

Investigating Prevalence Rates of Traumatic Brain Injury and associated behavioural and emotional outcome variables in adolescent male young offenders in Cape Town.

Research Project

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Abstract: 336

Word Count: 9683

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Adolescence is a risk period for delinquent behaviour as well as traumatic brain injuries (TBI). Internationally, both of these factors have been associated with various internalizing (e.g. depression) and externalizing (e.g. aggression) behavioural difficulties and are especially prevalent in young male offenders (Perron & Howard, 2008; Williams et al., 2010). Owing to the dearth of research investigating the prevalence of TBI in South Africa, data for young offender populations are even more limited (Adnams, 2010; Bruns & Hauser, 2003; Shuttleworth-Edwards & Whitefield, 2007). This research project is focused on a sample of young offenders (n=117) who were recruited from an institution near Cape Town. Non-offender were recruited from a school in the same area (n=27). The following measures were administered in Afrikaans or English: The Comprehensive Health Assessment Tool (CHAT; Offender Health Research Network, 2012), The Inventory of Callous-Unemotional Traits youth version (ICU; Frick et al., 2003), the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996), the Child Behaviour Checklist (Achenbach, 1991), the Maudsley Addiction Profile (MAP; Marsden et al., 1998) and the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, Fuente & Grant, 1993). The results indicate a 50% prevalence rate of self-reported TBI for young offenders and a 37% prevalence rate of self-reported TBI for non-offenders. The findings assist in understanding the comparative prevalence rates of TBI in the greater South African population. For the secondary analysis, young offenders were compared on the various emotional and behavioural measures. ANOVA was used to compare 40 participants that reported TBI with loss of consciousness (LOC) to 77 participants that did not report TBI with LOC. The dependent variables that were significantly associated with TBI status are as follows: Reactive and proactive aggression, depressive symptoms, psychological problems, health problems, substance use and criminal activity. The significantly associate dependent variables from the CBCL are as follows: Socialising problems, externalizing problems anxiety problems and oppositional defiance problems. This finding assists in supporting the relationship of TBI with various emotional and behavioural difficulties in a South African context.

**Keywords:** *young offender, traumatic brain injury, prevalence rate, risk factors, South Africa*

## Investigating Prevalence Rates of Traumatic Brain Injury and associated behavioural and emotional outcome variables in adolescent male young offenders in Cape Town.

TBI is one of the leading causes of morbidity and mortality in adolescents (Babikian & Asarnow, 2009; Collins & Dean, 2002). Internationally, TBI rates have also been found to be especially high in males (Collins & Dean, 2002; Farrer & Hedges, 2011; Farrer, Frost & Hedges, 2012; Perron & Howard, 2008; Schofield et al., 2006; Slaughter et al., 2003; Williams et al., 2010). Adolescence is a risk period for delinquent behaviour as well as traumatic brain injuries (TBI) (Carswell et al., 2004; Farrer, Frost & Hedges, 2013; Hodges, 2012; Perron & Howard, 2008; Pluddemann et al., 2010; Williams et al., 2010). Internationally, both of these factors have been associated with various internalizing (e.g. depression) and externalizing (e.g. aggression) behavioural difficulties and are especially prevalent in young male offenders (Perron & Howard, 2008; Williams Cordan, Mewsel, et al., 2010). Owing to the dearth of research investigating the prevalence of traumatic brain injuries, data for young offender populations are even more limited (Adnams, 2010; Bruns & Hauser, 2003; Shuttleworth-Edwards, & Whitefield, 2007).

### **Background and literature review**

#### **Traumatic Brain Injury**

Long-term effects, developmental difficulties and associated poor quality of life as well as economic and social costs place extra weight on individuals who have sustained a TBI, their families and their communities (Anderson et al., 2006; Cattelani, Lombardi, Brianti et al., 1998; Hawley, 2004; Shuttleworth-Edwards & Whitefield, 2007; Yeates & Anderson, 2008). This weight has become increasingly heavy as medical access and advancement has increased the survival rates of individuals who sustain TBIs (Yeates & Anderson, 2008). Further, research by Wilbacher et al., (2008) indicates that the majority of the weight is on low-and-middle-income-countries (LAMICs). It is therefore inferred that communities with low access to resources have relatively larger difficulties when addressing burdens associate with TBI.

Internationally, the leading causes of TBIs are motor vehicle accidents (MVA's) (60%), falls (20-30%) and interpersonal violence (10%) (Shuttleworth-Edwards & Whitefield, 2007; Williams et al., 2010; Hyder et al., 2007). However, the causes and rates of TBI vary across different subgroups of the population (Wilbacher et al., 2008; Williams et al., 2010). For example, research shows that there is higher incidence of TBI in males than

females (e.g. Farrer et al., 2013; Keenan et al., 2003; Perron & Howard, 2008). Internationally, TBI rates have also been shown to be higher among adolescents than any other age group (Babikian & Asarnow 2009; Farrer & Hedges, 2011; Farrer, Frost & Hedges, 2013; Perron & Howard, 2008; Williams et al., 2010). However, more research is needed to identify specific subgroups of the adolescent population that are at high risk for sustaining a TBI in terms of causes and associated risk factors (Farrer et al., 2013; Wilbacher et al., 2010).

### **Traumatic Brain Injury in South Africa**

South Africa has limited information, prevalence rates, odd ratios, policies and services available for identifying and assisting individuals who have sustained a TBI (Adnams, 2010; Shuttleworth-Edwards & Whitefield, 2007). Further, the available studies have shown that the situation in LAMIC countries such as South Africa may be different than internationally (e.g., Adnams, 2010; Hyder et al., 2007; Pludderman et al., 2010). According to Nell and Brown (1991), 316 per 100\_000 incidents of TBI are reported in SA and are especially high for coloured males between the ages of 15-25. It is noted that these figures were reported almost two decades ago. However, more recent data on incidents of TBI in adolescent samples in South Africa are lacking. More research is required to establish trends specific to current conditions in South Africa that can identify current vulnerable populations (Adnams, 2010; Pludderman et al., 2010).

Prevalence rates and etiological trends found internationally cannot fully guide TBI assumptions in South Africa. Research has indicated that the rates of TBI may be different in LAMIC's than in high-income-countries (HIC) such as the United States (Alexander et al., 2010; Bruns & Hauser, 2003). Therefore the prevalence rates of TBI may be higher for South African adolescents when compared to adolescents in the United States. The differences are attributed to the fact that specific groups of the South African population have increased risk to sustain a TBI as a result of higher rates of crime, gangsterism, Methamphetamine use, MVAs, interpersonal violence, prison rates, unsafe public spaces and hazardous environments (Adnams, 2010; Alexander et al., 2010; Bruns & Hauser, 2003; Levin, 2004; Naidoo & Mkize, 2012; Norman et al., 2007; Perron & Howard, 2008; Plüddemann et al., 2010; Semple, Bass & Peter, 1998; Siegel & Welsh, 2011). Trends seen in the causes of TBI may also be different in South Africa (Alexander et al., 2010). For example, the higher rates of interpersonal violence may cause more TBI in South Africa than in the US.

## **Definition and pathophysiology of TBI**

TBI can be defined as a blunt or penetrating blow to the head, which results in disorientation, confusion, loss of consciousness or memory (Ruff et al., 2009). Further, there is a dose-response relationship between severity of injury and outcome (Johnsson, Dematt, & Salario, 2009; Ruff et al., 2009). Multiple types of injuries may result in brain damage as a result of axonal tearing and shearing from accelerating and decelerating forces, penetrating objects as well as damage caused by bleeding and swelling (Johnsson et al., 2009). However, even though a unified definition is possible, the severity spectrum of TBI is broad, the injury affects individuals in unique and various ways, and the outcomes are influenced by a variety of risk and protective factors (Mayfield & Homack, 2005; Ruff et al., 2009).

The severity of TBI ranges on a spectrum from mild (grade 1), to moderate (grade 2) to severe (grade 3) (Hyder et al., 2007; Ruff et al., 2009). Medically, severity is often determined using the Glasgow Coma Scale (Teasdale, & Jennett, 1974). Further, the length of time for confusion, disorientation, loss of consciousness (LOC) or post-traumatic amnesia (PTA) as a result of a TBI can also be used to determine the severity (Johnsson et al., 2009; Ruff et al., 2009; Schwarzbald et al., 2008). However, there is little consensus whether to include feeling dazed and confused in the diagnosis of TBI, especially when self-report measures are used in the absence of the Glasgow Coma Scale (Farrer et al., 2013). For example, the definition of TBI varies in research dedicated to young offenders: Some authors include feeling dazed and confused (e.g., Hux et al., 1998), others only include LOC (e.g., Perron & Howard, 2008), some include both (e.g., Williams et al., 2010) and few include PTA (Farrer et al., 2013). According to Ruff et al., (2009) separating generalized head injuries from mild TBI is a challenging and much debated aspect of TBI research.

### **TBI-related outcomes**

The outcome of an individual who has sustained a TBI is challenging to predict as each individual is influenced by multiple risk and protective factors to varying degrees. Post-TBI outcomes are dependent on a range of factors, including the parts of the brain damaged by a TBI, the cause, primary and secondary injuries, the number of previous TBI, the severity of each injury and the period of associated mental status change or LOC, as well as so called real life factors (Johnsson, 2009; Kinsella, et al., 1999; Prigatano & Gray, 2007; Ylvisaker, Feeney & Szekeres, 1998). Real life factors refer to factors such as age of injury, family situation, gender, socio economic status (SES), access to and quality of healthcare, post-

injury assistance and education level (Anderson et al., 2006; Babikian & Asarnow, 2009; Perron & Howard, 2008; Prigatano & Gray, 2007; Wassenberg, Marx, Koele et al., 2004; Williams et al., 2010).

Research indicates that the damage caused by TBI can impact various important brain regions associated with cognitive, emotional, behavioural functioning and learning outcomes (Anderson et al., 2006; Babikian & Asarnow, 2009; Farrer et al., 2013; Schrieff et al., 2011; Shuttleworth-Edwards & Whitefield, 2007). For example, TBI resulting in frontal lobe damage have been shown to be related to executive functioning difficulties (Babikian & Asarnow, 2009). This translates into various outcome difficulties of inhibition, attention, memory, risk taking, processing speed, learning and knowledge acquisition (Babikian & Asarnow, 2009). Research has shown a relationship between sustaining a TBI and having difficulties with various internalizing and externalizing behavioural and emotional outcomes. Internalizing difficulties refer to outcomes such as anxiety, depression, mood swings, apathy and psychiatric disorders (Gabella et al., 1997; Miura et al 2005; Peek-Asa et al., 2004; Perron & Howard, 2008; Rao & Lyketsos, 2000; Semple et al., 1998). Externalizing difficulties refer to substance use, hyperactivity, impulsivity, social disinhibition and aggression (Blair, 2007; Dooley, Anderson, Hemphill et al., 2008; Farrer et al., 2013; Hawley, 2004; Hodges, 2012; Moffit & Caspi, 2001; Pluddemann et al., 2010; Roose et al., 2010).

Given these internalizing and externalizing behaviours post-TBI, it is not surprising that individuals who have sustained a TBI often encounter several challenges such as earlier involvement with criminal activity, violent emotions, substance use and behavioural and interpersonal relationship difficulties (Farrer et al., 2013; Perron & Howard, 2008; Schneider et al., 1999; Williams et al., 2010). For example, a TBI resulting in behavioural difficulties such as proactive aggression has been specifically linked to increased criminal activity and delinquent behaviour (Hodges, 2012).

**TBI and young offenders.** Besides the high prevalence of TBI in adolescence, this developmental stage is also a high-risk period for delinquency (Farrer et al., 2013; Hodges, 2012; Perron & Howard, 2008; Pluddemann et al., 2010; Williams et al., 2010). Delinquency refers to the variety of behaviours (e.g., aggression), emotions (e.g., depression), and cognitions (e.g., impulsivity) that are shown to be associated with difficulties such as antisocial behaviour, crime and/or violence (Sharp & Dellis, 2010). Children and adolescents who engage in delinquent behaviour and come into conflict with the law are referred to as young offenders (Dalby, 1985). Further, delinquent behaviour varies across factors such as

ethnicity, geographic location and other temporal factors (Sharp, & Dellis, 2010). Factors associated with delinquency include: Substance abuse, risky sexual activity, depression, poor nutrition, poor education, aggression, dropping out of school, delayed linguistic abilities, poor social skills, poor physical health, poor nutrition, complications during pregnancy, traumatic brain injuries, failure at school, low motivation for positive extracurricular involvement, gang involvement and conduct disorder (Hodges, 2012; Johnstone et al., 2008; Sharp, & Dellis, 2010; Ward et al., 2007; Wasssweman et al., 2003; Williams et al., 2010). These factors influence adolescent outcomes differently and many co-occur in young offenders who have sustained a TBI (Farrer et al., 2013).

Various international TBI research is therefore aimed at male adolescents who are at relatively higher risk for sustaining a TBI and being involved in delinquent behaviour (Farrer et al., 2013; Hodges, 2012; Leon-Carrion & Ramos, 2003). An emerging body of research consistently reports high rates of self-reported TBI in young offender samples (Farrer et al., 2013). For example, in a study of 11-19 year old, young offending males, William et al., (2010) found a 46% prevalence rate of TBI with LOC in that US sample. Further, Hux et al., (1998) reported a 50% prevalence rate of TBI in young offenders. The results of a meta-analysis showed that 30.6% of 1524 young offenders in the US and UK have a history of TBI that included LOC (Farrer et al., 2013).

However, the majority of findings rely on homogenous samples from mostly high-income-countries (HIC) (Alexander et al., 2010). Owing to the dearth of research investigating the prevalence of TBI in South Africa, data on the rates of TBI in young offender populations are even more limited (Adnams, 2010; Bruns & Hauser, 2003; Shuttleworth-Edwards & Whitefield, 2007). One unpublished study in the Western Cape indicated a 50% prevalence rate of TBI in a young offender's sample of 44 mixed race males aged 14-17 years (Badul, 2012). No comparative studies exist that can establish if this prevalence rate is simply a function of the general adolescent population or specifically of young offenders. Thus it is necessary to extend adolescent TBI research beyond young offenders (Hodges, 2012; Williams et al., 2010).

Findings from such research may assist in understanding the specific difficulties faced by South African adolescents and how to allocate resources efficiently to improve their outcomes. Investigating TBI in South African adolescents can assist in understanding two things. Firstly, considering that many adolescents are living in similar situations as their young offender counterparts, factors such as exposure to violence may be increasing the risk of sustaining a TBI irrespective of offending the law. Secondly, adolescents who sustain a



TBI can be identified early and assisted with adequate rehabilitation to address associated delinquent behaviour which may result in trouble with the law (Hodges, 2012; Hux et al., 1998; Williams et al., 2010). This is important as young offenders have difficulties being incorporated back into education and vocational systems because of continued behavioural and emotional difficulties, related criminal activities, and criminal records. Further, when young offenders reach eighteen years of age, they may be exposed to prison environments where there is an increased risk for sustaining further TBI (Alexander et al., 2010; Farrer et al., 2013; Naidoo & Mkize, 2012; Perron & Howard, 2008; Williams et al., 2010). It is therefore essential to investigate TBI prevalence rates and associated factors in South Africa's adolescent populations.

### **Aims and Hypotheses**

This study is part of a larger project that aims to compare matched samples of young offenders and school-going adolescents in terms of the prevalence rate of TBI, as well as executive functioning and other behavioural outcomes. This larger project has pre-defined criteria for participants that include well defined ages, ethnicity and demographics for participation. The primary aim of the study is to establish an odds risk ratio and prevalence rate of reported TBI in a young offender sample and to compare these rates to a non-offender sample. Further, risk factors for delinquency and TBI, such as learning problems, substance abuse, physical and psychological health, depression, callous-unemotional behaviour as well as alcohol dependence, will be investigated to determine general trends as well as associations with participant's delinquency- and reported TBI-status. The current study will utilize data from and expand on the study conducted by Badul (2012). The hypotheses that will be tested are:

- 1- The prevalence rate of reported TBI in a young offender sample is higher than the broader non-offender sample in the Western Cape.
- 2- Reported TBI with LOC are associated with higher rates of associated difficulties such as substance use, mood problems (e.g., depression and anxiety), general psychological and physical health problems, socialising problems and behavioural problems (e.g., proactive aggression and externalizing difficulties) for the young offender sample.

## Methods

### Design and Settings

For the purpose of this analysis the delinquency status of participants determined their inclusion into one of two groups: Young offender and non-offender groups. For the young offender group, reported TBI status also creates two groups: no TBI and TBI (as indicated by LOC). Further, young offenders were matched on age, sex, race, language and socio-economic status to minimize confounding influences of these factors. The design of this study is cross-sectional and quantitative. The prevalence rates and odds risk ratios of self-reported TBI in non-offender and young offender samples were assessed and compared to one another. The independent variable for the analysis of young offenders is the presence/absence of reported TBI. When these are combined, two subgroups can be formed: Young offenders with TBI and young offenders with no TBI.

In addition to comparing the prevalence rates of reported TBI in the young offender and non-offender samples, the two young offender subgroups (i.e. those with and without TBI) were assessed and compared on the following dependent variables: Callous-unemotional behaviour, substance use, criminal activity, depressive symptoms, proactive and reactive aggression, externalizing and internalizing difficulties, anxiety problems, socialising problems, oppositional defiance problems, rule breaking problems and conduct disorder problems. These aforementioned factors may be highly associated with young offender participants who report a TBI with LOC according to international research.

Data collection for the young offender sample took place at an institution on the outskirts of Cape Town. Matched controls for the non-offender were sampled from a high school in the same area as the young offender institution.

### Participants

The young offender sample consists of adolescents who have been in conflict with the law or were awaiting trial at a private institution in the Western Cape. The institution serves as the boy's legal guardian (caregivers) while they await trial or participate in rehabilitation. The sample collected by Badul (2012;  $n=44$ ) was expanded on. The language criterion was extended from the initial young offender sample (only English-speaking) to include Afrikaans-speaking boys. Otherwise, similar criteria to Badul (2012) were used to form a young offender sample. The inclusion criteria for the young offender sample were adolescent mixed race males, aged 13-17 years. Participants were excluded if they did not speak Afrikaans or English fluently. Further, any participants who reported severe intellectual disability, mental disorders, diagnosed Attention Hyperactivity Disorder (ADHD), and

medical conditions such as stroke, epilepsy or diabetes (Williams et al., 2010) were excluded from participation.

Matched school going participants were recruited from a high school in the Western Cape to form the non-offender sample. This sample is defined as school-going adolescents who have not had conflict with the law at the time of interview. Inclusion criteria for this sample included that they were adolescent mixed race males, aged 13-17 years. Participants were excluded if they did not speak Afrikaans or English fluently. Further, any participants who suffered from severe intellectual disability, mental disorders, diagnosed Attention Hyperactivity Disorder (ADHD), and medical conditions such as stroke, epilepsy or diabetes (Williams et al., 2010) were excluded from participation. This ensured that confounding influences were minimized as much as possible.

Hence, all participants were matched on age, sex, race, language and are from low socio-economic backgrounds. This offered greater homogeneity when prevalence rates of offender and non-offender samples were compared.

### **Measures**

The order of questions as well as the administration remained the same as in Badul's (2012) study. All measures were translated from English to Afrikaans for the participants' convenience as well as ensuring assessments were understood and answered to the best of each participant's ability. All measures were translated using forward and backward translations as well as authenticated by the Stellenbosch Language Laboratory. The following screening measures were used: Comprehensive Health Assessment Tool (CHAT), Beck Depression inventory (BDI-II), Alcohol Use Disorders Identification Test (AUDIT), Maudsley Addiction Profile (MAP), The Inventory of Callous-Unemotional Traits youth version (ICU), Reactive-Proactive Aggression Questionnaire (RPQ), Child Behaviour Checklist (CBCL) and a parent / care-giver demographic questionnaire and asset index.

**Demographic questionnaire and asset index.** This is a 17-item Parent Questionnaire and Asset Index (Myer, Stein, Grimsrud, Seedat, & Williams, 2008). SES was determined using annual household income and material assets of the parent/caregiver (Appendix B). Further, education levels and employment were combined to serve as a proxy for participant's SES. This questionnaire was developed for a South African context and has been shown to be reliable by Cronbach's alpha of .92 (Myer et al., 2008).

**The Comprehensive Health Assessment Tool (CHAT).** The CHAT (Offender Health Research Network [OHRN], 2012) is used to obtain the self-reported physical and mental health status of participants. Information regarding associated learning difficulties was

also obtained. A combination of open-ended questions, Likert scales and closed-ended questions are included in this measure. The primary sections deal with assessing TBI in terms of presence, frequency, causation, severity, and associated physical and mental symptoms. I used this questionnaire to screen for the presence of TBI(s) by asking if participants had sustained, “an injury to the head that has caused the participant to be knocked out (lose consciousness) and/or dazed, disoriented and confused”. The severity of the TBI was determined by 5 categories: Dazed or confused, LOC under 5minutes, over 5 minutes LOC but under 10 minutes, over 10 minutes LOC but under 30 minutes and over 30 minutes LOC but under 60 minutes. Only confusion and LOC are used to determine the severity of the TBI as indicated by Williams et al., (2010).

The CHAT is still under development and although it has been used for similar purposes in international research (Williams et al, 2010), few other psychometric properties are available to verify its use. It has only been utilised in South Africa in an unpublished study (Badul, 2012).

**Alcohol Use Disorders Identification Test (AUDIT).** The AUDIT consists of 10 items that detected patterns of hazardous alcohol use (Saunders, Aasland, Babor, Fuente & Grant, 1993). These items have been developed by the World Health Organisation to test a broad spectrum of drinking behaviour (Babor, Higging-Biddle, Saunders & Monteiro, 2001). Participants chose one of four possible responses that described their alcohol use in the past year (Appendix C). Scores above 8 out of a possible 40 indicated substance abuse problems. The measure was administered as an oral interview which took 2-4 minutes to complete. It was easy to score and performs well when compared to other alcohol screening tools (Babor et al., 2001). This questionnaire has a high internal consistency of  $r = .86$  as indicated by Test-retest correlation. Further, reliability and validity for this questionnaire is established in a South African context (Babor et al., 2001). It also showed that the AUDIT is culturally sensitive and suitable for youths. Thus, administration guidelines are adhered to as set out by Babor et al., (2001).

**Maudsley Addiction Profile (MAP).** This questionnaire deals with substance use, health-risk behaviour, physical and psychological health, crime related activities and social functioning. It is suitable for youths and has good content and face validity (Marsden 1998). The self-report version is shown to be valid by the same study. Reliability has been established for its use by a correlation coefficient of  $r = .94$  (Marsden et al., 2002). It has only been utilised in South Africa in an unpublished study (Badul, 2012).

**Beck Depression Inventory (BDI-II).** This questionnaire consists of 21 sets of 4 statements which are indicators of depressive symptoms (Beck, Steer, & Brown, 1996). For each set the 4 statements were read and the option which best described the participant in the past two weeks was selected. Dozois, Dobson and Ahnberg (1998) and Beck et al., (1996) found the BDI- II to be reliable and valid in identifying depressive symptoms with a Cronbach's alpha of between .93 and .96. The internal consistency is therefore excellent (Dozois et al., 1998). This questionnaire has been found to be adequate for use in South African samples as it is culturally sensitive and suitable for young participants (see, e.g., Ward, Flisher, Zissis, Muller, & Lombard, 2003).

**The Inventory of Callous-Unemotional Traits youth version (ICU).** This questionnaire consists of 24, 4-point, Likert scale items which required participants to indicate their level of agreement with statements by selecting "Not true at all", "Somewhat True", "Very true" or "Definitely True" (Frick et al., 2003). The ICU tested three factors: callousness, uncaring traits, and unemotional traits. These factors are confirmed by factor analysis to be related to a unitary, high-order dimension (Kimonos, 2008). The ICU has high internal consistency with a Cronbach's alpha of .77 (Essau, Sasagawa, & Frick, 2006). The same study confirms good construct validity for this questionnaire. According to Kimonis et al., (2008) the ICU has an overall Cronbach's alpha of .74. The same study shows Cronbach's alpha scores of .78 for uncaring traits, .71 for callousness and .45-.6 for unemotional traits. It can be considered a good indicator of precursors to personality disturbances and links with juvenile behaviour. The ICU is also suitable for use with youths (Kimonis et al., 2008). It has only been utilised in South Africa in an unpublished study (Badul, 2012).

**Reactive-Proactive Aggression Questionnaire (RPQ).** The RPQ is a 23-item scale which is divided into two sections. There are 12 items that measure proactive aggression and 11 items measuring reactive aggression (Raine et al., 2006). The participants responses were limited to 0 (never), 1 (sometimes) or 2 (often). The sum of the items provided an overall score of aggression. This measure has been found to be valid and reliable for use with adolescents, especially in terms of identifying delinquency, hostility and impulsivity (Raine et al., 2006). The RPQ has an internal reliability of .83.

**Child Behaviour Checklist (CBCL).** This questionnaire is appropriate for use relating to children aged 4-18 (Appendix L; Achenbach, 1991). It consists of 118-items associated with internalized and externalized behavioural problems. This measure has good

inter-item reliability of .93. It is also been shown to be reliable and valid to detect antisocial behaviour (Le Corff & Toupin, 2010).

### **Procedure**

Purposive and snowball sampling was used to recruit the young offender and non-offender samples. All participants were interviewed in private rooms to minimise any potential distractions.

The young offender sample from Badul (2012) was expanded on by continued sampling from the same institution. However, it is important to note that the CBCL and RPQ were added as additional measures in 2013 and administered to 73 and 65 young offenders, respectively. The purpose of the study was explained to the institution's director. The institution served as the youth's legal guardian and provided consent for the research to be conducted. The institution provided updated lists for the specified age groups three times during 2013. Social workers, who were unfamiliar with the hypothesis, randomly identified potential participants. Participants were approached and required to provide verbal and written assent before administration took place (Appendix A). The questionnaires were administered to participants during a 30 minute interview in the following order: the CHAT, the AUDIT, the MAP, The BDI-II, the ICU, the RPQ, and lastly the CBCL.

For the school going sample, three schools, situated in the same area as the young offender institution, were contacted and the nature and purpose of the study was explained. One school could accommodate the study in the third term of 2013. A letter was delivered to the school to explain the details and requirements of the study (Appendix D). Once the school indicated its willingness to participate, written consent was required from the principal (Appendix B) and names of all one thousand five hundred students were provided to compile lists of potential mixed race, male participants of the appropriate ages. A slightly modified letter was sent ( $n=60$ ) to all the parents/caregivers of the school going adolescents who were randomly selected from these lists (Appendix E). The parents/caregivers were required to return the letter providing signed consent for their children's participation ( $n=28$ ). We obtained consent and assent from the parents/caregivers and the youths respectively (Appendix E; Appendix A). At this stage, any of the parents/caregivers who indicated an unwillingness to allow their children to potentially participate ( $n=2$ ) were excluded when students were interviewed. Participants were approached during regular school hours for a similar assessment to that conducted with the young offenders. During the third term, one non-offender was expelled and therefore did not participate in the study. Permission from the

participants was gained to contact parents for completing a demographic and asset index as well as to potentially verify TBI reports.

After the interviews the young offenders and non-offenders were thanked; refreshments and snacks were provided while participants were encouraged to ask any further questions or discuss any matters they saw as important.

Parents/caregivers for both young offender and school going samples were contacted via telephone to schedule appointments for completing questionnaires. Only a few parents/caregivers ( $n=23$ ) were available to complete questionnaires telephonically. Private and quiet spaces were used by the researchers, during these phone conversations, to minimise distraction as much as possible. Each interview lasted approximately twenty five minutes. Parents/caregivers completed a SES and childhood developmental questionnaire. Further, they were asked to verify their child's reported incident(s) of TBI(s) using the format of the CHAT. This was done to provide some corroborating and elaboration of the relevant participant's TBI status.

### **Ethical Considerations**

This study was approved by the Research Ethics Committee of the Department of Psychology at the University of Cape Town. The Western Cape Education Department (Appendix C) approved the larger research project. No deception was used in this study. The rationale, significance, beneficence, voluntary nature of participation (autonomy) and confidentiality of the research is outlined in the consent form (Appendix B). An explanation was provided to each participant that there were no direct risks or benefits for participation, that their names would not be disclosed to any other party and that it was their choice to participate in the study. Their names were assigned a number associated with the data they provided. Participants were reminded of the voluntary nature of their participation, that they could take breaks during the interview and that they could have withdrawn from the study at any point without penalty. The purpose of the study was also explained to each participant in their first language to ensure the details were understood. After the questionnaires were completed data was captured onto a secure computer and the files were secured.

### **Statistical Analysis**

SPSS (version 21.0) was used to analyse the data. A prevalence rate was calculated using descriptive statistics from both samples. This reporting style seemed appropriate as reported TBI have relatively well defined causes (Lee, 1994; Schmidt, & Kohlmann, 2008).

All of these were used in the primary analysis to determine if reported TBI prevalence rates are higher for the young offender sample when compared to the non-offender sample. These results were also used to infer what the chances are of having sustained a TBI in a young offender sample as compared to a school going sample.

For the secondary analysis, I used one-way analysis of variance (ANOVA) to compare two matched groups of young offenders, without TBI and with reported TBI (that resulted in LOC) in terms of substance use, criminal activity, physical and psychological health, depression scores, proactive and reactive aggression, callous-unemotional behaviour as well as alcohol dependence. All measures were scored as continuous variables. The data was also inspected to ensure data was relatively normally distributed. If normality or homogeneity of variance was violated, non-parametric Mann-Whitney tests were conducted and medians reported instead. Any outliers were removed from the data set and the analysis run again to ensure that the outliers did not have a significant impact on the results that were reported. Effect sizes were summarized using point bi-serial correlations ( $r_{pb}$ ) based on the bivariate relationship of the variables. The statistical significance threshold was set at  $\alpha = .05$ .

## Results

The results are presented in two parts. First, the prevalence rate of TBI in young offenders and non-offenders is reported. Second, the results of the between group analysis of variance (ANOVA) for the young offender sample with and without TBI is presented. Prevalence rates of TBI in young offenders are 50% and in non-offenders it is 37%.

### Participants Demographics

Overall, the co-investigator and I expanded the pilot study ( $n = 44$ ) by approaching 73 mixed-race, male participants from the young offender institution. Hence the young offender sample consists of 117 participants. In this group, 49 participants were Afrikaans-speaking and 68 were English-speaking and ages ranged from 13-17 ( $M = 16.21$ ,  $SD = 2.48$ ). The non-offender sample consisted of 27 participants. In this group, 20 participants were Afrikaans-speaking and 7 English-speaking and ages ranged from 13-17 ( $M = 15.37$ ,  $SD = 1.21$ ). Further, 21 parents of young offenders provided SES details of the household, 1 reported no annual income (R0), 10 reported an annual income between R1-R5000, 8 reported an annual income between R5001-R25000, and 2 reported an annual income between R25000-R100000. For the non offender parents, 2 were able to provide SES details, 1 reported no annual income (R0) and the other reported an annual income of over R100000. The response



rates of parents were generally low. Given this low rate of responses, only descriptive statistics are reported.

### **Self-Reported TBI**

It was hypothesized that the young offender sample would have a higher prevalence rate of reported TBI than the non-offender sample. Table 1 presents the frequencies of reported TBI for young offenders and non-offenders. Out of a 117 young offenders, 59 (50%) reported TBI and 40 (34%) reported a TBI associated with LOC. Further, 20 (17%) young offenders reported a history of two or more TBI, 41 (35%) young offenders reported sustaining a TBI within the last two years and 38 (32%) reported hospitalisation as a result of the reported TBI. For the young offender sample, the main reported causes of injury were fights and assault 32 (54%), followed by MVA 10 (17%) and falls 10 (17%), sport 3 (5%) and “other” 4 (7%).

Out of the 27 non-offenders, 10 (37%) reported a TBI and 4 (15%) reported a TBI associated with LOC. Further, 4 (15%) reported sustaining two or more TBI, 5 (19%) reported sustaining a TBI within the last two years and 4 (15%) reported a visit to the hospital related to the TBI. The main causes of injury were falls 3 (30%) and sport 3 (30%), followed by assaults and fights 2 (20%), MVA 1 (10%) and “other” 1 (10%).

Table 1. TBI Descriptive Statistics

	Young offenders ( <i>n</i> =117)	Non offenders ( <i>n</i> =27)
TBI	59 (50%)	10 (37%)
No TBI	58 (50%)	23 (63%)
TBI with LOC	40 (34%)	4 (15%)
No TBI (no LOC)	77 (66%)	23 (85%)
TBI (D&C)	19 (32%)	6 (60%)
LOC<5min	13 (22%)	1 (10%)
LOC>5>10 min	3 (5%)	1 (10%)
LOC >10>30 min	8 (14%)	0 (0%)
LOC>30> 60 min	2 (3%)	0 (0%)
LOC>60 min	14 (24%)	2 (20%)

*Note.* Frequencies presented in parentheses

**Between-Group Comparisons: Young offenders with TBI (LOC) vs. young offenders without TBI.**

It was hypothesized that the young offenders who reported TBI with LOC would report significantly higher rates of associated difficulties with various behavioural and emotional measures than young offenders who did not report TBI (no LOC). I compared the young offenders without TBI to the young offenders with TBI (LOC) using ANOVA. The results for the comparison between the TBI and no TBI group are presented in Table 2 for depressive symptoms, callous and unemotional behaviour, risk of alcohol dependence, substance use, criminal activity, psychological health symptoms and physical health symptoms and reactive and proactive aggression.

**Depressive symptoms.** These results show that reported depressive symptoms are significantly higher for the group with TBI when compared to the group with no TBI;  $F(1, 116) = 3.80, p = .03$ , with a small effect size  $r = .17$ . The six categories along the depressive symptoms index is on the threshold of significance for the TBI group when compared to the no TBI group;  $F(1, 116) = 2.64, p = .05$ , with a small effect size  $r = .14$ .

**Callous, unemotional and uncaring behaviour.** No statistically significant difference between the TBI and no-TBI groups and small effect sizes were observed for the ICU;  $F(1, 116) = .53, p = .21, r = .01$ , the subscales of callous behaviour;  $F(1, 116) = .48, p = .21, r = .07$ , unemotional behaviour;  $F(1, 116) = .31, p = .34, r = .01$  or uncaring behaviour;  $F(1, 116) = .209, p = .65, r = .04$ . The ICU showed almost complete independence of the presence of a TBI with LOC.

**Risk of alcohol dependence, substance use and criminal activity.** For risk of alcohol dependence, no significant difference was observed between the TBI and no-TBI groups;  $F(1, 116) = .86, p = .23$ , with a small effect size  $r = .07$ . The results show a significant difference between TBI and no-TBI groups along three categories (no, yes, multiple) for substance use;  $F(1, 116) = 4.36, p = .02$ , with a small effect size  $r = .22$ , and for criminal activity,  $F(1, 116) = 6.61, p = .005$ , with a small effect size  $r = .22$ .

**Psychological health symptoms and general physical health symptoms.** The results show a significant difference between TBI and no-TBI groups for psychological health symptoms;  $F(1, 116) = 4.33, p = .04$ , with a small effect size  $r = .20$ . For general physical health symptoms the Mann Whitney  $U$ -test showed a significant difference between TBI and no-TBI groups;  $U = 1103, z = -2.12, p = .01$ .



Table 2. *Behavioural and Emotional Measures in TBI and no-TBI young offenders*

	N	TBI LOC	No TBI	<i>F</i>	<i>df</i>	<i>p</i>	<i>r</i>
BDI	117	<i>n</i> = 40 (34%) ( <i>M</i> =30.90, <i>SD</i> =12.43)	<i>n</i> = 74 (66%) ( <i>M</i> =26.32, <i>SD</i> =11.85)	3.80	1,116	.03	.17
BDI categories	117	<i>n</i> = 40 (34%) ( <i>M</i> =4.33, <i>SD</i> =1.44)	<i>n</i> = 74 (66%) ( <i>M</i> =3.84, <i>SD</i> =1.56)	2.64	1,116	.05	.14
ICU	117	<i>n</i> = 40 (34%) ( <i>M</i> =27.95, <i>SD</i> =8.95)	<i>n</i> = 74 (66%) ( <i>M</i> =27.86, <i>SD</i> =9.23)	.003	1,116	.52	.01
Callous behaviour	117	<i>n</i> = 40 (34%) ( <i>M</i> =9.15, <i>SD</i> =5.60)	<i>n</i> = 74 (66%) ( <i>M</i> =9.97, <i>SD</i> =5.03)	.48	1,116	.25	.07
Unemotional behaviour	117	<i>n</i> = 40 (34%) ( <i>M</i> =10.50, <i>SD</i> =5.24)	<i>n</i> = 74 (66%) ( <i>M</i> =9.94, <i>SD</i> =5.13)	.32	1,116	.34	.01
Uncaring behaviour	117	<i>n</i> = 40 (34%) ( <i>M</i> =8.30, <i>SD</i> =5.55)	<i>n</i> = 74 (66%) ( <i>M</i> =7.84, <i>SD</i> =4.88)	.128	1,116	.72	.04
AUDIT	117	<i>n</i> = 40 (34%) ( <i>M</i> =13.38, <i>SD</i> =6.55)	<i>n</i> = 74 (66%) ( <i>M</i> =12.02, <i>SD</i> =6.68)	.86	1,116	.23	.07
Substance use	117	<i>n</i> = 40 (34%) ( <i>M</i> =1.90, <i>SD</i> =1.15)	<i>n</i> = 74 (66%) ( <i>M</i> =1.43, <i>SD</i> =1.16)	4.36	1,116	.02	.22
Criminal activity	117	<i>n</i> = 40 (34%) ( <i>M</i> =1.08, <i>SD</i> =.89)	<i>n</i> = 74 (66%) ( <i>M</i> =.66, <i>SD</i> =.79)	6.61	1,116	.005	.22
Psychological symptoms	117	<i>n</i> = 40 (34%) ( <i>M</i> =11.38, <i>SD</i> =6.19)	<i>n</i> = 74 (66%) ( <i>M</i> =8.95, <i>SD</i> =6.44)	4.33	1,116	.04	.20
Health symptoms	117	<i>n</i> = 40 (34%) ( <i>Median</i> =8.00, <i>SD</i> =6.62)	<i>n</i> = 74 (66%) ( <i>Median</i> =6.00, <i>SD</i> =5.58)	1103.00/ -2.25	1,116	.01	N/A
RPQ	65	<i>n</i> = 24 (37%) ( <i>M</i> =22.88, <i>SD</i> =9.82)	<i>n</i> = 41 (63%) ( <i>M</i> =17.12, <i>SD</i> =10.53)	4.75	1,64	.02	.26
Proactive aggression	65	<i>n</i> = 24 (37%) ( <i>M</i> =10.46, <i>SD</i> =6.39)	<i>n</i> = 41 (63%) ( <i>M</i> =6.88, <i>SD</i> =5.99)	5.15	1,64	.01	.28
Reactive aggression	65	<i>n</i> = 24 (37%) ( <i>M</i> =12.42, <i>SD</i> =4.26)	<i>n</i> = 41 (63%) ( <i>M</i> =10.24, <i>SD</i> =5.23)	2.94	1,64	.04	.22

*Note.* Median reported for Mann Whitney U test instead of mean. The *r* value is estimator of effect size.

**Reactive and Proactive aggression.** The group with TBI reported significantly higher levels of proactive and reactive aggression than the group without TBI;  $F(1, 64) = 4.75, p = .02$ , with a small effect size  $r = .26$ . Further, the subscale of proactive aggression was significantly higher for the group with TBI than for the group without TBI;  $F(1, 64) = 5.15, p = .01$ , with a small effect size  $r = .28$ . The subscale of reactive aggression was also significantly higher for the group with TBI than for the group without TBI;  $F(1, 64) = 2.94, p = .04$ , with a small effect size  $r = .22$ .

**CBCL.** The results for the comparison between the TBI and no TBI young offender groups are presented in Table 3 for externalizing, internalizing and total problems, and social, anxiety, affective problems, oppositional defiance conduct disorder, rule breaking and aggression problems. Participant's t-scores were used along three categories (normal, borderline and clinical). For externalizing problems ( $U = 477.00, z = -1.84, p = .03$ ) the Mann Whitney  $U$ -test showed the TBI group had significantly higher borderline and clinical cases than no-TBI groups. Further, social problems was significantly higher for TBI than no-TBI groups;  $F(1, 72) = 6.47, p = .005$ , with a small effect size  $r = .28$ . Oppositional defiance problems was also significantly higher for TBI than no-TBI groups;  $F(1, 72) = 4.13, p = .03$ , with a small effect size  $r = .24$ . Anxiety problems was also significantly higher for TBI than no-TBI groups;  $F(1, 72) = 3.68, p = .03$ , with a small effect size  $r = .22$ . Internalizing problems were on the threshold of significance;  $F(1, 72) = 2.31, p = .052$ , with a small effect size  $r = .17$ . All other CBCL measures were not significant.

Table 3. *Child Behaviour Checklist for TBI and no-TBI young offenders*

<i>n</i> = 73	TBI LOC ( <i>n</i> = 27)	No TBI ( <i>n</i> = 46)	<i>F</i>	<i>df</i>	<i>p</i>	<i>r</i>
Total problems	( <i>Median</i> =3.00, <i>SD</i> =.84)	( <i>Median</i> =2.50, <i>SD</i> =.98)	509.50/ -1.43	1,72	.08	N/A
Externalizing difficulties	( <i>Median</i> =3.00, <i>SD</i> =.80)	( <i>Median</i> =2.00, <i>SD</i> =.98)	447.00/ -1.84	1,72	.03	N/A
Internalizing difficulties	( <i>M</i> =2.33, <i>SD</i> =.88)	( <i>M</i> =2.00, <i>SD</i> =.92)	2.31	1,72	.052	.17
Social problems	( <i>M</i> =2.15, <i>SD</i> =.95)	( <i>M</i> =1.61, <i>SD</i> =.83)	6.47	1,72	.005	.28
Anxiety problems	( <i>M</i> =1.81, <i>SD</i> =.88)	( <i>M</i> =1.44, <i>SD</i> =.78)	3.68	1,72	.03	.22
Oppositional defiant problems	( <i>M</i> =1.81, <i>SD</i> =.88)	( <i>M</i> =1.41, <i>SD</i> =.78)	4.13	1,72	.02	.24
Conduct disorder problems	( <i>M</i> =2.04, <i>SD</i> =.94)	( <i>M</i> =1.85, <i>SD</i> =.97)	1.31	1,72	.26	.14
Rule breaking problems	( <i>M</i> =2.15, <i>SD</i> =.91)	( <i>M</i> =1.87, <i>SD</i> =.96)	2.12	1,72	.15	.18
Aggression problems	( <i>M</i> =1.89, <i>SD</i> =.89)	( <i>M</i> =1.63, <i>SD</i> =.90)	1.41	1,72	.12	.15

Thus, dependent variables that were significantly associated with TBI status are as follows: Reactive and proactive aggression, depressive symptoms, psychological problems, health problems, substance use and criminal activity. The significantly associate dependent variables from the CBCL are as follows: Socialising problems, externalizing problems anxiety problems and oppositional defiance problems.

## Discussion

### Summary and Interpretation of Findings

**Self-reported TBI rates.** The aim of this study was to establish a prevalence rate of TBI in young offenders and compare it to local non-offenders. I predicted that the reported TBI rates in a South African young offender sample would not be reflected in the broader school going population. There is a high prevalence rate (50%) of reported TBI for the young offender sample. Further, for this sample TBI rates with LOC is 40%. Therefore, it is concluded that the TBI reports have remained constant for this sample as compared to the results of the previous unpublished study on the same (smaller) sample (see Badul, 2012). Comparing these rates with local non-offenders provides some limited insight into the situation faced by South African adolescents. The reported prevalence rate for non-offender TBI is 37% and for TBI with LOC the rate is 15%. These rates are not as high as the prevalence rates seen in the young offender sample. Thus, the hypothesis is confirmed that young offenders report higher rates of TBI than non-offenders for these samples. Measuring the prevalence rates of non-offenders provides valuable information of the situation faced by the broader South African adolescent population. However, it is noted that the non-offender sample is relatively small when compared to the offender sample and caution is advised when comparing unequal sample sizes.

It is also important to compare studies of young offenders from HIC and LAMIC. This allows some insight into the similarities and differences faced by young offenders in a variety of contexts. A Meta-analysis of 1524 young offenders reported a 30% prevalence rate of TBI in young offenders from the UK and US (Farrer et al., 2013). Further, four comparable studies from the Meta-analysis were used to compare specific prevalence rates of young offenders from international research to the prevalence rates reported in the current study. In the UK and US, Williams et al., (2010) found a 46% prevalence rate of TBI. Further, Hux et al., (1998) reported a 50% prevalence rate of TBI in 316 young offenders. Carswell et al., (2004), Forrest et al., (2000) and Perron and Howard, (2008) reported prevalence rates of TBI ranging from 12-27%. Thus, the prevalence rates found in these studies are similar or lower than the rates reported in my study. Overall it can be concluded that the prevalence rates of TBI found in my study are on the high end of prevalence rates found in international literature. This supports the notion that the situation in LAMIC may place young offenders at similar or higher risk for sustaining TBI than in HIC. Further research is required to establish if prevalence rates are similar for non-offenders in LAMIC when compared to HIC (Alexander et al., 2010).



Further, my findings are consistent with Perron and Howard (2008), and Williams et al., (2010), that the majority of TBI in young offenders are a result of assaults and fighting. This is contrary to the findings of Nell and Brown (1993) where MVAs were the dominant cause of reported TBI. However, the Nell and Brown study was not conducted using a young offender sample, where assaults and fighting might be more common.

**Emotional and behavioural measures for offenders.** International research indicates various emotional and behavioural difficulties that are associated with TBI in young offenders. Thus, a secondary aim of this study was to investigate the known emotional and behavioural challenges faced by young offenders with TBI in a South African context. In the current study, young offenders with TBI that included LOC had significantly higher levels of reported difficulties, particularly with regard to proactive and reactive aggression, depressive symptoms, externalizing difficulties, substance use, criminal activity, anxiety problems, oppositional defiance problems, and general physical and psychological health problems than young offenders without TBI. It remains unclear whether these factors contribute, or are a result of TBI and causality cannot be addressed using cross sectional research. What is certain is that these factors co-occur with reported TBI status in young offenders and requires further investigation and promotion of intervention strategies.

Proactive and reactive aggression is significantly related to participants reporting a TBI. Proactive forms of aggression are predatory and instigated by the individual (Raine et al., 2006). The subscale of proactive aggression is shown to be significantly associated with TBI status, with young offenders with self-reported TBI reporting higher levels of proactive aggression than young offenders who did not report TBI. Reactive aggression is fear-based and impulsive (Raine et al., 2006). The reactive aggression subscale was also significantly associated with young offender TBI status, although to a lesser extent. This is in line with international research that shows there is a relationship between youths with TBI, specific types of aggression and criminal involvement (Farrer et al., 2013). This statement is especially true for proactive aggression (Hodges, 2012). It is unclear if proactive aggression increases adolescent risk for sustaining TBI or if TBI increases aggression in these young offenders. What can be concluded is that there is a relationship between forms of aggression and TBI reported. Behavioural difficulties such as proactive aggression need to be screened for in young offenders through the assistance of continued research to provide positive outcomes for young offenders with TBI.

Substance use is significantly related to offenders TBI status. The association of adolescent substance use and TBI supports the findings in international literature (e.g. Perron

& Howard, 2008; Williams et al., 2010). The use and especially the abuse of alcohol and illicit substances is especially problematic because it compounds the effects of sustaining a TBI, the individual's recovery potential and increases the risk for sustaining future TBI injuries (Corrigan, 2005; Crowe, 2008; Kaplan, & Corrigan, 1992). Further, Corrigan (2005) indicates that substance use pre- and post-injury complicate recovery potential if left untreated and has several negative influences on individual's quality of life. According to Crowe (2008) and Corrigan (2005), the months following a TBI is an excellent time period for rehabilitation of substance abuse problems through individual and group counselling. TBI research can work hand in hand with education and medical service delivery to ensure much needed rehabilitation is focused on the particular needs of individuals who have sustained a TBI and have co-occurring difficulties with substance use.

Further, the majority of young offender participants responded that they have used illicit substances. South African data is not available for the amount that substance abuse costs society. In the United States it is estimated that substance use and criminal involvement cost society roughly \$247 million annually (Hawkins, Shapiro, & Fagan, 2010). According to Hall and Chennells, (2011), high adolescent substance use is associated with low socioeconomic status areas irrespective of TBI status. The community from which my young offender sample is drawn is generally low socioeconomic status and the monthly income of the average household is below R3200 a month (Lehohla, 2011). Thus, the high rates of substance use may be a function of the young offender population in this particular context. Further investigation may provide understanding of the particular challenges faced by low socioeconomic communities and adolescent substance abuse, particularly in relation to young offenders.

The significant association of crime and TBI status in young offenders is consistent with international findings (e.g., Perron & Howard, 2008; Williams et al., 2010). The majority of young offenders reported that they have committed multiple crimes. However, types of criminal activity varied largely and serious crimes involving violence, rape or murder were not included in this study. Drawing conclusions of the relationship between crime and TBI status is beyond the scope of these findings. The significant result is not a good proxy for understanding the types of crimes committed or how these impact the TBI status of young offenders. However, according to Williams et al., (2010) young offenders that report a TBI have two times the conviction rate of young offenders that have not reported a TBI. Given the high rates of criminal involvement, substance use and aggression associated with young offenders with TBI, it may not be surprising that there is a high risk for offending

the law repeatedly. These factors require early identification to prevent repeat offences, especially when these offences may increase the risk of sustaining further TBI.

According to Williams et al., (2010) young offenders with reported TBI have significantly poorer mental and physical health than adolescents without TBI. These findings are consistent with my findings that TBI status is associated with relatively poorer psychological and physical health. According to O'Shanick & O'Shanick, (2005), individuals who have sustained TBI have significantly higher difficulties with psychiatric disorders and suicide and this leads to poor quality of life outcomes. Such co-morbid factors require immediate attention considering individuals who have sustained TBI struggle significantly with a range of mental and physical health difficulties and criminal activity. Further, depressive symptoms were significantly associated with TBI status for young offenders. This finding is consistent with international research that indicates the co-morbidity of depression, suicide and TBI status (Farrer et al., 2013; O'Shanick & O'Shanick, 2005). This statement may be true for psychological illnesses in general, but especially for depression and suicide, early identification and assistance in young offenders with TBI is needed.

The CBCL gave an indication of other types of externalizing and internalizing difficulties that may be in need of redress for young offenders who report TBI. Overall the variance of the data was moderate, a few categories were under-represented and this made accurate interpretation challenging. However, factors such as socialising problems, anxiety problems, and oppositional defiance problems are shown to be significantly higher for young offenders that report TBI. This finding is consistent with international research (Blair, 2007; Gabella et al., 1997; Hawley, 2004; Miura et al 2005; Peek-Asa et al., 2004; Perron & Howard, 2008; Rao & Lyketsos, 2000; O'Shanick & O'Shanick, 2005). How these externalizing and internalizing difficulties influence a young offender with and without a TBI is still not clearly understood. These factors do indicate the need for service delivery to young offenders with TBI. These aforementioned factors may be detrimental to adolescent outcomes in a host of ways and how they influence and are influenced by the TBI status of young offenders requires further investigation and methodologically sound intervention promotion through adequate service delivery for young offenders. For example, difficulties with socialising and communication can be circumvented through inexpensive rehabilitation that promotes pro-social conversational skills and increases individual's ability to inhibit inappropriate responses (O'Shanick & O'Shanick, 2005). However, the implementation of such interventions has not been researched in young offenders in a South African context.

Overall, the hypothesis is confirmed that TBI rates are different for young offenders than their non-offender counterparts for two South African samples. TBI rates in the young offender sample are also found to be similar to international rates although discrepancies do exist. Further, the hypothesis is confirmed that offenders with TBI perform significantly more poorly on various emotional and behavioural measures than young offenders without TBI. This is true for depressive symptoms, proactive and reactive aggression, substance use, criminal activity, externalizing problems, oppositional defiance problems, socialising problems and anxiety problems. These findings are consistent with international literature and indicate the co-morbidity of TBI with various internalizing and externalizing difficulties. This study's findings support international research that promotes the increased screening and intervention for TBI and the various emotional and behavioural difficulties that may negatively influence adolescent outcomes especially with relation to involvement with crime.

### **Limitations**

Relying on retrospective reports of TBI is a limitation of this study. Head injuries (including TBI) have been shown to be challenging to diagnose accurately, especially in the absence of medical verification (Corrigan, Selassie & Orman, 2010) (as cited by Farrer et al., 2013). Without medical verification, or parental corroboration, it is challenging to determine the accuracy of some of the self-reported TBIs. It is important to note that not every injury to the head results in TBI and the range of TBI makes accurate diagnosis challenging (Young & Andrews, 2008). For adolescent TBI research, there is no consensus if self-report and parent-reports of injuries are accurate enough (Farrer et al., 2013; Young & Andrews, 2008). However, Schofield, Butler, Hollis et al., (2006) compared self-report TBIs with medical records of TBI and concluded that self-reports are accurate enough for research with adult prison populations. Further, the majority of international research (e.g. Adams 2013; Forrest et al., 2000, Hux et al., 1998, Perron and Howard 2008 and Williams et al 2010) uses self-report interviews and questionnaires to determine TBI status among young offenders (reviewed in the Meta-analysis by Farrer et al., (2013). These studies indicate the necessity of using self-report measures because of the challenges faced in adolescent TBI research with corroboration and verification through medical records. Further, if this is the case for research in developed countries, it is assumed that in developing countries the situation is even more challenging (Steyerberg et al., 2008).

According to Perron and Howard (2008), Adams (2013) and Sharp and Dellis, (2010) the cross sectional nature of TBI research among young offenders is not appropriate for drawing aetiological inferences regarding causes and consequences of TBI. Thus, with all of

the behavioural and emotional measures, it is not possible to be certain whether TBI was a risk factor for offending the law, or if it was the cause of behaviour that resulted in criminal activity. According to Farrer et al., (2013) the cross sectional design of the majority of TBI research leaves room for the possibility of reverse causation, i.e. did the TBI result in behaviour that lead to offending the law, or if some form of delinquent behaviour resulted in the TBI, or a combination of the two? However, despite the inability to determine the causal relationship of TBI and co-morbid factors such as substance use, depression, antisocial behaviour and prior criminal activity, the necessity to research TBI in adolescent samples remains great. Further research is required to understand how these factors influence adolescents that have sustained TBI.

The size of the non-offender sample is limitation of this study. The response rate of non-offender's parents/caregivers is a related limitation of this study. Despite the randomised selection of non-offender participants and the thorough explanation of the nature of the research, only 50% of the consent letters were returned to the school. Thus, only 27 out of 60 selected non-offenders could be successfully interviewed. This low response rate and sample size decreases the generalizability of findings related to the non-offender sample. There may be unknown reasons that deter parents/caregivers from wanting their children to participate in research that investigates problems and injuries. It is also likely that some of the children did not want to participate in the research and failed to deliver the consent letter to their parents/caregivers. Thus, the school sample may be influenced by response bias.

This study fails to look at the various protective factors (e.g. , pro-social behaviour, being female, good nutrition, positive social orientation, involvement in positive extracurricular activities, academic achievement, good social skills, employment opportunities, positive expectations and an internal locus of control) that may buffer the negative effects of TBI and factors such as substance use, aggression, criminal activity, externalising difficulties, social problems and other delinquent behaviours (Catalano & Hawkins, 1996; Catalano, Kosterman, Hawkins et al., 1996; Linver, Roth & Brooks-Gunn, 2009; Wasserman et al., 2003). The specific factors and broader context of young offenders requires further investigation.

Given the limitations of sampling and access to only one young offender institutions and school, these finding are not generalizable and selection lists are not comprehensive of the offender and non-offender populations. However, this limitation did ensure that the participants from the young offender sample were matched and homogeneity was thus promoted by sampling participants from the same school and institution.

### **Recommendations for future research**

Future research should aim to verify TBI reports with medical records and/or parent/caregiver corroboration to increase the certainty of the participants' TBI history. It is also suggested that the other two schools and three young offender institutions in the same area are approached for potential inclusion in future research. This may allow more comprehensive lists of young offenders and non-offenders to be compiled for random selection. This can be used to increase the generalizability of findings related to TBI research among South African adolescents in this particular context. The contacts that were gained through this year's research may also be used to expand the young offender and non-offender samples. Larger samples, especially for the non-offenders, will allow for greater statistical power when comparisons and inferences are made related to prevalence rates and associated emotional and behavioural difficulties of TBI. This is especially important for the non-offender sample that can be treated as a pilot study in the same way the young offender sample from Badul (2012) was used. The low response rate of non-offender parents/caregivers may also be increased by sending letters to all parents or arranging open meetings at the school to discuss the nature of the research and encourage parents to raise concerns or questions related to their children's participation in TBI research.

The availability of such a large pool of young offenders that have sustained a TBI as well as matched non-offenders provides a valuable opportunity for research to investigate TBI in young offenders in LAMIC, especially considering the dearth of research in young offenders. The same author indicates the importance of researching participants that have similar access to resources and are matched in terms of sex, age, socioeconomic status and ethnicity. Future research may provide the much needed advocacy for intervention and cost effective programmes that are promoted in international research (Corrigan, 2005; Crowe, 2008; Kaplan, & Corrigan, 1992; O'Shanick & O'Shanick, (2005); Perron, & Howard, 2008; Williams et al., 2010; Yeates, & Anderson, 2008). According to Yeats & Anderson, (2008) something as simple as assisting individuals that have sustained a TBI with daily goal setting may assist in improving their outcomes.

### **Statement of significance**

TBI causes much disability and death throughout the world and research that addresses this issue is lacking. The findings from this study assist in understanding if the risk of sustaining a TBI in young offenders is lower than in non-offender populations in the given context. By looking at prevalence rate of samples of young offenders and non-offenders in LAMIC countries, some understanding is provided of the differences and similarities when

comparing research from HIC. Studies in LAMIC are important as fatalities related to TBI have been shown to be greater than in HIC. This is because resources and access to medical facilities are more limited in LAMIC (Wilbacher et al., 2008).

Further, significant associations of TBI and emotional and behavioural difficulties were shown for young offenders in a South African sample. This research may contribute to raising community wide awareness of the challenges young offenders face when they have sustained a TBI. Despite the fact that TBI impacts young offenders in diverse ways, research such as this is able to allude to the promise that reliable patterns of emotional and behavioural difficulties can be mapped and these maps may prove useful to guide rehabilitation and intervention practices in future research. The findings of this study may assist in early identification of adolescent TBI and associated factors in young offenders. Early antisocial behaviour (e.g. substance use, previous criminal activity, aggression) and TBI are risk factors for offending the law as well as later criminal involvement (Wasserman et al., 2003; Williams et al., 2010). Thus, research investigating these aforementioned factors may be one way of preventing crime if it can be used to guide appropriate intervention implementation (Wasserman et al., 2003; Williams et al., 2010). There is a well-structured system in place which can support intervention strategies such as counselling and behavioural modification training, especially while young offenders are institutionalised (Crowe, 2008). This research may be used to advocate the importance of capitalising on the “critical window” of adolescents, when it is possible to act early and reduce the impact of sustaining a TBI. It is evident from this study in combination with various international research that TBI is a major health concern for young offender populations (Williams et al., 2010). Young offenders who have sustained a TBI require identification and assistance that can potentially reduce involvement in future criminal activity and improve their outcomes.

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## Appendices

### Appendix A

#### ASSENT TO PARTICIPATE IN RESEARCH

We are inviting you to be in our research study. We would like to learn more about traumatic brain injuries and associated behaviours of young people. In order to do this, we are talking to young people who have had such an injury and also to those who have never had such an injury.

If you agree to be in this study we will ask you to meet with us twice. During the first session, we will ask you to answer some questions about your life. These may be very personal questions about your behaviour. This session will last approximately 1 hour. During the second session, we will ask you to do some table-top tasks with us that will help us to understand your thinking and behaviour better. This session will be approximately 2 hours long.

Taking part in this study will not place you at risk in any way. These activities will not harm you, but some of them may be long and you may feel tired at times. If you do, you can stop and rest at any time. There will be no penalty if you choose not to be part of this study or if you choose to stop being part of it. Other than receiving refreshments during the sessions and being compensated at the end of the second session for your participation, there are no known benefits to taking part in this study. You will, however, be helping us to better understand behaviours associated with having a traumatic brain injury.

Your identity will not be revealed and all the information you give will be strictly confidential. It will only be used for academic research purposes; such as in a research report.

If you sign this paper it means that you would like to take part in this study. If you would not like to take part in this study, you do not have to sign this form. It is up to you. Before you say whether you want to be part of this study or not, I will answer any questions that you may have. If you have a question later that you didn't think of now, you can ask me next time.

I would like to take part in this study:

Signature of Participant \_\_\_\_\_ Date \_\_\_\_\_

Signature of Investigator \_\_\_\_\_ Date \_\_\_\_\_

I agree to the interview sessions being tape-recorded:

Signature of Participant \_\_\_\_\_ Date \_\_\_\_\_

**Appendix B**  
**Consent Form**

***Informed Consent to Participate in Research and Authorization for Collection, Use, and Disclosure of Questionnaire and Other Personal Data***

You are being asked to take part in a research study. This form provides you with information about the study and seeks your authorization for the collection, use and disclosure of questionnaire data, as well as other information necessary for the study. The Principal Investigator (the person in charge of this research) or a representative of the Principal Investigator will also describe this study to you and answer all of your questions. Your participation is entirely voluntary. Before you decide whether or not to take part, read the information below and ask questions about anything you do not understand. By participating in this study you will not be penalized or lose any benefits to which you would otherwise be entitled.

**1. Name of Participant ("Study Subject")**

---

**2. Title of Research Study**

Investigating the prevalence rates of TBI in a sample of adolescent males in Cape Town

**3. Principal Investigator and Telephone Number(s)**

Pieter Erasmus

Honours Student

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021 650 3708

**4. Source of Funding or Other Material Support**

National Research Foundation (NRF)

**5. What is the purpose of this research study?**

The purpose of this research is to investigate the prevalence of traumatic brain injury (TBI) among South African adolescents and to assess their behaviour.

**6. What will be done if you take part in this research study?**

The purpose and procedure of the study will be explained to you. You will be asked to complete parent/caregiver information and socio-economic status questionnaire, and a questionnaire about your child's developmental history.

You will then be asked to complete two additional questionnaires that will look at your child's behaviour, and at how you and your family have coped with your child's injury.

You will be allowed to take breaks when necessary.

If you have any questions now or at any time during the study, you may contact the Principal Investigator listed in #3 of this form.

**7. If you choose to participate in this study, how long will you be expected to participate in the research?**

Completing the questionnaires will take place during one session, which should not last longer than one (1) hour.

If at any time during the session you wish to stop your participation, you are free to do so without penalty.

**8. How many people are expected to participate in the research?**

200

**9. What are the possible discomforts and risks?**

There are no known risks associated with participation in this study. Should you get tired during the study, you will be allowed to rest. Refreshments will be available to you.

If you wish to discuss the information above or any discomforts you may experience, you may ask questions now or call the Principal Investigator listed in #3 of this form.

**10a. What are the possible benefits to you?**

You or the child in your care may or may not personally benefit from participating in this study. Should behavioural problems be identified during the process of this study, you will be referred to the appropriate services.

**10b. What are the possible benefits to others?**

The information gained from this research study will help improve our understanding of adolescent behaviour with TBI.

**11. If you choose to take part in this research study, will it cost you anything?**

Participating in this study will not cost you anything.

**12. Will you receive compensation for taking part in this research study?**

No.

**13a. Can you withdraw from this research study?**

You are free to withdraw your consent and to stop participating in this research study at any time. If you do withdraw your consent, there will be no penalty.

If you have any questions regarding your rights as a research subject, you may phone the Psychology Department offices at 021-650-3430.

**13b. If you withdraw, can information about you still be used and/or collected?**

Information already collected may be used.

**15. Once personal and performance information is collected, how will it be kept secret (confidential) in order to protect your privacy?**

Information collected will be stored in locked filing cabinets or in computers with security passwords. Only certain people have the right to review these research records.

These people include the researchers for this study and certain University of Cape Town officials. Your research records will not be released without your permission unless required by law or a court order.

**16. What information about you may be collected, used and shared with others?**

This information gathered from you will be demographic information, information on your child's developmental history, and records of your responses to questionnaires regarding your child's behaviour, and the experience by your family in relation to your child's accident. If you agree to be in this research study, it is possible that some of the information collected might be copied into a "limited data set" to be used for other

research purposes. If so, the limited data set may only include information that does not directly identify you. For example, the limited data set cannot include your name, address, telephone number, ID number, or any other numbers or codes that link you to the information in the limited data set.

**17. How will the researcher(s) benefit from your being in the study?**

In general, presenting research results helps the career of a scientist. Therefore, the Principal Investigator and others involved this research project may benefit if the results of this study are presented at scientific meetings or in scientific journals.

**18. Signatures**

As a representative of this study, I have explained to the participant the purpose, the procedures, the possible benefits, and the risks of this research study; and how the participant's performance and other data will be collected, used, and shared with others:

\_\_\_\_\_

Signature of Person Obtaining Consent and Authorization      Date

You have been informed about this study's purpose, procedures, possible benefits, and risks; and how your performance and other data will be collected, used and shared with others. You have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time.

You voluntarily agree to participate in this study. You hereby authorize the collection, use and sharing of your performance and other data. By signing this form, you are not waiving any of your legal rights.



---

Signature of Person Consenting and Authorizing

---

Date

Please indicate below if you would like to be notified of future research projects conducted by our research group:

\_\_\_\_\_ (initial) Yes, I would like to be added to your research participation pool and be notified of research projects in which I might participate in the future.

Method of contact:

Phone number: \_\_\_\_\_

E-mail address: \_\_\_\_\_

Mailing address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Appendix C

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**ENQUIRIES:** Dr A T Wyngaard

Miss Helen Ockhuizen  
4 Teddington Court  
Teddington Road  
Rondebosch  
7701

**Dear Miss Helen Ockhuizen**

**RESEARCH PROPOSAL: THE PREVALENCE OF TRAUMATIC BRAIN INJURY (TBI) AND AN INVESTIGATION OF EXECUTIVE FUNCTIONING (AMONG THOSE WHO HAVE SUSTAINED A TBI) IN A SAMPLE OF JUVENILE DELINQUENT BOYS**

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Approval for projects should be conveyed to the District Director of the schools where the project will be conducted.
5. Educators' programmes are not to be interrupted.
6. The Study is to be conducted from **06 March 2013 till 28 September 2013**
7. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
8. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
9. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
10. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.

11. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
12. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services  
Western Cape Education Department  
Private Bag X9114  
CAPE TOWN  
8000**

We wish you success in your research.

Kind regards.

Signed: Dr Audrey T Wyngaard

**Directorate: Research**

**DATE: 04 March 2013**

## Appendix D

UNIVERSITY OF CAPE TOWN



Department of Psychology

University of Cape Town, Rondebosch 7701, South Africa  
Telephone: (021) 650 3435  
Fax No. (021) 650 4104

06 May 2013

Geagte Meneer/Mevrou,

U word harteliks uitgenooi om deel te neem aan n navorsings project saam met die Universiteit van Kaapstad. Ons is n group affilieerde navorsers wat besig is met a studie oor traumatiese kopebeserings en jongmense se gedrag wat daarmee tepaart gaan. Wat ons benodig is informasie van kinders wat kopebeserings opgedoen het, sowel as die wat nie kopebeserings opgedoen het nie.

Minimale onderbreking in die skool rouetine is een van ons nommer een prioriteite. Daar is n hand vol skole wat ons benader so indien U wel wil betrokke raak sal ons net n klein hoeveelheid van n kinders benodig. Gesamentlik wil ons 100 kinders se inligting kry van al die betrokke instansies. Die idee is om n ferm platform te bou wat verdere navorsing kan aanspoor om jeug se behoeftes in terme van gedrag en denk prosesse beter te verstaan en bevorder. Huidiglik is ons betrokke by n instansie wat kleurling seuns tussen die ouderdom van 14-17 ondersoek. Ons navorsing benodig U samewerking om seuns van soortgelyke ouderdom te verkry.

Die Raad van Onderwys het hierdie navorsing goedgekeur. Elke kind word geassesseer volgens internasionale en nasionale standaarde. Dus word die informasie nie gebruik in enige manier om U, die kinders, of U instansie direk te benadeel of bevoordeel nie. Die naam van die skool hoef nie bekend gemaak te word nie. Die navorsings data word konfidensieel gehou en alle inligting wat verskaf word sal geen individueel kan uitsonder as die verskaffer nie.

Deelname is willikeurig en elke persoon se instemming is vereis tydens die hele proses. Die proses sluit in om eerstens net n vinnige vraelys beantwoord te kry deur die seuns. Verder het ons n idee om ouers betrokke te kry met n telefoniese vraelys. Ons sal ook wil onderhandel om n meer sistematiese ondersoek in die neuro-ontwikkeling van die kinders te doen.

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The University of Cape Town is committed to policies of equal opportunity and affirmative action which are essential to its mission of promoting critical inquiry and scholarship.

Dit sal n plesier wees om ons navorsing met U te bespreek en enige vrae wat U mag he te beantwoord. Ons glo dat met U samewerking ons werklik n positiewe verskil kan maak in jongmense se lewens.

By voorbaat dank ek U vir die tyd,

P. E. Erasmus

L.E. Schrieff (Toesighouer en Dosent)

## Appendix E

### UNIVERSITY OF CAPE TOWN



### Department of Psychology

University of Cape Town, Rondebosch, 7701, South Africa

Telephone (021) 650-4605

Fax: (021) 650-4104

Date

Dear Parent

#### **Traumatic Brain Injury: Research study at your child's school**

Researchers from the Department of Psychology at the University of Cape Town have arranged to conduct a study of Traumatic Brain Injury (TBI) and youth well-being at your child's school.

Currently, We are conducting research regarding TBI and children's behaviour which goes along with it. What we require is information from children who have acquired a TBI, as well as those who have not sustained a TBI. This process includes the completion of a quick interview with your child. Further, in the future, we would aim to include parental questionnaires and medical histories of children. We would assess the neuro-development of your child with simple paper and pen assessments as well in a subsequent interview.

We would like to invite your child to fill in a questionnaire during an ordinary school period. They will be asked questions about their relationships, experiences, health and behaviours. This is a voluntary exercise and your child will be able to choose whether or not to participate. If they do participate, they will be free to withdraw from the study at any time, or to leave out certain questions. If they choose not to participate, this will have no effect on how your child will be treated at school.

All information provided by your child will be anonymous and confidential. They will not be asked to put their name on the questionnaire, and the information from all learners who participate will be combined in the presentation of the results. As a result, no child who participates in the research will be personally identifiable.

If you do *not* want your child to participate in this study, please fill in the reply slip below and return it to school by 30 July 2013. If you do not respond we will take that as permission for your child to participate.

Thank you for your cooperation.

Yours sincerely

Leigh Scrieff  
Principal Investigator

If you have any questions or complaints about this study, please contact:

Pieter Erasmus  
Sielkunde honneurs student  
Tel: 0845048360  
E-pos: [p.erasmus@live.com](mailto:p.erasmus@live.com)

Leigh Scrieff  
Hoof navorser  
Tel:  
E-pos: [l.e.scrieff@gmail.com](mailto:l.e.scrieff@gmail.com)

Ju-Reyn Ockhuizen  
Sielkunde meesters student  
Tel:  
E-pos:

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I **do not** wish for my son / daughter to participate in the research study being conducted by the UCT Psychology Department at my child's school.

Child's Name:

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Class: \_\_\_\_\_

Parent's / Guardian's Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_