman, Chun, Charatz & Melvin, 2004). However, in TBI patients with depression there are no clear predictor variables (Hibbard et al., 2004). Several research articles do however, outline some common risk factors which are found in groups of TBI sufferers. For example Hart, Hoffman, Pretz, Kennedy, Clark and Brenner (2012) suggested that pre-injury psychiatric issues, including but not limited to substance abuse was one risk factor. When an individual has suffered from a TBI

they may not suffer from any mental illness immediately, in fact it is more common for depression to occur in patient's years after their injury. Hibbard et al. (2004) report that major depression is found in 13% of TBI sufferers at one year post-injury, but that this increases to 61% eight years post-injury. These authors also suggest that previous psychiatric disorder is the strongest predictor of post-TBI depression. However it is possible that meditating factors may impact on reported rates of depression following TBI. For example, loss of job, inability to do the same things as before the injury, all of which can occur years after an injury when the chance of full recovery is becoming more remote. Where depression is present TBI significantly increases the likelihood suicidal behaviour (Brenner, Betthauser, Homaifar, Villarreal, Hardwood, Staves & Huggins, 2011). If an individual suffers from both TBI and PTSD (which isn't as common as depression and TBI) the individual is 3.3 times more likely to commit suicide than if the individual only suffers from a TBI (Brenner et al., 2011).

Individuals who have experienced TBI can have difficulty with everyday tasks particularly if the injury was severe enough to limit mobility or a mental illness develops after the injury. Some of the most common difficulties that these individuals encounter are lower levels of social functioning, low levels of support with everyday tasks, poor quality of life and decreased community involvement (Hibbard et al., 2004). Although some of these may be due to the developed mental illness (most commonly depression) it may also be due to the inability to do the same pre-injury behaviours with ease that is part of the cause for the depression. For example, a physical inability to complete daily tasks after an injury may lead to

depression for the patient is aware of this new difficulty and can become frustrated by this (Gomez-Hernandez, Max, Kosier, Paradiso & Robinson, 1997).

1.4 - Sleep and TBI

Sleep issues are frequently associated with TBI. Multiple studies have obtained both subjective (i.e., self-report) and objective (i.e., behavioural) measures of the level of sleep disturbances and difficulties in patients with TBI. Most studies suggest at least a 50% prevalence rate in sleep issues for patients with TBI with Parcell, Ponsford, Redman and Rajaratnam (2008) reporting 89% of TBI patients reporting poor sleep compared to 30% of controls. These issues with sleep can be wide ranging. For some the issue may be inability to fall asleep, while for others it may be broken sleep due to periods of waking during the night. Other research suggests that the lack of sleep and/or the difficulty sleeping may be due to other issues arising from a TBI, such as, anxiety or depression (Parcell, Ponsford, Rajaratnam & Redman, 2006).

Most individuals with a TBI do not report the existence of a sleep disorder prior to the injury (Steele, Rajaratnam, Redman & Ponsford, 2005). Literature suggests that individuals with a TBI sleep significantly later into the mornings when compared to individuals with no TBI regardless of work schedules (Parcell et al., 2006). These authors found that in patients aged between 16 and 61 years of age, with varying levels of TBI severity (mild to very severe), took longer daytime naps and took longer to fall asleep than a matched control group (Parcell et al., 2006).

There are several different aspects of sleep that can be affected by a TBI. Some of these are considered common sleep disorders while others are less common and only have a few documented cases. Sleep disturbance can be related to several different aspects of the individual injury. For example the inability to sleep at night time can arise from injury to the sleep regulating centers of an injury, which include, the reticular activating system or the suprachiasmatic nuclei of the anterior hypothalamus which regulate sleep timing (Parcell et al., 2006), damage to these centres can lead to the timing of sleep occurring at different times throughout the day when it does not usually occur. Other common disorders related to TBI include hypersomnia, which instead of inability to sleep, is the excess amount of sleep and excessive tiredness while awake (Castriotta & Lai, 2001). Some individuals who experience TBI also suffer from periodic limb movement disorder (Masel, Scheibel, Kimbark & Kuna, 2001).

It is reported that people who suffer from less severe TBI are associated with more severe sleep complaints (Parcell et al., 2006). The research suggests that there may be several reasons for this, for example it may depend on the measures used to determine if sleep disturbance is occurring. Castriotta, Wilde, Lai, Atanasov, Masel, & Kuna (2007) found that there was no relationship between level of sleep disturbance and the severity of the patient's injury. Parcell et al. (2006) argue that the difference in reporting may be due to the ability of patients with a less severe TBI to recall sleep patterns before their injury. They also argue that individuals with mild TBIs expect to go back to their day to day life more quickly than those with more severe injuries. There are several self-report questionnaires which assess the sleep

disturbance in individuals. These are a subjective way of measuring disturbances in sleep, whereas there is also objective ways of measuring such as sleep labs. Both of these ways are relatively accurate, and most report a significant difference in sleep quality when comparing TBI sufferers and a healthy control. This is important because it shows that when objective sleep measures cannot be used for any reason that self-report is still a very accurate way of measuring sleep disturbance.

1.5 - Current Study

It is known from previous research that male offenders have a higher rate of TBI than the general public. It is also known that people who suffer from TBI present with higher levels of depression, anxiety and sleep difficulties. Therefore, research unsurprisingly shows that incarcerated offenders also show a high level of mental health and sleep quality issues. However, most of the existing research focuses almost solely on male offenders and very few studies discuss the level at which female incarcerated offenders are affected. This leaves several critical questions unanswered, such as do incarcerated women show a high prevalence of TBI?; do incarcerated women who have a TBI suffer from mental health issues?; and does the age at the first injury have an effect on the mental health of individuals? From these questions stems the current research. The current research interviewed women from Christchurch Women's Prison in New Zealand with the following three hypotheses in mind.

1. The sample of participants from the prison population will present with high levels of prior TBI incidents.

2. Mental health issues (such as depression, anxiety and stress) will correlate strongly with TBI.
3. Participants who experience their first TBI at a young age will present with higher levels of mental health issues than those who received their first injury at a later age.

Method

2.1 - Participants

Offenders who were currently incarcerated at Christchurch Women's Prison (CWP) in May 2014 were recruited by researchers through a short presentation to each of the security wings. During the presentation the prisoners were told that participants with and without a known brain injury were required for the study. The women were then given the opportunity to sign up with the understanding they would be called individually to speak with a researcher at a later date. Of the 82 who were incarcerated, 38 agreed to participate (46.3%).

2.2 - Measures

2.2.1 - Ohio State University TBI Identification Method Short Form (OSU-TBI-ID; Bogner & Corrigan, 2009)

The OSU-TBI-ID was used to determine life time history of TBI, and if so, the severity of the injury. The questions used to determine this were formatted as follows: "Have you ever been hospitalized or treated in an emergency room following an injury to your head or neck? Think about any childhood injuries you remember or were told about." Participants were also asked about how any reported TBI events occurred, and if any other TBI events occurred that did not require hospitalization. If the participant answered yes to any of the questions further details were obtained including length of black outs, and the age of the participant when the injury occurred. The full questionnaire can be found in Appendix A. This form

has shown good test/retest reliability in incarcerated populations (Bogner & Corrigan, 2009).

2.2.2 - *The Achenbach System of Empirically Based Assessment- Adult Behaviour Checklist (ASEBA; Achenbach, Dumenci & Rescorla, 2003)*

The ASEBA – Adult Behaviour Checklist is a self-report questionnaire which focuses on a range of different mental health issues. These questions are formatted as statements and the participant is asked to decide how true this statement is about themselves. A three point scale ranging from 0-2 is used, with 0 representing not true for the participant, and 2 representing very true or often true. Examples of the 126 statements are as follows: I have trouble of sitting still; I lack self-confidence; I am impulsive or act without thinking; and I threaten to hurt people. The answers to these questions are added together for several scores which will fall into a normal or clinical range according to the Diagnostic and Statistical Manual of Mental Disorders (DSM; Achenbach, Dumenci & Rescorla, 2003). These scores are then added together and standardized depending on participants' age to give an overall score which will fall into the normal or clinical range. The checklist also gathers information about relationships with family members, peers and colleagues, as well as education and work commitments.

2.2.3 - *Pittsburgh Sleep Quality Questionnaire (PSQI; Buysse, Reynolds III, Monk, Berman & Kupfer, 1989)*

The PSQI is a self-report questionnaire used to determine the sleep quality of participants over the last month. This was done by asking participants to remember what time –on average- they went to bed, got up, how long it took to get to sleep and

the hours of sleep they have per night. It then moves to asking participants several questions relating to reasons for any sleep trouble the participant may be having. These are formatted as follows: [d]uring the past month, how often have you had trouble sleeping because you… could not get to sleep within 30 minutes; … had to get up to go to the toilet; and … had bad dreams. The full set of these questions can be found in Appendix A. These questions are answered on a scale ranging from not during the past month – three or more times a week. Also using this scale the questionnaire asks questions about sleep medicine and ability to stay awake while performing daily tasks. The PSQI also records sleep quality, and overall enthusiasm throughout the day. The scores from each of these components are raw scores (Buysse et al., 1989). These raw scores were converted into a standardized score ranging from 0 to 21. A score of five or less is associated with good sleep quality. Anything above five was associated with poor sleep quality. Buysse et al. (1989) found significant test re-test reliability and validity.

2.2.4 - Depression, Anxiety and Stress Scale (DASS-21; Grennan & Woodhams, 2007)

The DASS-21 consists 21 of three subscales each made up of seven questions. Participants were asked to think about each of the 21 statements in relation to their past week. Which are presented in the following format: I found it hard to wind down; I tended to over-react to situations; I found it difficult to relax and; I felt that life was meaningless. The entire list of questions can be found in Appendix A. Participants were given a four point scale to rate the statement on this ranged from 0 – did not apply to me at all, to 3 – applied to me very much, or most of the time.

Participants are then given a score for each of the subscales. Low scores suggest normal levels of depression, anxiety and stress. As a participants score increases the level of severity of also increases. The maximum score for each subscale is 21, the score for each subscale will then correspond to a severity category which range from normal to extremely severe. For example a score from 0-4 is a normal depression score and 5-6 is a mild depression score. The full categories can be found in Appendix A. The DASS-21 shows strong reliability and consistency in clinical and non-clinical samples (Antony, Bieling, Cox, Enns & Swinson, 1998; Henry &Crawford, 2005) as well as an offender group (Grennan & Woodhams, 2007).

2.2.5 - Weschler Abbreviated Scale of Intelligence (WASI) – Vocabulary and Matrix Reasoning

Two scales (vocabulary and matrix reasoning) from the WASI were used to estimate IQ of participants. Participants were first tested on receptive language skills. Answers given by participants were scored from 0-2 depending on level of understanding. The test was discontinued after five consecutive zeros were scored. The score was added up and the raw score is standardized so there is a mean of 10 and standard deviation of 3.

The matrix reasoning test required the participants to choose the missing piece of a pattern. Participants were given two practice examples in case the verbal instructions were unclear. Correct answers were worth one point while incorrect answers were worth zero. The puzzles were stopped after a participant received four consecutive zeros or four zeros in the last five puzzles. The standardized score was

calculated the same way as the vocabulary test. The two standardized scores were then added together and translated into an IQ score for that participant.

2.3 - Procedure and Design

Ethics was approved by both the University of Canterbury's Human Ethics Committee, reference number HEC 2013/30 (approval letter can be found in Appendix B), and the Department of Corrections.

The completion of the session with the researcher was considered informed consent, it was explained to participants at the beginning of the session that they were able to stop the session at any time and withdraw their data if they chose to do so. Participants completed a one on one semi-structured interview with one of two researchers. This interview took place in the interview rooms at CWP. Participants were told that the information collected was confidential, that their name would not be associated in any way and the data would not be shared with non-essential researchers and staff members. Each interview took approximately 45-55 minutes, see Table 1 for test order and approximate time of each questionnaire.

Once the questionnaires and tests were complete each participant was offered a debrief sheet which explained what their data would be used for, and asked if they any questions or concerns about the study. Participants were also encouraged to speak to someone - for example the prison Chaplin - if they experienced any problems or distress.

The design of this study is a between groups design because there is two separate groups which are being compared to one another. The participants were split into

two groups, according to age at first injury. They were also split into two groups according to severity of the TBI.

Table 1

Test order and time taken to complete each one

Test (in order completed)	Approximate Time Taken to complete
Ohio State University-Traumatic Brain Injury-Identification Form (OSU-TBI-ID)	5 minutes
Adult Behaviour Checklist for Ages 18-59 (ASEBA)	15 minutes
Wechsler Abbreviated Scale of Intelligence - Vocabulary (WASI-Vocab)	15 minutes
Pittsburgh Sleep Quality Questionnaire (PSQI)	5 minutes
Wechsler Abbreviated Scale of Intelligence- Matrix Reasoning (WASI-Matrix)	10 minutes
Depression Anxiety and Stress Scale Short Form (DASS-21)	5 minutes

Results

3.1 - Hypotheses

This chapter will provide evidence for the hypotheses outlined at the end of Chapter 1. These were:

1. The sample of participants from the prison population will present with high levels of prior TBI incidents. This is expected because previous research (Barnfield & Leathem, 1998) has indicated that offender populations have a high prevalence of TBI.
2. Mental health issues (such as depression, anxiety and stress) will correlate strongly with TBI. This is expected because research (Underhill et al., 2003) has shown previously that mental health disorders are more prevalent in individuals with TBI.
3. Participants who experience their first TBI at a young age will present with higher levels of mental health issues than those who received their first injury at a later age. This is expected because research (Hibbard et al., 2004) has suggested that children and adolescents experience more negative effects than adults after a TBI.

3.2 -Demographics

The Christchurch Women's Prison (CWP) can house up to 140 prisoners at one time, for the duration of our study the prison was not at capacity, with only 82 prisoners (58% capacity). Of the 82 incarcerated, 38 (46%) agreed to participate in the study. The average age of participants was 33 years (range 17-71) and the average IQ as measured by the WASI was 86 (range 55-115).

3.3 - TBI

Table 2. displays the level of severity for the TBIs reported, and the number of participants who reported more than one TBI. The mode of each participant's injury or injuries is listed in Appendix C. It also displays the number of participants who presented with a mild or moderate/severe injury. Some individuals were excluded from this because not enough information was gathered about their injury to make a distinction. Moderate/severe injuries were classified as injuries where loss of consciousness occurred for a long period of time, or the injury resulted in initial impact on the head.

Table 2.

Prevalence of traumatic brain injury in participants

- Total Number	96 injuries
- Multiple	*n* = 30
- Single	*n* = 6
-None	*n* = 2
- Age	
- Average at time of first injury	12 years 8 months (range 2 years - 34 years)
-Highest Level of Severity	
- Mild	*n* = 27
- Moderate / Severe	*n* = 8

**Severity of injury was based duration of unconsciousness along with mode of injury*

As shown in Table 2, the overall prevalence rate of TBI in this sample was 94.7% (n=36) The mean age of the participants at first injury was 12 years 8 months, with the majority of participants reporting a mild TBI (n=27).

3.4 - Mental health issues

Table 3. shows the average scores for the Depression, Anxiety and Stress Scale (DASS-21) subscales (depression, anxiety and stress) and the average score of the PSQI for the sample. It also gives the number and percentage of individuals who fell into the non-clinical (normal to mild) and clinical (moderate to extremely severe) ranges for each of the DASS-21 subscales, and the numbers of participants who reported scores of <5 (good sleep) and >5 (bad sleep) on the Pittsburgh Sleep Quality Index (PSQI).

Table 3.

The average score of participants for the DASS-21 and PSQI and the level of severity for different subscales

	Average Score (SD)	Number of Participants	Percentage
Depression	5.70 (4.46)		
-Non-Clinical Range		24	65%
-Clinical Range		12	35%
Anxiety	6.22 (5.02)		
-Non-Clinical Range		19	51%
-Clinical Range		17	49%
Stress	7.54 (5.51)		
-Non-Clinical Range		24	65%
-Clinical Range		12	35%
Sleep Quality	10.51 (4.85)		
-Poor		29	78%
-Good		8	22%

The mean score for the current study participants fell in different categories depending on the subscale, the mean of the depression scores (5.70) fell into the non-clinical category, while the mean anxiety score (6.22) fell into the clinical category

and the mean stress score (7.54) fell between the two categories. The majority of participants reported poor sleep quality (78%).

The scores from both the subscales of the DASS-21, and the PSQI scores were compared with data from previous research to identify how results for the present sample compare to those obtained with other non-offender and offender populations. This was done using independent *t*-tests, as shown in Tables 4 and 5. The tables also describe the type of sample each prior study used as well as their participant number and critical *t* value.

Table 4.

Comparison between participants in the current study and previous research using the DASS-21

Author	Population	Number of Participants	Subscale	Mean (SD)	*t*-value (Critical *t*-value)	Effect Size (Cohens d)
Antony, Bieling, Cox, Enns & Swinson (1998)	Non-Clinical Volunteers	49	Depression	2.12 (3.64)	*4.10(1.989)	.89
			Anxiety	1.22 (1.77)	*6.47(1.989)	1.41
			Stress	3.51 (3.78)	*4.02(1.989)	.88
Kavanagh, Rowe, Hersch, Barnett & Reznik (2010)	Custodial Sample	30	Depression	8.48 (5.30)	*-2.31 (1.997)	.57
			Anxiety	7.76 (5.93)	-1.14(-1.997)	.28
			Stress	9.72 (5.68)	-1.57(-1.997)	.39

**Significant t-values at p<0.05 **all t-tests two tail*

Table 5.

Comparison between participants in the current study and previous research using the PSQI

Author	Population	Number of Participants	Mean (SD)	*t*-value (Critical *t*-value)	Effect Size (Cohens d)
Elger (2009)	Inmate Sample				
	- Complained of Insomnia	77	12.50(4.00)	*2.31(1.981)	.44
	- No Complaint	61	3.20(2.00)	*-10.43 (1.985)	2.13
Knutson, Rathonz, Yan, Liu & Lauderdale (2006)	General Population				
	-Full Sample	610	5.70(3.10)	*8.82(1.963)	.69
	-White Female Subsample	187	5.10(2.80)	*9.37(1.971)	1.26

**Significant t-values at p<0.05 **all t-tests two tail*

As shown in Tables 4 and 5, the participants in this current study were significantly more impaired than the general population in both the DASS-21 scale and the PSQI scale. The current participants were significantly more depressed, anxious and stressed than Antony et al.'s (1998) non-clinical volunteer sample (which was 61% female) with the respective *t*-values $t(84)=4.10$, $p<.05$, $t(84)=6.47$, $p<.05$, and $t(84)=4.02$, $p<.05$. The current participants were not significantly different from Kavanagh et al.'s (2010) male custodial sample when it came to anxiety and stress but were significantly less depressed than this group $t(65)=-2.31$, $p<.05$.

The PSQI scores in the present sample were significantly different from both Elger's (2009) inmate sample and Knutson et al.'s (2006) general population sample as shown in Table 5. Elger's (2009) participants were split into two groups

dependent on whether or not they complained of insomnia. Participants in the current study reported sleeping significantly better than those who were in Elger's (2009) insomnia group, $t(112)= 2.31$, $p<.05$, but significantly worse than those in the no complaint group, $t(96)= -10.43$, $p<.05$. When compared with Knutson's et al.'s (2006) general population sample, participants in the current study reported a significant increase in sleep problems, $t(645)= 8.82$, $p<.05$. This increase was also found when compared to a subscale of the white females from Knutson et al.'s (2006) study, $t(222)= 9.37$, $p<.05$.

Table 6 shows the average score for subscales of the Achenbach System of Empirically Based Assessment - Adult Behaviour Checklist (ASEBA). It also show the number and percentage of participants that fell into the clinical and non-clinical range for each subscale. All subscales except rule-breaking behaviour and antisocial behaviour fell into the non-clinical range. Rule-breaking behaviour fell into the clinical range and antisocial behaviour fell between the non-clinical and clinical ranges.

Table 6.

The average score for subscales of the ASEBA, and number of participants who fell into the clinical and non-clinical range

	Mean(SD)	Number of Participants	Percentage
Anxiety Problems	7.16(3.35)		
- *Clinical Range*		8	22%
- *Non-clinical Range*		29	78%
Depressive Problems	10.81(6.21)		
- *Clinical Range*		13	35%
- *Non-clinical Range*		24	65%
Avoidant Behaviour	5.11(3.61)		
- *Clinical Range*		13	35%

-Non-clinical Range		24	65%
Antisocial Behaviour	12.89(8.10)		
- Clinical Range		15	41%
- Non-clinical Range		22	59%
Attention Problems	12.19(6.94)		
- Clinical Range		11	30%
- Non-clinical Range		26	70%
Rule-breaking Behaviour	10.86(5.88)		
- Clinical Range		27	73%
- Non-clinical Range		10	27%
Anxious/Depressed	15.08(8.95)		
- Clinical Range		13	35%
- Non-clinical Range		24	65%
Thought Problems	6.46(4.87)		
- Clinical Range		15	41%
- Non-clinical Range		22	59%
Intrusive Thoughts	2.70(2.78)		
- Clinical Range		3	8%
-Non-clinical Range		34	92%

3.5 - Age at First Injury

Table 7 shows outcomes when the participants were split by age of first injury, five participants were excluded from this particular analyses due to no age being given for their first injury. All tests for heterogeneity of variance (Levene's tests) were not significant. Therefore equal variance was assumed, except for intrusive thoughts. Five variables were significantly different between individuals who experienced their first injury before nine years (n=13) and those who experienced a TBI after nine years (n= 18): Anxiety measured in the ASEBA, $t(29) = -3.34$, $p = .002$; anxious/ depressed feeling, $t(29) = -2.14$, $p = .041$; thought problems, $t(29) = -2.39$, $p = .024$; anxiety measured by the DASS-21, $t(29) = -2.19$, $p = .037$; and stress, $t(29) = -2.32$, $p = .028$.

Table 7.

Outcomes for participants when divided according to age of first injury. Note: boldface t values indicate p < .05.

	Group Means Injury ≤9years Injury>9years	*t*-value	*p*-value	Effect Size (Cohens *d)*
ASEBA				
-Anxiety	9.46 5.78	**3.343**	**.002**	1.24
-Depressive	12.85 9.83	1.322	.196	.49
-Avoidant Behaviour	6.38 5.50	.690	.496	.26
-Antisocial Behaviour	15.15 11.89	1.044	.305	.39
-Attention Problems	13.62 11.33	.871	.391	.32
-Rule-Breaking Behaviour	11.85 10.06	.776	.444	.29
-Anxious/ Depressed	19.23 12.56	**2.140**	**.041**	.79
-Thought Problems	8.92 4.89	**2.388**	**.024**	.89
-Intrusive Thoughts*	4.00 2.06	1.727	.089	.78
PSQI	10.38 11.89	-.889	.381	.33
IQ-Score	82.31 87.56	-1.139	.264	.42
DASS-21				
-Anxiety	8.62 4.72	**2.189**	**.037**	.81
-Stress	10.31 5.94	**2.315**	**.028**	.86
-Depression	6.15 5.78	.226	.823	.08

**df =19.427 **df =29, group is split into first injury before or after nine.*

3.6 - Other Analyses

Results were further evaluated using severity of the injury as the grouping variable. Severity level was appointed a 4-point scale (no injury =0 to severe injury =3) and participants were given two severity scores, one for first injury (*m*= 1.27, *SD*= *.72)* and a cumulative one for all injuries (*m*= 2.95, *SD*= 1.43). Participants were also given two other binary scores based on whether they reported one or more of their injuries being caused by domestic violence or a motor vehicle accident. These four variables were then correlated with the DASS-21 subscales scores, PSQI scores, ASEBA subscales, and IQ. The four new variables were not significantly correlated with the other measures, as Table 8 shows.

Table 8.

Correlations of severity of injury, specific type of injury and mental health constructs

	Severity of first injury	Cumulative injury score	Domestic violence	Motor vehicle accident
PSQI	-.103(.568)	.204(.226)	.021(.900)	.116(.493)
Depression	.018(.92)	.067(.694)	.153(.366)	.124(.465)
Anxiety	.051(.779)	.114(.503)	-.063(.711)	.135(.425)
Stress	.043(.812)	.052(.851)	-.149(.378)	-.042(.806)
IQ Score	-.057(.753)	-.133(.433)	.212(.209)	-.178(.292)
Anxious Problems	-.251(.153)	.111(.506)	-.123(468)	-.029(.866)
Depressive Problems	-.051(.773)	.062(.712)	-.126(.456)	.135(.472)
Avoidant Behaviour	-.080(.653)	.080(.634)	.097(.570)	.210(.213)
Antisocial Behaviour	.134(.450)	.242(.143)	-.126(.456)	.291(.081)
Attention Problems	-.024(.894)	.098(.558)	.044(.774)	.220(.190)
Rule-breaking	-.037(.835)	.136(.414)	-.085(.619)	.199(.237)

Behaviour				
Anxious/Depressed	-.203(.250)	.010(.954)	-.055(.746)	.041(.811)
Thought Problems	-.019(.914)	.156(.344)	-.185(.272)	-.088(.604)
Intrusive Thoughts	.054(.762)	.226(.173)	-.030(.858)	.159(.346)

**Formatted r-value(p-value)*

Chapter 4 - Discussion

4.1 - Summary of Results

The general aim of the current study was to contribute to the research literature on incarcerated females. It is known that much of the research on individuals who are incarcerated is based on male or unspecified populations. Male and females can act and react in different ways to one another therefore it is important that these populations are studied separately (Bennett, Farrington & Huesmann, 2005). The research undertaken for this study had three specific aims. The first aim was to determine whether incarcerated females in New Zealand had an increased risk of TBI compared to the general population. The results from the Ohio State TBI questionnaire showed that the majority of participants reported at least one incidence of TBI, with only two reporting no injury throughout their lifetime. The results also showed that 83% of individuals who reported TBI reported more than one incidence in their lifetime with a total of 96 separate TBI injuries occurring in this sample.

The second and third aims focussed on the levels of mental health issues in the studied population. The second aim evaluated at what level the current participants were dealing with mental health issues, including depression, anxiety, stress as well as the quality of sleep. We found that the average participant from the current study fell into the non-clinical range for both depression and stress, but into the clinical range for anxiety. When compared to individuals from other studies, the present sample had similar levels to an incarcerated population of anxiety and stress, but had significantly lower levels of depression. However, when compared to a group of

non-clinical volunteers, the present sample showed significantly higher levels for anxiety, stress, and depression. The average sleep quality reported by individuals in the current study was categorized as bad sleep. When compared to a general population (Knutson, Rathonz, Yan, Liu & Lauderdale, 2006) the present sample reported significantly worse sleep quality. The same was true when the current sample was compared to a white female subgroup of that general population. When compared to a different incarcerated group (Elgar, 2009) however, the current participants fell in the middle, reporting significantly better sleep than those who reported insomnia, but significantly worse than those who did not report insomnia. The average scores for the subscales of the ASEBA fell mostly in the non- clinical range, with only rule-breaking behaviour falling into the clinical range.

The third aim focussed on the rates of mental health issues within just the current sample. More specifically we asked if the participants' scores were dependent on the age of first TBI incidence. We found that individuals who reported their first injury occurring before the age of nine were significantly more impaired than those who indicated their first injury occurred after the age of nine in a number of areas including anxiety (measured by both the ASEBA and DASS-21), an anxious/depressed variable (a variable that stems from questions that measure both depression and anxiety) and thought problems and stress.

Additional analysis showed that the severity of first injury and the cumulative severity level did not significantly correlate with any of the mental health problems that were measured.

4.2 - Significant and non-significant findings

4.2.1 - TBI

The participants from the current study reported a very high incidence rate of TBI with only two participants reporting no injury. The high prevalence of TBI in incarcerated populations is not uncommon, with the majority of research on offenders reporting a high percentage of participants having a TBI. Barnfield and Leathem (1998) reported a TBI rate of 86.4% in a New Zealand offender population (unspecified regarding gender). The current sample's TBI incidence rate is slightly higher than this (94.7%). With the security level of the incarcerated populations being similar (minimum to high security) it is possible that this difference is due to the number of participants in each study or the gender of the participants.

When the current study is compared to an all-female sample (Brewer-Smyth et al., 2004) it shows very contrasting results. Brewer-Smyth et al.'s (2004) sample is similar to the current sample in several ways, not only are they a fully female sample but they also have a very similar average age (33.4 years), and security level. However, Brewer-Smyth et al. (2004) reported a substantially lower TBI prevalence (42.5%). There is a couple of potential reasons as why this difference may exist, the first is that these two studies were completed in different countries 10 years apart which could lead to a change in the definition used or the types of questions that were used as a detection of TBI, for example, in their study Brewer-Smyth et al. (2004) specify that the individuals who reported TBI all reported loss of consciousness whereas this was not always the case for participants from the current study. This difference in prevalence rate of TBI could also be due to the percentage of each population that participated in the respective studies. It is possible in the current study that females

from the population may have only participated if they knew of a TBI incidence in their life. This possibility is considered in more detail below.

4.2.2 - Mental health issues

DASS-21

The current sample from CWP showed significantly higher levels of all three of the DASS-21 subscales than Anthony et al.'s (1998) sample from a non-clinical sample. When compared to Kavanagh et al.'s (2010) sample of male offenders, participants showed similar levels of anxiety and stress but significantly greater levels of depression. These results show that the population studied here is similar to other offender populations. It also shows that participants from a prison sample are at risk of having higher levels of depression, anxiety and stress than the general population. As discussed earlier, previous research has suggested that people who suffer from a TBI are more likely than the general population to suffer from mental health issues such as depression and anxiety. The current sample presented with a high prevalence of TBI, therefore TBI may be contributing to this result.

The difference in depression between male and female offenders could be the result of several factors, for example a female offender is more likely to be far from home and loved ones during their sentence due to fewer facilities for housing them. This can possibly lead to less visitation from friends and family members which may lead offenders to feel abandoned during their sentence. It is also possible that the female offenders deal with situations that may lead to depression differently than their male counterparts.

PSQI

The average PSQI score of the participants of the current study suggests that overall the quality of sleep is poor. There are several reasons as to why this might be. For example, the participants are currently incarcerated and while all reported having no roommates the level of noise when that many people are in a confined area can be distracting and difficult to sleep through. Another possible reason for the poor sleep quality reported is that due to being in an unfamiliar place with strict rules an individual's sleep patterns may have been disturbed. A third possible reason for the poor quality of sleep is that the majority of the participants reported some form of TBI, and previous research has shown that those with a TBI have more difficulty sleeping than those who do not have a TBI (Parcell et al., 2008). When the sleep quality was compared to a different sample of offenders, the current participants' scores were similar, while in contrast, the sleep quality of the current participants was reported as significantly worse than a sample from the general population.

4.2.3 - Age at first injury

The brain is continuously developing throughout childhood and if a TBI occurs it can impair this process. Previous research with general population samples suggests that the earlier injury is associated with more adverse the outcomes (Hibbard et al., 2004). Analyses of the current data showed that for some variables the adverse outcomes were significantly worse for the participants who reported their first TBI to have occurred before the age of nine. These constructs were anxiety, stress and thought problems. There are several possible explanations as to why these variables

were significantly related to time of TBI occurrence. The first of these has been discussed in previous research and that is that mental health issues typically present after a period of time, not straight away. Therefore it is possible that the participants reported an injury later in life have not yet started to present with mental health problems.

A second possible explanation is that individuals who report a TBI have not yet learned coping mechanisms for stress and thought problems. These tend to happen automatically throughout life (Skinner & Zimmer-Gembeck, 2007), however when the injury occurs early in life this may not have had a chance to develop before the injury and the TBI may impair this learning (McKinlay, 2014), and there may be no emphasis on learning how to process situations which may lead to stress or anxiety. However, individuals who report TBI in later life have most likely learned these coping mechanisms before their accident, so it is easier for them to return to these after the injury.

Another potential explanation for these results is also related to what is learned prior to the TBI incident. Children are learning and developing at different speeds, and it may not be until later in their childhood that problems due to a TBI are noticed (McKinlay, 2014). Therefore there is a chance that it is not known just how severe the effects from a TBI are until they are substantially older. This is different in older individuals with TBI because these developments have occurred already at a normal age so it is easier to notice whether that individual has had any personality change. This may provide more of an opportunity to help resolve any issues that have arisen post-injury.

However there were also several variables that were not significantly different depending on the age of TBI occurrence. These were depressive feelings (both ASEBA and DASS-21 measures), avoidant behaviour, antisocial behaviour, attention problems, rule-breaking behaviour, intrusive thoughts, sleep quality, and IQ-score. There are several reasons why these variables might not have been significantly different between the first injury age groups, the simplest of these being that these variables are not affected by the age at which an injury occurs. However previous research (Hibbard et al., 2004) has suggested otherwise for some of these variables, such as depression. Therefore other potential reasons should be considered, for example, sample size. Sample size in this study is relatively small which can lead to a non-significant results when the samples are different.

Sleep quality did not show a significant difference between those who reported their first injury before the age of nine and those who reported their first injury after the age of nine. A potential reason for this was discussed earlier, that is the participants are in an unfamiliar environment which can sometimes lead to sleeping difficulties.

Interestingly, self-reported antisocial behaviour and rule-breaking behaviour were not significantly different between the two groups, and had medium and small effect sizes respectively. This means that age at first injury may not have any effect on whether an individual will offend. If this is the case then it is possible that TBI may be a risk factor for future offending. Previous research has already provided evidence for this (McKinlay, Grace, McLellan, Roger, Clabour & McFarlane, 2014).

4.2.4 - Other analyses

Other analyses showed that the severity of both the first injury and a cumulative score for multiple injuries did not significantly correlate with any of the mental health issues that were measured, sleep quality or IQ. There are several possible reasons as to why this is the case. The first of these is that simply there is no relationship between the variables. However previous research suggests this is unlikely. A more probable reason is that the current sample was skewed, that is the majority of participants in this sample reported a mild TBI (mTBI).

4.3 -Practical and theoretical importance

The results of this study have both theoretical and practical implications. Relatively few studies have focussed on female offenders, but the present study shows why such research is important. Perhaps our most notable finding was that the large majority of female offenders reported having experienced some form of TBI, ranging in severity from mild moderate and severe. The majority of the offenders in this sample also reported multiple injuries. This research can provide information on how TBI can have an effect on an individual's wellbeing, and when the TBI data is collected alongside data on IQ, and mental health variables it can be used to help understand how these individuals both learn and process information, as well as what could be impairing an individual from learning or processing information. These results can lead to rehabilitation programmes which can be tailored to be effective for people who have suffered from TBI. An acknowledgement of the prevalence of TBI in offenders could also lead to a better understanding of offender needs and processes put in place to help these individuals.

The average IQ-score for this group with TBI was below average, therefore an emphasis could be placed on learning tools in offenders who suffer from a TBI. When it comes to the prevalence of mental health in offender groups these learning tools are important because it shows that these individuals may not have the best coping skills and this could lead to a better understanding on what leads these individuals to offend. The results presented here can also be helpful in understanding the best way to interact with offenders to get a positive outcome. This can also lead to rehabilitation programmes that focus on mental health awareness and coping mechanisms for these mental health issues.

4.4 - Limitations

There are several limitations of the present study that should be acknowledged. The first of these was mentioned earlier, that is the number of participants from the population willing to participate. Of the 82 offenders who were residing at CWP at the time of data collection, 38 chose to take part which may have biased the results. It is possible that those who chose to be part of the study were those that have a known TBI, while those who chose not to participate did not have a TBI. Nonetheless even if this were the case over 46% of the population would have experienced a TBI event.

Another limitation to this study is that the data does not have any information about the offence the participant committed or how long their sentence is. This information could have been used as a potential moderating factor for stress anxiety and depression, as well as sleep quality. Length of sentence or how far through their

sentence may have an effect on participants' mental health. It is possible that people nearing the end of their sentence may be more anxious or stressed when they know that soon they are going to reintegrate back into the community.

The lack of control group is a third limitation to this research. While it is possible to compare the current participants amongst themselves dependent on age of first injury, it would be just as beneficial to compare the participants to a group with TBI from the community. This control group could help to answer additional questions, such as is the degree of mental health problems that are associated with TBI and with incarceration.

4.5 - Future directions

There are several directions future research could stem from the current study. One of these is focussing on the development of programmes that are tailored to both female offenders and offenders who present with a TBI. This would be an important attempt to make programmes more effective for offenders, which could lead to a reduction in recidivism and eventually a safer community. These programmes could focus on the findings from this research, for example the level of anxiety of the participants is, on average, at a moderate level, and significantly higher in participants who report an earlier TBI incidence. Therefore a focus on ways to reduce anxiety levels might be a worthwhile programme target.

A second direction future research could focus on is the differing parenting styles of female offenders. A better understanding of parenting style of this population may lead to ways of improving relationships between parents and children which

could lead to a reduction in future juvenile offending. By learning more about how offenders interact with their children it may be possible to set up programmes to keep offenders interacting with their children during their sentence time which could lead to more positive relationships for both parent and child.

4.6 - Conclusions

The majority of research with offender populations has used males or gender unspecified participants. This research is then generalized to female offenders and programmes are not tailored specifically for them. The main aim of this research was to add to the literature regarding female offenders. The first hypothesis predicted that the sample would present with high prevalence rates of TBI. The results confirmed this hypothesis. The second hypothesis predicted that mental health issues in this group would also be prevalent in this sample. The results showed that mental health issues including depression, anxiety, stress and sleep quality of the current sample were reported to be significantly worse than the general population but not significantly different than a different offender population. The third hypothesis predicted that participants who reported a TBI at a younger age will report more mental health issues. Here, results were mixed with some variables showing the predicted difference while others showed no significant difference. These results fulfil the main aim of adding to the literature on female offenders. This research provides a starting point for research into new programmes focussing on issues that females face in an attempt to reduce recidivism.

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Appendix A

A-1 - Ohio State University TBI Identification Method Short Form

1. Have you ever been hospitalized or treated in an emergency room following an injury to your head or neck? Think about any childhood injuries you remember or were told about.
2. Have you ever injured your head or neck in a car accident or from some other moving vehicle accident? (e.g. motorcycle, ATV)
3. Have you ever injured your head or neck in a fall or from being hit by something (e.g. falling from a bike, horse, or rollerblades, falling on ice, being hit by a rock)? Have you ever been injured playing sports or on the playground?
4. Have you ever injured your head or neck in a fight, from being hit by someone, or from being shaken violently? Have you ever been shot in the head?
5. Have you ever been nearby when an explosion or blast occurred? If you served in the military, think about any combat-related incidents.

If all above are "no" then stop. If answered "yes" to *any* of the questions above, ask:

6. Were you knocked out or unconscious following any of the injuries you mentioned above? DO NOT INCLUDE LOSING CONSCIOUSNESS DUE TO DRUG OVERDOSE OR FROM BEING CHOKED (see #8, below).

If answer to #6 is "No", ask:

7. Were you dazed of have a gap in your memory from the injury(ies) you mentioned above?

If answer to #6 is "Yes", ask:

8. How long were you knocked out? (If identified multiple injuries with loss of consciousness, ask for each. If not sure of the time frame, encourage them to make their best guess.)
9. Have you ever lost consciousness from a drug overdose or being choked?

Number of times from a drug overdose
Number of times from being choked

A-2 - Pittsburgh Sleep Quality Index

1. During the past month, what time did you usually go to bed at night?
2. During the past month, how long (in minutes) did it usually take you to fall asleep each night?
3. During the past month, what time did you usually get up in the morning?
4. During the past month, how many hours of <u>actual sleep</u> did you get at sleep did you get at night? (This may be different from the number of hours you pent in bed.)

5. During the past month, how often have you had trouble sleeping because you…
    a. Could not sleep within 30 minutes
    b. Woke up in the middle of the night or early morning
    c. Had to get up to go to the toilet
    d. Could not breathe comfortably
    e. Coughed or snored loudly
    f. Felt too cold
    g. Felt too hot
    h. Had bad dreams
    i. Had Pain
    j. Other reason(s); please describe
6. During the past month, how would you rate your sleep quality overall?
7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?
10. Do you have a bed partner or room mate?

If you have a room mate or bed partner, ask him/her how often in the past month you have had:

    a. Episodes of loud snoring
    b. Long pauses between breaths while sleep
    c. Legs twitching or jerking while asleep
    d. Episodes of disorientation or confusion when waking up at night
    e. Other types of restlessness while asleep; please describe

A-3 - Depression, Anxiety and Stress Scale

1. I found it hard to wind down
2. I was aware of dryness of my mouth
3. I couldn't seem to experience any positive feeling at all
4. I experienced breathing difficulties (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)
5. I found it difficult to work up the initiative to do things
6. I tended to over-react to situations
7. I experienced trembling (eg, in the hands)
8. I felt that I was using a lot of nervous energy
9. I was worried about situations in which I might panic and make a fool of myself
10. I felt that I had mothing to look forward to
11. I found myself getting agitated
12. I found it difficult to relax

13. I felt down-hearted and blue
14. I was intolerant of anything that kept me from getting on with what I was doing
15. I felt I was close to panic
16. I was unable to become enthusiastic about anything
17. I felt I wasn't worth much as a person
18. I felt that I was rather touchy
19. I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)
20. I felt scared without any good reason
21. I felt that life was meaningless

Table A-3. Degree of severity categories for the depression, anxiety, and stress scale

	Depression	Anxiety	Stress
Normal	0-4	0-3	0-7
Mild	5-6	4-5	8-9
Moderate	7-10	6-7	10-12
Severe	11-13	8-9	13-16
Extremely Severe	14+	10+	17+

Appendix B

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2013/30

20 May 2013

Dr Audrey McKinlay
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Audrey

The Human Ethics Committee advises that your research proposal "Women in prison with traumatic brain injury: prevalence, mechanism and impact on women and their families" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 17 May 2013.

Best wishes for your project.

Yours sincerely

Lindsey MacDonald
Chair
University of Canterbury Human Ethics Committee

Appendix C

Participant	TBI	What?	Age?	Youngest Age	LOC?	Drug?	Choked?	Severity ?	DV	MVA
1	Y	Fall From Horse	14/15	14/15	N	0	2	Mild		
		Fight	30s		30 mins					
2	Y	MVA	27		4 mins	0	0	Mild		1
		Workshop accident	17		1sec					
		Punched	9	9	5-10 mins					
3	Y	Fall From Motorbike	10	10	2 mins	0	0	Mild		
		Fall from horse	10		5 mins					
		Beach buggy Flip*	18		3 mins					
4	Y	Caregiver bashed head against wall	12		20 mins	0	0	Mild		
		Slamming head into doors	13/14		Briefly					
		MVA	8	8						1
		Punched in head	17							
5	Y	MVA	24	24	Next morning	0	0	Mild		1
		Domestic Violence	25-45		Briefly				1	
		Fall off Bike	?		Briefly					
		Car door opened	29		?					
6	Y	Hit by Rock	10	10	No	0	0	Mild		
		Fight, Punched in Head	16/17		Dazed					
7	Y	Fell backwards off swing	8	8	2 mins	0	0	Mild		
8	Y	Fall on confidence course	?			0	0	Mild		
		Gate opened on self	3	3	not sure					
9	Y	Falling off bike	?		?	0	0	Moderate/Severe		
		Banging head on wall	5	5	5 mins	0	0			

		head banged on Oven	15		9.30- next morning				
		Epilepsy (when falls)							
10	Y	Hammer to head	13		concussion	0	0	Mild	
		High Tackle	13		30 mins				
		MVA	12	12	concussion				1
		Fights	15-18		concussion				
11	Y	MVA	25		5 mins	>20	0	Mild	1
		Fell off Slide	4		?				
		Assault from Mother	2	2	?			1	
12	N								
13	Y	Fall	17	17	2 mins	3	10	Mild	
		Fight	24		2 mins				
		TV fell on head	24						
14	Y	Multiple MVAs	20	20		0	0	?	1
			25						
			35						
15	Y	Fall off Playground	6	6	?	0	0	?	
		Fire in Hairspray Can	?		?				
16	Y	Head hit with Crowbar	12	12	70h	0	0	Severe	
		Domestic Violence	15-21		5 mins			1	
17	Y	Netball Injury	10	10	concussion	0	0	Mild	
		Domestic Violence	18		blackout			1	
		Work with ID hit on head	?		?				
18	Y	Run over by Car	33			0	0	Mild	
		Slipped on wet floor	66		Dazed				
		Fall	64						
		Fall	14	14					
19	Y	MVA Fractured skull	8	8	LOC	0	0	Severe	1
		Falls from seizure	20						

		Domestic Violence			5-10 mins				1	
20	Y	Fall from horse	10	10	concussion	0	1	Mild		
		Fights	17 & 18		Briefly					
		Domestic Violence	19		10sec				1	
21	Y	MVA	34	34	?	5	0	?		1
		MVA**	35							
22	Y	Fight	12	12	2 mins	0	0	Moderate/Severe		
		MVA	?		?					1
23	Y	MVA**	25		?	0	0	Mild		1
		Domestic Violence	24-25	24					1	
24	Y	Domestic Violence	36			0	0	Mild	1	
		MVA	16		in and out					1
		Fall from horse	10		winded					
		Fights with Father	6-12y	6	k/o					
		Fights	14		concussion					
25	Y	Fight	?	?		0	0	Mild		
26	Y	Fall	13	13		0	0	Moderate		
		Fight	27		30-40 mins					
27	Y	MVA, Snapped spine***	27	27	2 weeks	0	0	Severe		1
		Fall from horse	?							
		Hits head against wall as								
28	Y	stress relief	Always		no	0	0	?		
29	Y	Domestic Violence	28	28	>30	0	0	Moderate	1	
30	N									
31	Y	MVA	?	?	?	0	0	Mild		1
32	Y	Fall	?			0	20+	Mild		
		Fight	18	18	15-20mins					
		MVA	?							1
33	Y	Fell out of Car	30		3 mins	1	0	Mild		
		Fell out Window	3	3	?					

		Explosion occurred	?						
34	Y	Fall from Float	6	6	concussion	0	0	Mild	
		Running into door frame	8		concussion				
		hit head against wall	14-15						
		Fight	17		concussion				
					Concussed				
35	Y	Jungle gym injury	7	7	for 2 Days	0	0	Mild	
		MVA	15		seconds				1
		Mountian bike injury	17		minutes				
		Fall	18		seconds				
36	Y	Fall	?		no	0	2	Mild	
		Fight	?		no				
37	Y	MVA	4	4	30 mins	1	0	Moderate	1
			7		30 mins				
		Fight	?						
38	Y	Fight	23	23	3 mins	0	0	Mild	

* In hospital for four and a half week ** Does not remember accident *** Induced Coma