

The association between traumatic brain injury (TBI) and proactive and reactive aggression  
in a sample of young male offenders and non-offenders.

Kimberly Blake

ACSENT Laboratory  
Department of Psychology  
University of Cape Town



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## Abstract

Traumatic brain injury (TBI) and youth criminality are both highly prevalent problems in South Africa. There is increasing evidence that there is a relationship between TBI and young offending, which could be a result of the neurological, emotional, and behavioural issues which follow TBIs. This relationship is under researched in South Africa. This study investigated the association between TBI and proactive and reactive aggression in a sample of male young offenders, compared to a control group of non-offenders. Participants were males between the ages of 13-18 years, and were fluent in English and/or Afrikaans. The data was collected using questionnaires to assess the prevalence of reported TBI, alcohol use, substance use, depression, and lastly, proactive and reactive aggression. In order to investigate these relationships, the data has been considered using descriptive statistics, Mann-Whitney U and Chi-square tests, and multiple hierarchical regression analyses with proactive aggression and reactive aggression set as the outcome variables. Significant between group differences were found, however, both regression models were not significant when account for TBI and the grouping variable, after controlling for the other variables. Further, only alcohol use was found to significantly contribute to both regression models, and illegal substance use to significantly contribute to the outcome variable, reactive aggression. The findings suggest an interesting relationship between proactive and reactive aggression and substance use, which should be investigated further by future studies.

*Keywords:* traumatic brain injury, proactive aggression, reactive aggression, young offenders

## **Introduction**

Traumatic brain injury (TBI) and criminal activity committed by young offenders are both widespread, global problems (Williams et al., 2018). Increasing evidence suggests that there is a relationship between TBI and young offending. However, this relationship is complex. Acquiring a TBI during adolescence may result in many different neurological, emotional and behavioural issues, all of which increase the risk of crime in this population (Hughes et al., 2015; Williams, McAuliffe, Cohen, Parsonage, & Ramsbotham, 2015). It is thus important that this relationship is explored (Williams et al., 2018).

In the following introduction, I will present the epidemiology and classifications of TBI and the definition of young offenders. I will then discuss pertinent literature on the relationship between TBI and young offenders with regard to the neurocognitive capacities of adolescents, and the disruption caused to these capacities as a result of acquired TBI. Finally, I will discuss the behavioural outcomes of TBI in adolescents, with a particular emphasis on proactive and reactive aggression, and the relationship this has with youth criminality.

### **Definition and Epidemiology of TBI**

TBI is defined as the disruption to the normal functioning of the brain, caused either by an impact to the head (e.g. a direct blow, with or without penetration of the skull), or a force causing the brain to move around inside the skull. The most common causes of reported TBIs, which vary according to context and population demographics, are falls, motor vehicle accidents (MVAs), being struck against or by an object, and physical assaults (Center for Disease Control and Prevention, 2016; Griffin, 2011; Hughes, Williams, Chitsabesan, Davies, & Mounce, 2012). Societal unrest, violence and MVAs are common causes of TBI in Sub Saharan Africa (Hyder, Wunderlich, Puvanachandra, Gururaj, & Kobusingye, 2007; Peden, Kobusingye, & Monono, 2013), while the most common reported cause of severe TBI in higher-income countries is MVAs (Thurman, 2016). The severity of TBIs are commonly measured by degree of loss of consciousness (LOC), which is usually tested using the Glasgow Coma Scale (Hughes et al., 2012; Teasdale et al., 2014).

The annual incidence of TBI in children and adolescents in the United States, is estimated to be approximately 691 per 100000 (Thurman, 2016), and approximately 245 per 100000 across Europe (Williams et al., 2018). Although no formal TBI incidence rates are reported for South Africa (SA), they are estimated to be up to three times higher in SA and other developing countries than in Europe, given contextual vulnerabilities such as violence (Hyder et al., 2007; Williams et al., 2018). TBIs are more frequently reported for males than females both in local and international contexts (Schrieff, Thomas, Dollman, Rohlwink, & Figaji, 2013; Williams, 2012). In addition, TBIs are prevalent in approximately 50-80% of offender populations, including young offenders (Williams, 2012).

### **Definition and Epidemiology of Young Offenders**

Young offenders are defined as individuals under the age of 18 who have been accused of committing a criminal offence. They are presented at a juvenile court, and if found guilty of an offence, are incarcerated (Hughes et al., 2015). For the purposes of the study, young offenders are defined as adolescents between the ages of 13-18 years, who have broken South African law and who are awaiting trial or have been convicted of this crime.

Approximately 4313 of the estimated 161 984 inmates in South Africa are young offenders, with 98% of these being male (Africa Check, 2017). There are no recent local published statistics on the prevalence of TBI in this population.

### **Traumatic Brain Injury and Offending**

Studies show that there is an association between TBI and criminal behaviour (Hughes et al., 2012). The number of times an individual has sustained a TBI resulting in LOC is higher among those who are persistent offenders, as compared to non-persistent offenders (Hughes et al., 2012; Raine et al., 2005). Criminality is greater in individuals who have sustained a TBI, compared to their siblings, who presumably came from the same or at least similar, social environment (Fazel, Lichtenstein, Grann, & Långström, 2011).

The association between TBI and criminal behaviour can, however, be complex. Young offenders may engage in criminal behaviours for a number of reasons not related to TBI, including abuse, peer pressure, genetics, and a poor socioeconomic status (Williams et al., 2015). Further complicating the issue,

TBI is more common in adolescence, generally, a period in which the likelihood of risky behaviours is increased. These variables make it difficult to determine whether there is a causal link between TBI and criminality in young offenders, and what the direction of this relationship is (Williams, Cordan, Mewse, Tonks, & Burgess, 2010; Williams et al., 2015). However, TBI may increase the likelihood of criminal behaviour in adolescents in a number of ways (Williams et al., 2015).

### **Neurocognitive, Structural and Behavioural Outcomes of TBI**

TBI can damage the infrastructure of the brain, which may extend to blood vessels, connective tissues, tissues surrounding neurons, fluids inside the meninges, vascular structures, and the skull (Griffin, 2011). Even mild TBIs can cause inefficiency in brain systems due to damage of white matter tracts, the development of which is important for multiple cognitive functions (Bigler, 2013; Fuhrmann, Knoll, & Blakemore, 2015). Moderate to severe TBIs can result in white matter injury, in addition to injury to anterior brain regions (Williams et al., 2015), particularly the frontal lobes (Zappalà, Thiebaut de Schotten, & Eslinger, 2012).

Normal brain changes in white and grey matter of the frontal, parietal and temporal lobes are profound during adolescence (Fuhrmann et al., 2015; Tamnes et al., 2013). Some of these white and grey matter changes occur to structures and areas of the brain, known as the “social brain network”, which is responsible for acceptable social behaviour (Hughes et al., 2015; Williams et al., 2015; Williams et al., 2018). These behaviours include understanding situations from different perspectives (Dumontheil, Apperly, & Blakemore, 2010; Fuhrmann et al., 2015), memory, executive functioning (Williams, 2012), risk-taking, sensation-seeking behaviours, inhibition, understanding others’ emotions, empathy (Williams et al., 2015; Williams et al., 2018), and regulating aggression (Albers, 2012; Newman, 1999).

Childhood and adolescence are sensitive times for the maturation of these social brain networks (Wahlstrom, Collins, White, & Luciana, 2010). The different neural networks of the social brain have different developmental trajectories. The reward and sensation seeking systems become mature during the teenage years, while the dorsolateral prefrontal cortex, which is responsible for controlling impulses and judging situations, only becomes mature in the late teenage years (Williams et al., 2018). In addition to this,

the social brain is particularly vulnerable to acquired TBIs (Williams et al., 2015). Acquiring a TBI during adolescence could interfere with the development of these structures and networks, disrupting functioning and resulting in behavioural issues, such as those mentioned above. These behavioural problems caused or exacerbated by acquiring a TBI, could in turn, cause or contribute towards offending in youth (Anokhin, Golosheykin, & Mulligan, 2015; Fuhrmann et al., 2015; Williams et al., 2015). However, it is worth noting that the relationship between TBI and cognitive and behavioural outcomes is a complicated one.

It is possible that young offenders did not have a neurotypical brain before sustaining a TBI, meaning they may have offended despite acquiring this injury (Williams et al., 2015). Adolescents who are already offending may acquire a TBI due to risky behaviours associated with criminal activity, such as violence (Hughes et al., 2012). Sustaining a TBI may also increase the risk of developing mental disorders, such as depression (Williams, 2012), possibly causing stigma and compromised cognitive functioning, which could contribute to criminal behaviours in males (Hughes et al., 2012; Timonen et al., 2002). TBI could also play a role in increasing existing dysfunctional social behaviours, for example, by influencing the regulation of aggressive behaviour (Williams et al., 2015).

### **Proactive and Reactive Aggression**

There are two main subtypes of aggression agreed upon in literature. Proactive aggression (PA) involves deliberate acts which are committed in order to obtain specific goals (Card & Little, 2006). Reactive aggression (RA) refers to emotional, angry, and defensive responses to a perceived threat or frustration, which can either be considered a socially appropriate response, or out of proportion to the provocation (Card & Little, 2006).

Aggression regulation involves multiple brain structures, including those of the prefrontal cortex and hypothalamus (Bartholow, 2004), the damage of which may result in difficulties controlling impulsive aggression (Hughes et al., 2012; Wahlstrom et al., 2010; Williams et al., 2015). RA is a part of a human's threat response system, consisting of the amygdala, the medial hypothalamus, and the dorsal periaqueductal gray. It is controlled by the anterior cingulate and ventrolateral and orbital-prefrontal cortex. PA functions

on a broader neural network, influenced by social factors. TBI in youth may disrupt these aggression systems, contributing to criminal behaviours and psychosocial issues (Bartholow, 2004).

Aggression is associated with psychosocial issues in children under the age of 18 (Card & Little, 2006). RA is associated with difficulties regarding internalising problems, emotional dysregulation, attention deficit/hyperactivity disorder (ADHD) type symptoms (e.g. impulsivity, inattention, and easily angered), delinquency, low prosocial behaviour, high peer rejection, and victimisation. Further, reactively aggressive young males may have few close friendships, psychopathy, and psychological disorders such as depressive disorders (Raine et al., 2006; Swogger, Walsh, Houston, Cashman-Brown, & Conner, 2010), and are at risk of committing suicide (Hartley, Pettit, & Castellanos, 2018).

Research indicated that incarcerated youth who have experienced complex trauma, often become reactively aggressive as a result of impaired information processing, impulse control issues, self-critical and maladaptive ways of thinking, and behaviours that are antisocial, aggressive and delinquent. They are also at risk of developing alcoholic and illegal substance use problems (Ford, Chapman, Connor, & Cruise, 2012).

Adolescent males who exhibit PA are more likely to be rejected by peers, and be diagnosed with psychopathy (Swogger et al., 2010). However, other research contrasts this, stating that adolescents who are proactively aggressive are more popular among their peers than those who are reactively aggressive (Raine et al., 2006). There is an association between PA in young males and single-parent status and low socio-economic status, and evidence suggests that proactively aggressive males are more likely to engage in substance use (alcoholic and illegal substances) than reactively aggressive young males (Raine et al., 2006). Further, there is a relationship between maternal criticism and the development of proactively aggressive behaviours in adolescents (Skripkauskaite et al., 2015). Although it may be hypothesised that reactively aggressive males are more likely to engage in criminal behaviour, due to social-information processing impairments and poor inhibitory control, evidence shows that PA is more related to conduct and adjustment problems, serious violent behaviours, and adolescent criminality (Ang, Huan, Li, & Chan, 2016; Raine et al., 2006).



## **Rationale for Research**

There is increasing evidence that TBI can have negative consequences on the development of neurocognitive abilities, and contribute to social and behavioural difficulties, such as the ability to control aggression (Hughes et al., 2012; Williams et al., 2015). Further, evidence suggests that the potential TBI sequelae are linked to criminal activity (Timonen et al., 2002). Due to the high rates of TBI in addition to adolescent crime in South Africa (Africa Check, 2017), and the uncertainty regarding the link between these factors, research in this area is necessary.

The proposed research study forms a part of a larger parent study investigating the prevalence of TBI and associated behavioural, emotional and executive functioning sequelae in a sample of male young offenders. There is no research, to my knowledge, on the association between TBI and PA and RA in young male offenders in South Africa. Given this dearth, this study aims to add to the understanding of these outcome variables, and hopefully in turn, allow for the problem of young male offenders in South Africa, to be better addressed, at least in this regard. Further, the knowledge gained from this study, and future studies, will ideally contribute to the development of better preventative and rehabilitation programs for young offenders, in the future.

## **Aims and Hypotheses**

I aimed to investigate the relationship between TBI and proactive and reactive aggression specifically among male young offenders 1) who have sustained one or more self-reported TBIs, 2) who have not sustained any TBIs, and 3) a matched control group of non-offenders.

This research project tested the following hypothesis:

Young male offenders who have sustained one or more reported TBIs will have higher proactive and reactive aggression scores than young male offenders who have not sustained any TBIs and both young offender groups will have higher proactive and reactive aggression scores than the non-offender group.

## **Methods**

### **Design and Setting**

This is a quantitative, cross-sectional study that used a between-subjects quasi-experimental design. Three groups were compared: young male offenders who have sustained one or more TBIs, young male offenders who have not sustained any TBIs, and a matched control group of non-offenders. The participants were asked to answer questionnaires concerning their demographics and on TBI and certain outcome measures. For this study, I used young offender data collected as part of a previous related study (Ockhuizen, 2014). Young offenders in that study were recruited from a youth development centre in Cape Town. I collected data for the control participants at two Cape Town high schools.

### **Participants**

Participants from the non-offender group came from low socio-economic status (SES) schools and areas of residence, were fluent in English and/or Afrikaans, and were between the ages of 13 and 18 years at the time of data collection. They were largely matched to young offenders who had similar demographics.

For the purposes of the study, young offenders were defined as adolescents between the above mentioned ages, who have been convicted of a crime in which he had broken South African law. The non-offenders control group consisted of adolescents between these ages who had not broken South African law before and at the time of the study and/or were not awaiting trial.

In total, 54 participants were recruited in the non-offender control group, and the data from 63 of the young offenders was used. Purposive, random sampling was used to select the non-offenders and the participants were matched in terms of SES and sex. The G-Power analysis, using an effect size of 0.35, 7 predictors, a power of 0.95, and a significance level of 0.05, calculated 70 as the minimum sample size, which has been exceeded.

### **Exclusion Criteria**

Participants who were not fluent in English or Afrikaans were excluded. Participants who had severe intellectual disability, or any medical condition that could affect neuropsychological testing (e.g. epilepsy) were also excluded. These exclusion criteria were screened for during the interview processes.

### **Measures**

I describe the measures used in the current study, below. The young offender data were collected using all of the same measures, with the exception of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST); the Maudsley Addiction Profile (MAP) was used in that study. We sourced information on use of illegal substances from these measures (ASSIST and MAP).

**Demographic questionnaire.** Participants were asked questions assessing their demographics, and the demographics of their parent/caregivers, such as living environment (area of residence and housing structure) and occupation.

**Comprehensive health assessment tool (CHAT).** The CHAT (Chitsabesan, Lennox, Williams, Tariq, & Shaw, 2015) was developed to assess the health of juvenile offenders in facilities in England. It is a semi-structured assessment tool with multiple sections including physical health, mental health, and neurodisability. It has high validity and reliability, and is a highly accurate measure of reported TBI. The TBI sub-section of the physical health section, and the neurodisability section have been used in the study. The first was used to determine if participants sustained one or more TBIs, and the second was used to determine if participants needed to be excluded due to neurodisability, such as learning problems or intoxication.

**Reactive-proactive aggression questionnaire (RPQ).** The RPQ (Raine et al., 2006) asks questions which cover both verbal and physical forms of aggression, as well as accounts for situational context. The test contains 23 items in total, with 12 items on proactive aggression, and 11 on reactive aggression. The scores are summed together to get an overall measure of aggression, and the test takes approximately 3 minutes to complete.

The RPQ is a self-report measure, which asks participants to rate how often they have experienced each of the test items. They can choose from the options: 0 = *Never*, 1 = *Sometimes*, and 2 = *Often*. Item-total correlations for the total test ranges from .41 to .60, and both the proactive and reactive aggression scales have a high internal reliability of .83.

**Alcohol use disorders identification test (AUDIT).** AUDIT (Reinert & Allen, 2007) is a 10 item self-report measure, developed by the World Health Organisation (WHO), and used to assess alcohol

consumption behaviours and potential alcohol abuse problems. It has good psychometric properties, with high reliability found in multiple studies (Bischof et al., 2005; Tsai et al., 2005).

**The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST).** The ASSIST is a screening measure consisting of 8 questions, which was developed by the WHO to detect psychoactive substance use problems (WHO ASSIST Working Group, 2002). The screening measure has good psychometric properties, with test-retest reliability scores ranging from good to excellent, and is considered to be a good measure to be used internationally.

**Maudsley Addiction Profile (MAP).** The MAP consists of four domains which measure substance use, health risk behaviour, physical and psychological health, and personal/social functioning (Marsden et al., 1998). The substance use section considers types of substances used, frequency of use, quantity of substances, and method of use. MAP has a high average test-retest reliability score of .94.

**Beck's Depression Inventory (BDI-II).** Beck's depression inventory (Beck, Steer, & Brown, 1996) was used in order to assess for the presence of depressive symptoms and their severity. It has 21 self-report items, which are added to obtain a final score. A score of 21 and above indicates clinical depression. The BDI-II has a coefficient alpha estimate of reliability .92 for outpatients, and .93 for a non-clinical sample.

## **Procedure**

Once ethical approval was granted, high schools were approached. Class lists from grade 8 to 12 were obtained, and from this, a list of suitable participants, who fit the study criteria, were compiled. Individuals not involved in the study were asked to randomly select participants from these lists. The parents/guardians were contacted for consent. Each participant whose parent provided consent was then invited to participate in the study. In total, 54 participants were recruited from the high schools.

At the start of each session, participants were given an assent form, explaining the study. I then requested verbal and signed assent, and the study procedure and risks and benefits were explained before commencing the interview sessions.

If the participants gave assent, the session began using the measures discussed above. Participants also received snacks and refreshments. At the end of the session, they received a debriefing form and a R50 Pick n Pay voucher.

### **Ethical Considerations**

Ethical approval was submitted to and approved by the University of Cape Town's (UCT) Psychology Department's Research Ethics Committee (REC) (see appendix C), and the Western Cape Education Department (see appendix F). The Ockhuizen (2014) study was also approved by UCT's Psychology Department's REC (see appendix E).

Consent and assent processes were undertaken as explained in the procedure section. The participants were assured that if they felt uncomfortable, for example due to the personal nature of some of the questions (such as those regarding illegal substance use and depression), they could withdraw from the study at any time. Participants were also informed about voluntary participation, in addition to anonymity and confidentiality, which was assured by using code names of the participants along with their information. There were no known risks to the participants. However, due to the long duration of the session (approximately 1 to 1 and a half hours), participants were offered breaks in order to decrease possible effects caused by fatigue.

A referral process was put in place, and participants who scored 21 and higher on the Beck's depression inventory (Beck et al., 1996), who made any indication of suicidal thoughts, or who reported any other concerning personal events, were referred to the school's psychologist / social worker.

### **Statistical Analyses**

Data analysis was conducted by using the Statistical Package for the Social Sciences (SPSS), Version 25. The level of statistical significance was set according to convention, as  $p < .05$ . For the first set of assessments and questions (alcohol use, PA and RA, depression, and age) I first ran descriptive statistics to gain insight into the relationships between these variables. I then considered the frequency of language, reported TBI and reported illegal substance use in the participants. I ran chi-square tests and Mann-Whitney U tests (due to the violation of homogeneity of variance), in order to examine between group differences.

Following this, I ran a correlation analysis to determine whether the data was suitable for multiple regression analysis, and found no signs of multicollinearity. Hierarchical regression analyses were then run for both PA and RA, as outcome variables, using alcohol and illegal substance use, depression, age, and language as controls, and reported TBI and the grouping variable as predictors.

## Results

### Descriptive Statistics and Between Groups Analyses

The raw data was first scored and analysed using descriptive statistics and Tables 1-3 provide frequencies for some of the variables. Table 1 shows the frequency of reported TBI in both groups (the young offender group and the non-offender control group), showing that reported TBI was higher in the young offender group than the non-offender group. The Chi-square test result showed a significant difference between reported TBI in the young offender group, compared to the non-offender control group,  $X^2(1, N = 117) = 3.62, p = .043$ .

Table 1  
*Frequencies of TBI: Young offenders vs. non-offenders (N = 117)*

Reported TBI	Group	
	Non-offender	Young Offender
TBI	<b>18</b> (33.33)	<b>32</b> (50.79)
No TBI	36 (66.66)	31 (49.20)
Total	54 (100.00)	63 (100.00)

*Note.* Percentages are reported in parentheses. TBI – traumatic brain injury.

Table 2 shows the frequencies of reported illegal substance use, again with a higher frequency in the young offender group than the non-offender group. Further, the Chi-square test showed a significant difference between reported illegal substance use between the two groups,  $X^2(1, N = 117) = 38.57, p < .001$ .

Table 2  
*Frequencies of illegal substances (ASSIST/MAP): Young offenders vs. non-offenders (N = 117).*

Reported substance use	Group	
	Non-offender	Young Offender
Substance use	<b>20</b> (37.03)	<b>58</b> (92.06)
No substance use	33 (61.11)	5 (7.94)
Total	54 (100.00)	63 (100.00)

*Note.* Percentages are reported in parentheses. ASSIST – the Alcohol, Smoking and Substance Involvement Screening test. MAP – Maudsley Addiction Profile.

Table 3 provides the frequency of English vs Afrikaans speakers among participants. The Chi-square test result showed a significant difference between the young offender group and non-offender group, with regards to language,  $X^2(1, N = 117) = 69.76, p < .001$ .

Table 3

*Frequencies of language: Young offenders vs. non-offenders (N = 117).*

Language	Group		Group	
	Non-offender	Young Offender	Non-offender	Young Offender
English	54	(100.00)	15	(23.81)
Afrikaans	0	(0)	48	(76.19)
Total	54	(100.00)	63	(100.00)

*Note.* Percentages are reported in parentheses.

Table 4 shows the descriptive statistics for the remainder of the variables considered in the study (proactive aggression, reactive aggression, age, alcohol use, and depression). As was expected, the means of both proactive and reactive aggression are higher in the young offender group, as compared to the non-offender group. Further, both groups have higher mean scores for reactive aggression, than proactive aggression. The remainder of the variables also have higher means in the young offender group, compared to the non-offender group. However, the mean age in both groups is approximately 15.

Table 4

*Descriptive statistics of non-offenders and young offenders, according to measures*

	Group				
	Non-offenders			Young offenders	
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>
Proactive aggression	<b>2.56</b>	3.78	24	<b>8.16</b>	6.42
Reactive Aggression	<b>7.81</b>	3.81	17	<b>11.03</b>	5.03
Age	<b>15.15</b>	1.51	5	<b>15.86</b>	1.03
AUDIT	<b>4.62</b>	5.7	24	<b>7.3</b>	8.06
BDI-II	<b>14.28</b>	8.18	51	<b>25.9</b>	11.4

*Note.* AUDIT – Alcohol Use Disorders Identification Test. BDI-II – Beck’s Depression Inventory 2<sup>nd</sup> ed.

Given that parametric assumptions were not upheld for the variables reported in Table 4, Table 5 shows the mean ranks of the continuous variables in the two groups and the Mann-Whitney U tests which were run on these variables. Using these ranks, the tests showed that PA, RA, age, and depression (as measured by the BDI-II) are significantly higher in the young offender group compared to the non-offender control group. Only alcohol use (AUDIT) was not significantly different between the groups.

Table 5

Mean rank of variables and Mann-Whitney U for non-offenders as compared to young offenders, according to measures

	Group		U	Z	p
	Non-offenders	Young offenders			
Proactive aggression	40.35	74.98	<b>694</b>	-5.54	<b>p &lt; .001</b>
Reactive Aggression	46.88	69.39	<b>1046.5</b>	-3.59	<b>p &lt; .001</b>
Age	48.67	67.86	<b>1143</b>	-3.12	<b>.002</b>
AUDIT	54.16	63.15	<b>1439.5</b>	-1.48	<b>.141</b>
BDI-II	40.20	75.11	<b>686</b>	-5.55	<b>p &lt; .001</b>

Note. PA – proactive aggression. RA – reactive aggression. TBI – traumatic brain injury. ASSIST – the Alcohol, Smoking and Substance Involvement Screening Test. MAP – Maudsley Addiction Profile. AUDIT – the Alcohol Use Disorders Identification Test. BDI-II – Beck's Depression Inventory 2<sup>nd</sup> ed.

Table 6 displays the Pearson correlation and p-values between the variables. PA and RA are highly correlated ( $r = .748$ ), however, this is to be expected as they are the two subscales, measuring the same construct – aggression. The remainder of the variables have correlations below .8, showing no signs of multicollinearity in the data.

Table 6

Correlations between variables

		Age	PA	RA	TBI	A/Map	AUDIT	BDI	Language
Age	Pearson Correlation	1	0.237*	0.217*	0.033	-0.272**	0.202*	0.042	0.193*
	p		.010	.019	.725	.003	.029	.653	.037
PA	Pearson Correlation	.237*	1	.748**	-.280**	-.469**	.529**	.394**	.485**
	p	.010		p < .001	.002	p < .001	p < .001	p < .001	p < .001
RA	Pearson Correlation	.217*	.748**	1	-.257**	-.467**	.420**	.282**	.350**
	p	.019	p < .001		.005	p < .001	p < .001	.002	p < .001
TBI	Pearson Correlation	.033	-.280**	-.257**	1	.244**	-.183*	-.209*	-.298**
	p	.725	.002	.005		.008	.048	.024	.001
ASSIST/MAP	Pearson Correlation	-.272**	-.469**	-.467**	.244**	1	-.330**	-.437**	-.553**
	p	.003	p < .001	p < .001	.008		p < .001	p < .001	p < .001
AUDIT	Pearson Correlation	.202*	.529**	.420**	-.183*	-.330**	1	.288**	.185*
	p	.029	p < .001	p < .001	.048	p < .001		.002	.046
BDI-II	Pearson Correlation	.042	.394**	.282**	-.209*	-.437**	.288**	1	.414**
	p	.653	p < .001	.002	.024	p < .001	.002		p < .001
Language	Pearson Correlation	.193*	.485**	.350**	-.298**	-.553**	.185*	.414**	1
	p	.037	p < .001	p < .001	.001	p < .001	.046	p < .001	

Note. \*. Correlation is significant at the 0.05 level (2-tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

PA – proactive aggression. RA – reactive aggression. TBI – traumatic brain injury. ASSIST – the Alcohol, Smoking and Substance Involvement Screening Test. MAP – Maudsley Addiction Profile. AUDIT – the Alcohol Use Disorders Identification Test. BDI-II – Beck's Depression Inventory 2<sup>nd</sup> ed.



## Hierarchical Regression for Proactive Aggression

After the descriptive statistics were run, I ran multiple hierarchical regression models in order to investigate the relationships between the predictor variables and the outcome variables. Table 6 shows the model summary for the hierarchical regression using proactive aggression as the outcome variable. Language, age, alcohol use, substance use, and depression were all entered into the first block of the regression model in order to control for their possible effects on the outcome variable, and were found to significantly predict the outcome,  $R^2 = .46$ ,  $F(5, 111) = 18.99$ ,  $p < .001$ . TBI was entered into the next block, followed by the grouping variable. The results below show that the model is not significant once TBI and the grouping variable are added to the model,  $R^2 = .47$ ,  $F(1,109) = 0.63$ ,  $p = .430$ .

Table 7  
*Model Summary for Proactive Aggression*

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	SE of the Estimate	Change Statistics					Durbin-Watson
					R <sup>2</sup>	F	Change	df1	df2	
1	.68	<b>.46</b>	.44	4.53	.461	18.99	5	111	<b><math>p &lt; .001</math></b>	
2	.68	<b>.47</b>	.44	4.52	.006	1.26	1	110	<b>.264</b>	
3	.69	<b>.47</b>	.44	4.53	.003	0.63	1	109	<b>.430</b>	1.95

Note. a. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP

b. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI

c. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI, Group

d. Dependent Variable: PA

PA – proactive aggression. TBI – traumatic brain injury. ASSIST – the Alcohol, Smoking and Substance Involvement Screening Test. MAP – Maudsley Addiction Profile. AUDIT – the Alcohol Use Disorders Identification Test. BDI-II – Beck’s Depression Inventory 2<sup>nd</sup> ed.

Table 8 shows that the ANOVAs were significant, meaning the model is significantly better at predicting influences on the outcome variable than the mean,  $F(7,109) = 13.82$ ,  $p < .001$ .

Table 8  
ANOVA for Proactive Aggression

Model		Sum of Squares	df	M Square	F	p
1	Regression	1945.75	5	389.15	18.99	<b><i>p</i> &lt; .001</b>
	Residual	2274.89	111	20.49		
	Total	4220.63	116			
2	Regression	1971.48	6	328.58	16.07	<b><i>p</i> &lt; .001</b>
	Residual	2249.16	110	20.45		
	Total	4220.63	116			
3	Regression	1984.34	7	283.48	13.82	<b><i>p</i> &lt; .001</b>
	Residual	2236.29	109	20.52		
	Total	4220.63	116			

Note. a. Dependent Variable: PA

b. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP

c. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI

d. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI, Group

RA – reactive aggression. TBI – traumatic brain injury. ASSIST – the Alcohol, Smoking and Substance Involvement Screening Test. MAP – Maudsley Addiction Profile. AUDIT – the Alcohol Use Disorders Identification Test. BDI-II – Beck’s Depression Inventory 2<sup>nd</sup> ed.

Table 9, the coefficients table, shows that only alcohol use (AUDIT), had a significant contribution to the model,  $\beta = 0.39$ ,  $t(5.06)$ ,  $p < .001$ . In order to check the reliability of the model, the histogram, normal P-P plot, and scatter plot are considered. As can be seen by the histogram and the normal P-P plot, the residuals are not perfectly normally distributed (see appendix O, figure 1 and 2), however, this could be due to the outliers in the data. In addition, the dots on the scatter plot are mostly random, therefore, there appear to be no issues of heteroscedasticity (See appendix O, figure 3).

Table 9

*Coefficients for Reactive Aggression*

Model	Unstandardized Coefficients		Standardized Coefficients	<i>p</i>	95% Confidence Interval for B		Correlations			Collinearity Statistics		
	B	SE	Beta		Lower Bound	Upper Bound	Zero order	Partial	Part I	Tolerance	VIF	
1 (Constant)	<b>-5.42</b>	6.14		-0.88	<b>.380</b>	-17.58	6.75					
Age	<b>0.3</b>	0.34	<b>0.07</b>	0.9	<b>.373</b>	-0.37	0.97	0.24	0.09	0.06	0.89	1.12
ASSIST/MAP	<b>-1.43</b>	1.16	<b>-0.11</b>	-1.23	<b>.221</b>	-3.72	0.87	-0.47	-0.12	-0.07	0.59	1.7
AUDIT	<b>0.33</b>	0.06	<b>0.39</b>	5.2	<i>p</i> < <b>.001</b>	0.21	0.46	0.53	0.44	0.36	0.85	1.18
BDI	<b>0.06</b>	0.04	<b>0.11</b>	1.32	<b>.190</b>	-0.03	0.14	0.39	0.12	0.09	0.73	1.37
Language	<b>3.58</b>	1.05	<b>0.29</b>	3.39	<b>.001</b>	1.49	5.66	0.49	0.3	0.24	0.65	1.53
2 (Constant)	<b>-4.3</b>	6.21		-0.69	<b>.491</b>	-16.6	8.01					
Age	<b>0.35</b>	0.34	<b>0.08</b>	1.03	<b>.303</b>	-0.32	1.03	0.24	0.1	0.07	0.88	1.14
ASSIST_MAP	<b>-1.33</b>	1.16	<b>-0.1</b>	-1.14	<b>.255</b>	-3.63	0.97	-0.47	-0.11	-0.08	0.58	1.71
AUDIT	<b>0.32</b>	0.06	<b>0.38</b>	5.03	<i>p</i> < <b>.001</b>	0.2	0.45	0.53	0.43	0.35	0.83	1.2
BDI	<b>0.05</b>	0.04	<b>0.1</b>	1.28	<b>.205</b>	-0.03	0.14	0.39	0.12	0.09	0.73	1.37
Language	<b>3.34</b>	1.07	<b>0.27</b>	3.11	<b>.002</b>	1.21	5.47	0.49	0.28	0.22	0.63	1.6
TBI	<b>-1.02</b>	0.91	<b>-0.08</b>	-1.12	<b>.264</b>	-2.81	0.78	-0.28	-0.11	-0.08	0.87	1.15
3 (Constant)	<b>-4.27</b>	6.22		-0.69	<b>.494</b>	-16.61	8.06					
Age	<b>0.31</b>	0.35	<b>0.07</b>	0.88	<b>.379</b>	-0.38	0.99	0.24	0.08	0.06	0.85	1.17
ASSIST_MAP	<b>-1.13</b>	1.19	<b>-0.09</b>	-0.95	<b>.343</b>	-3.49	1.22	-0.47	-0.09	-0.07	0.56	1.79
AUDIT	<b>0.33</b>	0.06	<b>0.39</b>	5.06	<i>p</i> < <b>.001</b>	0.2	0.45	0.53	0.44	0.35	0.83	1.2
BDI	<b>0.04</b>	0.06	<b>0.08</b>	0.99	<b>.325</b>	-0.04	0.13	0.39	0.09	0.07	0.67	1.5
Language	<b>2.62</b>	1.41	<b>0.21</b>	1.86	<b>.065</b>	-0.17	5.41	0.49	0.18	0.13	0.37	2.73
TBI	<b>-1.11</b>	0.91	<b>-0.09</b>	-1.21	<b>.229</b>	-2.92	0.71	-0.28	-0.12	-0.08	0.86	1.16
Group	<b>1.16</b>	1.47	<b>0.1</b>	0.79	<b>.430</b>	-1.75	4.07	0.46	0.08	0.06	0.33	3.06

*Note.* RA – reactive aggression. TBI – traumatic brain injury. ASSIST – the Alcohol, Smoking and Substance Involvement Screening Test. MAP – Maudsley Addiction Profile. AUDIT – the Alcohol Use Disorders Identification Test. BDI-II – Beck’s Depression Inventory 2<sup>nd</sup> ed.

**Hierarchical Regression for Reactive Aggression**

Table 11 shows the model summary for the hierarchical regression in which reactive aggression was set as the outcome variable. Again, language, age, alcohol use, substance use, and depression were placed into the first block in order to control for their effects on the outcome variable, and were found to

significantly predict the outcome variable,  $R^2 = .31$ ,  $F(5, 111) = 10.1$ ,  $p < .001$ . TBI was placed into the next block, followed by the grouping variable, Again, the model was not found to be significant once TBI and the grouping variable were added,  $R^2 = .32$ ,  $F(1,109) = 0.01$ ,  $p = .905$ . Table 12 shows the ANOVAs, which were significant once again.  $F(7,116) = 7.45$ ,  $p < .001$ .

Finally, Table 13 shows the coefficients for the model. Like the previous model discussed, alcohol use (AUDIT) was found to contribute significantly to the variance in the model,  $\beta = 0.27$ ,  $t(3.16)$ ,  $p = .002$ . This time, another predictor was found to contribute significantly to the model, this being substance use, which was measured by ASSIST/MAP, and coded as 1 for ‘yes’ and 2 for ‘no’,  $\beta = -0.27$ ,  $t(-2.52)$ ,  $p = .013$ . Both reported alcohol use and reported illegal substance use contribute the same amount of variance towards RA. The histogram and the normal P-P plot show that the residuals are normally distributed (see appendix O, figure 4 and 5), and the scatterplot shows no signs of heteroscedasticity (see appendix O, figure 6).

Table 11  
Model Summary for Reactive Aggression

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	SE of the Estimate	Change Statistics					Durbin-Watson
					R <sup>2</sup> Change	F Change	df1	df2	p F Change	
1	.56	<b>.31</b>	.28	4.04	.313	10.1	5	111	<b>p &lt; .001</b>	
2	.57	<b>.32</b>	.29	4.02	.011	1.75	1	110	<b>.189</b>	
3	.57	<b>.32</b>	.28	4.05	p < .001	0.01	1	109	<b>.905</b>	1.82

- a. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP
- b. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI
- c. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI, Group
- d. Dependent Variable: RA

Note. PA – proactive aggression. TBI – traumatic brain injury. ASSIST – the Alcohol, Smoking and Substance Involvement Screening Test. MAP – Maudsley Addiction Profile. AUDIT – the Alcohol Use Disorders Identification Test. BDI-II – Beck’s Depression Inventory 2<sup>nd</sup> ed.

Table 12  
ANOVA for Reactive Aggression

Model		Sum of Squares	df	M Square	F	p
1	Regression	825.41	5	165.08	10.1	<b>p &lt; .001</b>
	Residual	1813.58	111	16.34		
	Total	2638.99	116			
2	Regression	853.8	6	142.3	8.77	<b>p &lt; .001</b>
	Residual	1785.19	110	16.23		
	Total	2638.991	116			
3	Regression	854.036	7	122.005	7.450	<b>p &lt; .001</b>
	Residual	1784.955	109	16.376		
	Total	2638.991	116			

- Note. a. Dependent Variable: RA
- b. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP

c. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI  
d. Predictors: (Constant), Language, AUDIT, Age, BDI, ASSIST\_MAP, TBI, Group

Table 13

*Coefficients for Reactive Aggression*

Model	Unstandardized Coefficients		Standardized Coefficients	t	p	95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	SE				Lower Bound	Upper Bound	Zero-order	Partial	Partial	Tolerance	VIF
			Beta									
1 (Constant)	<b>6.95</b>	5.48		1.27	<b>.207</b>	-3.91	17.81					
Age	<b>0.21</b>	0.3	<b>0.06</b>	0.71	<b>.481</b>	-0.38	0.81	0.22	0.08	0.06	0.89	1.12
ASSIST_MAP	<b>-2.8</b>	1.04	<b>-0.28</b>	-2.71	<b>.008</b>	-4.85	-0.75	-0.47	-0.25	-0.21	0.59	1.7
AUDIT	<b>0.19</b>	0.06	<b>0.29</b>	3.35	<b>.001</b>	0.08	0.3	0.42	0.3	0.26	0.85	1.18
BDI	<b>0.01</b>	0.04	<b>0.03</b>	0.27	<b>.787</b>	-0.07	0.09	0.28	0.03	0.02	0.73	1.37
Language	<b>1.18</b>	0.94	<b>0.12</b>	1.25	<b>.213</b>	-0.69	3.04	0.35	0.12	0.1	0.65	1.53
2 (Constant)	<b>8.13</b>	5.53		1.47	<b>.145</b>	-2.84	19.09					
Age	<b>0.27</b>	0.3	<b>0.07</b>	0.88	<b>.384</b>	-0.34	0.87	0.22	0.08	0.07	0.88	1.14
ASSIST_MAP	<b>-2.7</b>	1.03	<b>-0.27</b>	-2.61	<b>.010</b>	-4.75	-0.65	-0.47	-0.24	-0.21	0.58	1.71
AUDIT	<b>0.18</b>	0.06	<b>0.27</b>	3.18	<b>.002</b>	0.07	0.3	0.42	0.29	0.25	0.83	1.2
BDI	<b>0.01</b>	0.04	<b>0.02</b>	0.22	<b>.826</b>	-0.07	0.08	0.28	0.02	0.02	0.73	1.37
Language	<b>0.93</b>	0.96	<b>0.1</b>	0.97	<b>.333</b>	-0.97	2.83	0.35	0.09	0.08	0.63	1.6
TBI	<b>-1.07</b>	0.81	<b>-0.11</b>	-1.32	<b>.189</b>	-2.66	0.53	-0.26	-0.13	-0.1	0.87	1.15
3 (Constant)	<b>8.13</b>	5.56		1.46	<b>.146</b>	-2.89	19.15					
Age	<b>0.26</b>	0.31	<b>0.07</b>	0.84	<b>.404</b>	-0.35	0.87	0.22	0.08	0.07	0.85	1.17
ASSIST_MAP	<b>-2.67</b>	1.06	<b>-0.27</b>	-2.52	<b>.013</b>	-4.78	-0.57	-0.47	-0.23	-0.2	0.56	1.79
AUDIT	<b>0.18</b>	0.06	<b>0.27</b>	3.16	<b>.002</b>	0.07	0.3	0.42	0.29	0.25	0.83	1.2
BDI	<b>0.01</b>	0.04	<b>0.02</b>	0.18	<b>.861</b>	-0.07	0.09	0.28	0.02	0.01	0.67	1.5
Language	<b>0.83</b>	1.26	<b>0.09</b>	0.66	<b>.509</b>	-1.66	3.33	0.35	0.06	0.05	0.37	2.73
TBI	<b>-1.08</b>	0.82	<b>-0.11</b>	-1.32	<b>.189</b>	-2.7	0.54	-0.26	-0.13	-0.1	0.86	1.16
Group	<b>0.16</b>	1.31	<b>0.02</b>	0.13	<b>.905</b>	-2.44	2.76	0.34	0.01	0.01	0.33	3.06

*Note.* PA – proactive aggression. RA – reactive aggression. TBI – traumatic brain injury. ASSIST – the Alcohol, Smoking and Substance Involvement Screening Test. MAP – Maudsley Addiction Profile. AUDIT – the Alcohol Use Disorders Identification Test. BDI-II – Beck’s Depression Inventory 2<sup>nd</sup> ed.

## **Discussion**

This study aimed to investigate the issue of TBI and young offenders in South Africa with specific focus on the association between these variables and proactive and reactive aggression. This association was explored by comparing a young male offender group and a non-offender control group, both with and without reported TBI.

### **Summary of Results**

It was hypothesised that higher PA and RA scores would be found in young male offenders who have sustained one or more reported TBIs compared to young male offenders who had not sustained any TBIs. Further, it was hypothesised that young offenders with and without reported TBI will have higher PA and RA scores than the non-offender group.

Contrary to the predicted results, which were consistent with literature showing associations between young offenders and aggression (Ford et al., 2012; Raine et al., 2006) and TBI and aggression (Albers, 2012), the results of the current study showed that 46% and 31% of proactive and reactive aggression outcome scores respectively, were explained by demographic (language and age), behavioural (substance and alcohol use) and mental health issues (depression) rather than TBI or offender status. I discuss each of these variables below.

### **Illegal Substance Use**

Use of illegal substances was found to be higher among the young offender group than the non-offender group, with 92.06% of the young offenders reportedly having used and/or currently using illegal substances. In contrast, only 37.03% of non-offenders reported using illegal substances. This result is consistent with evidence of significant substance use within the young offender population, as a risk factor for offending behaviour (Souverein, Ward, Visser, & Burton, 2016). In addition, substance use is also high among young offenders who have sustained one or more TBIs, suggesting a possible association between these two factors (Williams, 2012). The relationship between substance use and both PA and RA is also supported in the literature (Raine et al., 2006; Ford et al., 2012).

### **Alcohol Use**

Although alcohol use was found to be higher in the young offender group compared to the non-offender control group descriptively, this difference was not significant. However, alcohol use was the only predictive factor which had a significant contribution to both regression models. This is to be expected as alcohol use is associated with high levels of both forms of aggression (Ford et al., 2012; Raine et al., 2006). It is also not unusual that there are similar rates of alcohol use in both the young offender and non-offender groups. This is because high rates of alcohol use in adolescents is associated with environmental stressors, such as poverty (Brook, Rubenstone, Zhang, Morojele, & Brook, 2011), and the young offenders and non-offender control group used in this study were adolescents from low SES backgrounds.

### **Depression**

The BDI-II scores, measuring the prevalence and severity of depression in the two groups, was substantially and significantly higher in the young offender group than the control group, with the young offender group's mean score in the clinical depression range (Beck et al., 1996). Depression did not contribute significantly to the RA regression model, although some research suggests a relationship between higher levels of internalizing behaviour problems (including depression) and higher levels of RA in young offenders (Hartley et al., 2018; Raine et al., 2006; Swogger et al., 2010).

Therefore, the very high levels of depression found in the young offender group could have another explanation. Research shows that the prevalence of depression in incarcerated youth is higher than in the general population, because of the adverse conditions which are experienced in prisons and youth detention centres (Lambie & Randell, 2013). Alternatively, these high rates of depression could be linked with TBI, as evidence suggests that depression is very common after sustaining a TBI (Williams, 2012), and TBI was found to be higher in the young offender group.

### **Traumatic Brain Injury in the Two Groups**

By examining the frequencies, it is seen that reported TBI was significantly higher among the young offender sample (50.79%), compared to the non-offender control sample (33.33%). This is consistent with the literature, which states that there are high rates of TBI among young offender populations (Williams, 2012). The high rates of reported TBI in the young offender sample could be due to various reasons. One

explanation could be that young offenders are prone to sustaining TBIs, because of their behavioural profiles, such as engaging in violent activity (Hughes et al., 2012). However, TBI did not explain any of the variance in both the PA and RA outcomes in the current study.

Although reported TBIs were found to be higher in the young offender sample, rates of reported TBIs were still high in the non-offender sample. This finding could be due to the high risk of acquiring a TBI during adolescence, due to the reward and sensation seeking behaviours mentioned above (Williams et al., 2018). Further, this finding is consistent with the major issue of contextual vulnerabilities in SA and other developing countries. Societal unrest and rates of physical violence are very high in SA, and are a major cause of TBIs. Therefore, it is to be expected that rates of reported TBI would also be high in the non-offender sample, who come from low SES backgrounds in a developing country, and are therefore at risk of sustaining injuries caused by violence (Hyder et al., 2007; Peden et al., 2013).

Alternatively, the higher rate of TBI in the young offender group could be a result of the possible contribution of TBI to offending behaviour. TBI can cause damage to structures which are a part of the “social brain”, which is undergoing a critical developmental stage during adolescence (Wahlstrom et al., 2010). This disruption could result in difficulties with executive functioning, such as inhibition, emotion regulation, and aggression regulation, which are still in the developmental stages during this adolescence, while in contrast, reward and sensation seeking behaviours may have already finished development (Williams et al., 2018). Ultimately, this in turn increases the risk of offending behaviours, which could account for the higher rates of reported TBIs found in the young offender sample (Williams et al., 2018).

### **Proactive and Reactive Aggression and Group Membership**

Although, group membership did not have a significant contribution to either regression model, an interesting finding worth noting is that RA was found to be higher in both groups than PA. In the young offender group, the high rate of RA could be because incarcerated youth are often exposed to complex trauma, which results in internalising behavioural and cognitive issues, such as impaired information processing, and externalising behaviour issues such as substance use and aggression. In turn, these deficits result in difficulties with regulating reactive aggression (Ford et al., 2012).



This explanation can also be applied to the high levels of RA found in the control group. Because the control group also come from a low SES background, they are perhaps likely more exposed to high levels of violence and trauma in their communities (Hyder et al., 2007; Peden et al., 2013), which could lead to the same issues described above.

### **Study Limitations and Future Recommendations**

This study is not without limitations. As noted, the young offender data was collected as part of a previous related study (Ockhuizen, 2014), and compared to current data collected for the control group. In that young offender study, not all of the RPQ measures were completed, meaning many participants' data was unusable. In addition, due to the scope of the study, only reported measures of TBI and the other variables could be used, leaving room for inaccuracy with regard to these variables, such as over or under reported TBI, and an inflation or deflation of reported alcohol and drug use. Finally, the study only considered male young offenders.

Future studies should use bigger sample sizes, and ideally collect this data over a shorter time frame. This is the purpose of the ongoing larger study. Further, it is recommended that self-report measures are not used, where available. Future studies could make use of neuroimaging techniques, or hospital records, in order to assess the severity of TBI in participants. This will allow for the collection of more accurate data, in this regard. Finally, it is recommended that future studies consider the relationship between TBI and PA and RA in a female sample of young offenders.

### **Study Significance and Conclusion**

This study provides interesting findings in a surprisingly under researched area of research in South Africa, given its contextual vulnerabilities of high rates of crime and proposed high rates of TBI. Although results were not as predicted, based on trends in the international literature, the results contribute to the understanding of this relationship between TBI, offender status and aggression outcomes in a local context, and provides possible areas for further inquiry in this field of research. A better understanding of these variables in young male offenders with TBI may aid in better addressing this populations' needs, in turn

working towards reducing re-offending, and finally, helping to decrease the costs of the criminal justice system in the future (Williams, 2012; Williams et al., 2015).

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**Appendix A**  
**Parent Consent Form**



**UCT Department of Psychology**

**Parent Consent Form – Non-offenders**

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

Your son is being asked to take part in a research study. This form provides you with information about the study and asks for your permission for your son to part take in the research study. Consent is also asked for the collection of questionnaire data, as well as other information (demographics and information about income) necessary from you. Signing this will also give the researcher permission to access medical records of your son in order to confirm any head injuries. The Principal Investigator (the person in charge of this research) or a representative of the Principal Investigator will describe this study to you and answer all of your questions before you sign this consent form. Your son's participation is entirely voluntary. Before you decide whether or not he may take part, read the information below and ask questions about anything you do not understand. You and/or your son will not be disadvantaged in any way by not participating in this study.

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

---

**2. Title of Research Study**

The prevalence of traumatic brain injury and an investigation of behavioural, emotional and executive functioning in a sample of male young offenders.

**3. Principal Investigators and Telephone Numbers**

Jamie Lee Adams  
Kimberly Blake  
Melissa Gouws  
Zayaan Goolam Nabi  
Asheeqa Petersen  
Honours in Psychology (students)  
Department of Psychology  
University of Cape Town  
021 650 3417

Nina Steenkamp  
MA in Neuropsychology (student)  
Department of Psychology  
University of Cape Town  
021 650 3417

Dr Leigh Schrieff-Elson  
Supervisor  
Department of Psychology  
University of Cape Town  
021 650 3708

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

National Research Foundation.

#### **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 young offenders and non-offenders in the Western Cape; and to investigate their behaviour (e.g., aggression and anti-social traits), emotional outcomes (e.g., feeling happy or angry), and executive functioning (e.g., thinking, planning, and flexibility) by administering neuropsychological pen and paper measures and questionnaires.

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

You will be asked to complete a parent/caregiver information and socio-economic status questionnaire, a questionnaire about your son's developmental history, and you will be asked questions regarding your son's behaviour.

**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 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, 100 non-offenders and 100 young offenders

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

There are no known risks associated with participation in this study. Should you or your son get tired during the study, you will be allowed to rest. If you wish to discuss the information above or any discomforts you may experience, you may ask questions now or call the Principal Investigators listed in #3 of this form.

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

You or your son may or may not personally benefit from participating in this study but the findings may help in our understanding of the cognitive, behavioural and emotional outcomes of young offenders with and without TBI. Should behavioural problems be identified during the process of this study, your son will be referred to the school counsellor or to the nearest Western Cape Education department school clinic if there is no counsellor at your son's school.

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

The information gained from this research study will help improve our understanding of the offending behavior of young offenders 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?**

Your son will receive a R50 Checkers shopping voucher.

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

You and your son 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 in this research, you may phone the Psychology Department office and get in touch with Rosalind Adams.

Her email address is [rosalind.adams@uct.ac.za](mailto:rosalind.adams@uct.ac.za) or you may contact her via telephone – 021 650 3417.

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

Information already collected may be used.

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

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. Your son's identity will not be revealed and all the information you give will be strictly confidential. Any information collected will have your name removed so that it is anonymous.

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

This information gathered from you will be demographic information, information on your son's developmental history, and records of your responses to questionnaires regarding your son's behaviour. 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.

**16. 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 giving away 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 B

### Participant Assent Form



### UCT Department of Psychology

### Participant Assent Form

#### PERMISSION 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 pen and paper 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 with a R50 checkers voucher at the end of the second session for your participation, there are no known personal 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. Any information collected will have your name removed so that it is anonymous, and only certain people will have access to the data.

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.

You are free to withdraw your permission 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 in this research, you may phone the Psychology Department office and get in touch with Rosalind Adams.

Her email address is [rosalind.adams@uct.ac.za](mailto:rosalind.adams@uct.ac.za) or you may contact her via telephone – 021 650 3417.

I would like to take part in this study:

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

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



## Appendix C

### UCT Psychology Department Ethical Approval

UNIVERSITY OF CAPE TOWN



Department of Psychology

University of Cape Town Rondebosch 7701 South Africa  
Telephone (021) 650 3417  
Fax No. (021) 650 4104

13 June 2018

Kimberley Blake  
Department of Psychology  
University of Cape Town  
Rondebosch 7701

Dear Kimberley

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for your study, *The association between TBI and proactive and reactive aggression in a sample of male young offenders*. The reference number is PSY2018-040.

I wish you all the best for your study.

Yours sincerely

A handwritten signature in cursive script, appearing to read 'Lauren Wild'.

Lauren Wild (PhD)  
Associate Professor  
Chair: Ethics Review Committee

## Appendix D

### UCT Psychology Department Ethical Approval: Nina Steenkamp

Browser tabs: (21) iCloud Mail - Inbox, KM\_C554e-20180212180, 8 ways to take screenshot

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Page: 1 / 1

UNIVERSITY OF CAPE TOWN



Department of Psychology

University of Cape Town, Rondebosch 7701 South Africa  
Telephone: (021) 650 3417  
Fax No. (021) 650 4104

15 November 2017

Nina Steenkamp  
Department of Psychology  
University of Cape Town  
Rondebosch 7701

Dear Nina

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for your study, *The prevalence of traumatic brain injury and an investigation of behavioural, emotional, and executive functioning in a sample of male young offenders*. The reference number is PSY 2017-052].

I wish you all the best for your study.

Yours sincerely



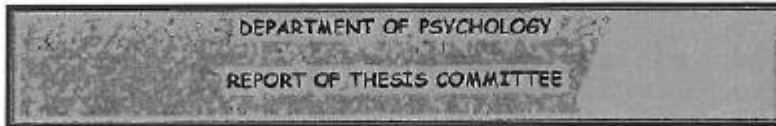
Lauren Wild (PhD)  
Associate Professor  
Chair: Ethics Review Committee

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## Appendix E

### UCT Psychology Department Ethical Approval: Ju-Reyn Ockhuizen

University of Cape Town, Psychology Department Research Ethics Committee Approval



Student Name: (HELEN) JU-REYN OCKHUIZEN  
Student #: OCKHELOO1  
Degree: MA NEUROPSYCHOLOGY  
Title (as proposed): THE PREVALENCE OF TBI AND AN INVESTIGATION OF EXECUTIVE FUNCTIONING AMONG THOSE THAT HAVE SUSTAINED A TBI IN A SAMPLE OF JUVENILE DELINQUENT BOYS  
Supervisor: LEIGH SCHRIEFF  
Co-supervisor: -  
Committee members: PROF. MARIE SOLHUS  
DR. LAUREN WILD  
DR. SWIAN MALCOLM-SMITH

WE:

1. Approve the proposal, and recommend that the student continue with the research.
- ② Approve the proposal, and recommend that the student may continue with the research. However, we recommend that change(s), as noted below, be incorporated in the research, to the satisfaction of the supervisor.  
*Assent form adapted;*
- ③ Approve the proposal in terms of its ethical implications. If necessary, explanatory notes appear below.
4. Find the proposal unsatisfactory, for the reason(s) listed below. The student is hereby requested to re-present the proposal to a departmental thesis committee by \_\_\_\_\_.

NOTES:

**Appendix F**  
**Western Cape Education Department Approval**

[Audrey.wyngaard@westerncape.gov.za](mailto:Audrey.wyngaard@westerncape.gov.za)

tel: +27 021 467 9272

Fax: 0865902282

Private Bag x9114, Cape Town, 8000

wced.wcape.gov.za

**REFERENCE:** 20180308–249

**ENQUIRIES:** Dr A T Wyngaard

Ms Nina Steenkamp  
18 Vissershof Road  
Bothasig  
7441

**Dear Ms Nina Steenkamp**

**RESEARCH PROPOSAL: THE PREVALENCE OF TRAUMATIC BRAIN INJURY AND AN INVESTIGATION OF BEHAVIOURAL, EMOTIONAL AND EXECUTIVE FUNCTIONING IN A SAMPLE OF MALE YOUNG OFFENDERS**

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. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **02 April 2018 till 28 September 2018**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. 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?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. 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: 09 March 2018**

## Appendix G

### Debriefing Letter



### Debriefing Letter

Thank you for partaking in the study titled: The prevalence of traumatic brain injury and an investigation of behavioural, emotional and executive functioning in a sample of male young offenders. Your participation and answers to questionnaires and interviews are appreciated.

Should you have any worries or concerns regarding your participation in this study or feel anxious or unsettled in relation to your participation, you may contact the researchers or their supervisor involved in this study: Dr. Leigh Schrieff-Elson (leigh.[schrieff-elson@uct.ac.za](mailto:schrieff-elson@uct.ac.za); Tel: 021 650 3708); Researcher: Nina Steenkamp ([ninasteenkamp1@gmail.com](mailto:ninasteenkamp1@gmail.com)).

This current study is being conducted at UCT by a Psychology Masters and 5 Honours students. This study aims to investigate the prevalence of traumatic brain injury among young offenders as compared to non-offenders in the Western Cape; and to investigate their emotional outcomes, behavioral outcomes, and executive functioning (e.g., thinking, planning and flexibility). Thus, the information gathered from this research will enable greater understanding of offending behaviour of young offenders with TBI in a South African context and can play a role in informing interventions which aim to prevent offending from occurring in the first place

## Appendix H

### Demographic Questionnaire

<b>DEMOGRAPHIC QUESTIONNAIRE AND ASSET INDEX</b>
--

#### GENERAL INFORMATION

Full name (Parent):	
Telephone:	Work: Home: Cell:
How would you describe your ethnicity / race?	1. Black 2. Coloured 3. White 4. Asian 5. Other(specify):
Home Language:	
Full name (Child):	
Gender:	M F
Date of Birth:	
Grade:	

#### HOUSEHOLD INCOME: (Please circle appropriate number)

Household income per year:	1. R0 2. R1 - R5 000 3. R5001 - R25 000 4. R25 000 - R100 000 5. R100 001+
----------------------------	--

#### PARENTAL EDUCATION: (Please circle appropriate number)

	Biological mother	Biological father	Guardian
--	-------------------	-------------------	----------

Highest level of education reached?			
Mark one response for each person as follows:	1.	1.	1.
1. 0 years (No Grades/Standards) = No formal education (never went to school)	2.	2.	2.
2. 1-6 years (Grades 1-6 / Sub A-Std 4) = Less than primary education (didn't complete primary school)	3.	3.	3.
3. 7 years (Grade 7 / Std 5) = Primary education (completed primary school)	4.	4.	4.
4. 8-11 years (Grades 8-11 / Stds 6-9) = Some secondary education (didn't complete high school)	5.	5.	5.
5. 12 years (Grade 12 / Std 10) = Secondary education (completed senior school)	6.	6.	6.
6. 13+ years = Tertiary education (completed university / technikon / college)	7.	7.	7.
7. Don't know			

**PARENTAL EMPLOYMENT: (Please circle appropriate number)**

Hollingstead categories:	Biological mother	Biological father	Guardian
--------------------------	-------------------	-------------------	----------

1. Higher executives, major professionals, owners of large businesses)	1.	1.	1.
2. Business managers of medium sized businesses, lesser professions (e.g. nurses, opticians, pharmacists, social workers, teachers) 3. Administrative personnel, managers, minor professionals, owners / proprietors of small businesses (e.g. bakery, car dealership, engraving business, plumbing business, florist, decorator, actor, reporter, travel agent)	2.	2.	2.
4. Clerical and sales, technicians, small businesses (e.g. bank teller, bookkeeper, clerk, draftsman, timekeeper, secretary)	3.	3.	3.
5. Skilled manual - usually having had training (e.g. baker, barber, chef, electrician, fireman, machinist, mechanic, painter, welder, police, plumber, electrician)	4.	4.	4.
6. Semi-skilled (e.g. hospital aide, painter, bartender, bus driver, cook, garage guard, checker, waiter, machine operator)	5.	5.	5.
7. Unskilled (e.g. attendant, janitor, construction helper, unskilled labour, porter, unemployed)	6.	6.	6.
8. Homemaker	7.	7.	7.
9. Student, disabled, no occupation	8.	8.	8.
	9.	9.	9.

**MATERIAL AND FINANCIAL RESOURCES (ASSET INDEX): (Please circle appropriate number)**

Which of the following items, in working order, does your household have?

Items	Yes	No
-------	-----	----



1. A refrigerator or freezer	1.	1.
2. A vacuum cleaner or polisher	2.	2.
3. A television	3.	3.
4. A hi-fi or music center (radio excluded)	4.	4.
5. A microwave oven	5.	5.
6. A washing machine	6.	6.
7. A video cassette recorder or dvd player	7.	7.

Which of the following do you have in your home?

Items	Yes	No
1. Running water	1.	1.
2. A domestic servant	2.	2.
3. At least one car	3.	3.
4. A flush toilet	4.	4.
5. A built-in kitchen sink	5.	5.
6. An electric stove or hotplate	6.	6.
7. A working telephone	7.	7.

Do you personally do any of the following?

Items	Yes	No
1. Shop at supermarkets	1.	1.
2. Use any financial services such as a bank account, ATM card or credit card	2.	2.
3. Have an account or credit card at a retail store	3.	3.

**Appendix I**  
**Short Questionnaire**

1. What area do you in live?
2. What material is your house made of? (E.g. bricks, wood, metal)
3. Who lives with you?
4. How many rooms does your house have?

## Appendix J

### Reactive-proactive Aggression Questionnaire

#### Reactive and proactive aggression questionnaire

The Reactive–Proactive Questionnaire (RPQ) scores (0, 1 or 2) for proactive aggression items (2, 4, 6, 9, 10, 12, 15, 17, 18, 20, 21, 23) and reactive items (1, 3, 5, 7, 8, 11, 13, 14, 16, 19, 22) are summated to form proactive and reactive scales. Proactive and reactive scale scores are summated to obtain total aggression scores.

#### Instructions

There are times when most of us feel angry, or have done things we should not have done. Rate each of the items below by putting a circle around 0 (never), 1 (sometimes), or 2 (often). Do not spend a lot of time thinking about the items—just give your first response. Make sure you answer all the items (see below).

How often have you...

1. Yelled at others when they have annoyed you	0	1	2
2. Had fights with others to show who was on top	0	1	2
3. Reacted angrily when provoked by others	0	1	2
4. Taken things from other students	0	1	2
5. Gotten angry when frustrated	0	1	2

6. Vandalized something for fun	0	1	2
7. Had temper tantrums	0	1	2
8. Damaged things because you felt mad	0	1	2

9. Had a gang fight to be cool	0	1	2
10. Hurt others to win a game	0	1	2
11. Become angry or mad when you don't get your way	0	1	2
12. Used physical force to get others to do what you want	0	1	2
13. Gotten angry or mad when you lost a game	0	1	2

14. Gotten angry when others threatened you	0	1	2
15. Used force to obtain money or things from others	0	1	2
16. Felt better after hitting or yelling at someone	0	1	2
17. Threatened and bullied someone	0	1	2
18. Made obscene phone calls for fun	0	1	2
19. Hit others to defend yourself	0	1	2
20. Gotten others to gang up on someone else	0	1	2
21. Carried a weapon to use in a fight	0	1	2
22. Gotten angry or mad or hit others when teased	0	1	2

23. Yelled at others so they would do things for you	0	1	2
--	---	---	---

## Appendix K

### Alcohol Use Disorders Identification Test

#### AUDIT questionnaire

**Please circle the answer that is correct for you**

1. How often do you have a drink containing alcohol?

- Never
- Monthly or less
- 2-4 times a month
- 2-3 times a week
- 4 or more times a week

2. How many standard drinks containing alcohol do you have on a typical day when drinking?

- 1 or 2
- 3 or 4
- 5 or 6
- 7 to 9
- 10 or more

3. How often do you have six or more drinks on one occasion?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

4. During the past year, how often have you found that you were not able to stop drinking once you had started?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

5. During the past year, how often have you failed to do what was normally expected of you because of drinking?

- Never

- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

6. During the past year, how often have you needed a drink in the morning to get yourself going after a heavy drinking session?

1

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

7. During the past year, how often have you had a feeling of guilt or remorse after drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

8. During the past year, have you been unable to remember what happened the night before because you had been drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

9. Have you or someone else been injured as a result of your drinking?

- No
- Yes, but not in the past year
- Yes, during the past year

10. Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested you cut down?

- No
- Yes, but not in the past year
- Yes, during the past year



## Scoring the AUDIT

Scores for each question range from 0 to 4, with the first response for each question (eg never) scoring 0, the second (eg less than monthly) scoring 1, the third (eg monthly) scoring 2, the fourth (eg weekly) scoring 3, and the last response (eg. daily or almost daily) scoring 4. For questions 9 and 10, which only have three responses, the scoring is 0, 2 and 4 (from left to right).

A score of 8 or more is associated with harmful or hazardous drinking, a score of 13 or more in women, and 15 or more in men, is likely to indicate alcohol dependence.

Saunders JB, Aasland OG, Babor TF et al. Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption — II. *Addiction* 1993, 88: 791–803.

## Appendix L

### The Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)

#### A. WHO - ASSIST V3.0

INTERVIEWER ID		COUNTRY			CLINIC	
PATIENT ID		DATE				

**INTRODUCTION (Please read to patient)**

Thank you for agreeing to take part in this brief interview about alcohol, tobacco products and other drugs. I am going to ask you some questions about your experience of using these substances across your lifetime and in the past three months. These substances can be smoked, swallowed, snorted, inhaled, injected or taken in the form of pills (show drug card).

Some of the substances listed may be prescribed by a doctor (like amphetamines, sedatives, pain medications). For this interview, we will not record medications that are used as prescribed by your doctor. However, if you have taken such medications for reasons other than prescription, or taken them more frequently or at higher doses than prescribed, please let me know. While we are also interested in knowing about your use of various illicit drugs, please be assured that information on such use will be treated as strictly confidential.

**NOTE: BEFORE ASKING QUESTIONS, GIVE ASSIST RESPONSE CARD TO PATIENT**

**Question 1**

(if completing follow-up please cross check the patient's answers with the answers given for Q1 at baseline. Any differences on this question should be queried)

In your life, which of the following substances have you <u>ever used</u> ? (NON-MEDICAL USE ONLY)	No	Yes
a. Tobacco products (cigarettes, chewing tobacco, cigars, etc.)	0	3
b. Alcoholic beverages (beer, wine, spirits, etc.)	0	3
c. Cannabis (marijuana, pot, grass, hash, etc.)	0	3
d. Cocaine (coke, crack, etc.)	0	3
e. Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)	0	3
f. Inhalants (nitrous, glue, petrol, paint thinner, etc.)	0	3
g. Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)	0	3
h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	0	3
i. Opioids (heroin, morphine, methadone, codeine, etc.)	0	3
j. Other - specify:	0	3

Probe if all answers are negative:  
 “Not even when you were in school?”

If "No" to all items, stop interview.

If "Yes" to any of these items, ask Question 2 for each substance ever used.

Question 2

In the <u>past three months</u> , how often have you used the substances you mentioned ( <i>FIRST DRUG, SECOND DRUG, ETC</i> )?	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
a. Tobacco products (cigarettes, chewing tobacco, cigars, etc.)	0	2	3	4	6
b. Alcoholic beverages (beer, wine, spirits, etc.)	0	2	3	4	6
c. Cannabis (marijuana, pot, grass, hash, etc.)	0	2	3	4	6
d. Cocaine (coke, crack, etc.)	0	2	3	4	6
e. Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)	0	2	3	4	6
f. Inhalants (nitrous, glue, petrol, paint thinner, etc.)	0	2	3	4	6
g. Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)	0	2	3	4	6
h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	0	2	3	4	6
i. Opioids (heroin, morphine, methadone, codeine, etc.)	0	2	3	4	6
j. Other - specify:	0	2	3	4	6

If "Never" to all items in Question 2, skip to Question 6.

If any substances in Question 2 were used in the previous three months, continue with Questions 3, 4 & 5 for each substance used.

Question 3

During the <u>past three months</u> , how often have you had a strong desire or urge to use ( <i>FIRST DRUG, SECOND DRUG, ETC</i> )?	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
a. Tobacco products (cigarettes, chewing tobacco, cigars, etc.)	0	3	4	5	6
b. Alcoholic beverages (beer, wine, spirits, etc.)	0	3	4	5	6
c. Cannabis (marijuana, pot, grass, hash, etc.)	0	3	4	5	6
d. Cocaine (coke, crack, etc.)	0	3	4	5	6

e. Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)	0	3	4	5	6
f. Inhalants (nitrous, glue, petrol, paint thinner, etc.)	0	3	4	5	6
g. Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)	0	3	4	5	6
h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	0	3	4	5	6
i. Opioids (heroin, morphine, methadone, codeine, etc.)	0	3	4	5	6
j. Other - specify:	0	3	4	5	6

Question 4

During the <u>past three months</u> , how often has your use of ( <i>FIRST DRUG, SECOND DRUG, ETC</i> ) led to health, social, legal or financial problems?	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
a. Tobacco products (cigarettes, chewing tobacco, cigars, etc.)	0	4	5	6	7
b. Alcoholic beverages (beer, wine, spirits, etc.)	0	4	5	6	7
c. Cannabis (marijuana, pot, grass, hash, etc.)	0	4	5	6	7
d. Cocaine (coke, crack, etc.)	0	4	5	6	7
e. Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)	0	4	5	6	7
f. Inhalants (nitrous, glue, petrol, paint thinner, etc.)	0	4	5	6	7
g. Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)	0	4	5	6	7
h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	0	4	5	6	7
i. Opioids (heroin, morphine, methadone, codeine, etc.)	0	4	5	6	7
j. Other - specify:	0	4	5	6	7

Question 5

During the <u>past three months</u> , how often have you failed to do what was normally expected of you because of your use of ( <i>FIRST DRUG, SECOND DRUG, ETC</i> )?	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
a. Tobacco products					
b. Alcoholic beverages (beer, wine, spirits, etc.)	0	5	6	7	8
c. Cannabis (marijuana, pot, grass, hash, etc.)	0	5	6	7	8

d. Cocaine (coke, crack, etc.)	0	5	6	7	8
e. Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)	0	5	6	7	8
f. Inhalants (nitrous, glue, petrol, paint thinner, etc.)	0	5	6	7	8
g. Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)	0	5	6	7	8
h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	0	5	6	7	8
i. Opioids (heroin, morphine, methadone, codeine, etc.)	0	5	6	7	8
j. Other - specify:	0	5	6	7	8

Ask Questions 6 & 7 for all substances ever used (i.e. those endorsed in Question 1)

Question 6

Has a friend or relative or anyone else <u>ever</u> expressed concern about your use of (FIRST DRUG, SECOND DRUG, ETC.)?	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
a. Tobacco products (cigarettes, chewing tobacco, cigars, etc.)	0	6	3
b. Alcoholic beverages (beer, wine, spirits, etc.)	0	6	3
c. Cannabis (marijuana, pot, grass, hash, etc.)	0	6	3
d. Cocaine (coke, crack, etc.)	0	6	3
e. Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)	0	6	3
f. Inhalants (nitrous, glue, petrol, paint thinner, etc.)	0	6	3
g. Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)	0	6	3
h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	0	6	3
i. Opioids (heroin, morphine, methadone, codeine, etc.)	0	6	3
j. Other – specify:	0	6	3

Question 7

Have you <u>ever</u> tried and failed to control, cut down or stop using (FIRST DRUG, SECOND DRUG, ETC.)?	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
a. Tobacco products (cigarettes, chewing tobacco, cigars, etc.)	0	6	3

b. Alcoholic beverages (beer, wine, spirits, etc.)	0	6	3
c. Cannabis (marijuana, pot, grass, hash, etc.)	0	6	3
d. Cocaine (coke, crack, etc.)	0	6	3
e. Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)	0	6	3
f. Inhalants (nitrous, glue, petrol, paint thinner, etc.)	0	6	3
g. Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)	0	6	3
h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	0	6	3
i. Opioids (heroin, morphine, methadone, codeine, etc.)	0	6	3
j. Other – specify:	0	6	3

Question 8

	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
Have you <u>ever</u> used any drug by injection? (NON-MEDICAL USE ONLY)	0	2	1

## Appendix M

### Beck's Depression Inventory (BDI-II)

#### Beck's Depression Inventory

This depression inventory can be self-scored. The scoring scale is at the end of the questionnaire.

1.

- 0 I do not feel sad.
- 1 I feel sad
- 2 I am sad all the time and I can't snap out of it.
- 3 I am so sad and unhappy that I can't stand it.

2.

- 0 I am not particularly discouraged about the future.
- 1 I feel discouraged about the future.
- 2 I feel I have nothing to look forward to.
- 3 I feel the future is hopeless and that things cannot improve.

3.

- 0 I do not feel like a failure.
- 1 I feel I have failed more than the average person.
- 2 As I look back on my life, all I can see is a lot of failures.
- 3 I feel I am a complete failure as a person.

4.

- 0 I get as much satisfaction out of things as I used to.
- 1 I don't enjoy things the way I used to.
- 2 I don't get real satisfaction out of anything anymore.
- 3 I am dissatisfied or bored with everything.

5.

- 0 I don't feel particularly guilty
- 1 I feel guilty a good part of the time.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6.

- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7.

- 0 I don't feel disappointed in myself.  
1 I am disappointed in myself.  
2 I am disgusted with myself.  
3 I hate myself.
- 8.
- 0 I don't feel I am any worse than anybody else.  
1 I am critical of myself for my weaknesses or mistakes.  
2 I blame myself all the time for my faults.  
3 I blame myself for everything bad that happens.
- 9.
- 0 I don't have any thoughts of killing myself.  
1 I have thoughts of killing myself, but I would not carry them out.  
2 I would like to kill myself.  
3 I would kill myself if I had the chance.
- 10.
- 0 I don't cry any more than usual.  
1 I cry more now than I used to.  
2 I cry all the time now.  
3 I used to be able to cry, but now I can't cry even though I want to.
- 11.
- 0 I am no more irritated by things than I ever was.  
1 I am slightly more irritated now than usual.  
2 I am quite annoyed or irritated a good deal of the time.  
3 I feel irritated all the time.
- 12.
- 0 I have not lost interest in other people.  
1 I am less interested in other people than I used to be.  
2 I have lost most of my interest in other people.  
3 I have lost all of my interest in other people.
- 13.
- 0 I make decisions about as well as I ever could.  
1 I put off making decisions more than I used to.  
2 I have greater difficulty in making decisions more than I used to.  
3 I can't make decisions at all anymore.
- 14.
- 0 I don't feel that I look any worse than I used to.  
1 I am worried that I am looking old or unattractive.  
2 I feel there are permanent changes in my appearance that make me look unattractive  
3 I believe that I look ugly.
- 15.



0 I can work about as well as before.

1 It takes an extra effort to get started at doing something.

2 I have to push myself very hard to do anything.

3 I can't do any work at all.

16.

0 I can sleep as well as usual.

1 I don't sleep as well as I used to.

2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.

3 I wake up several hours earlier than I used to and cannot get back to sleep.

17.

0 I don't get more tired than usual.

1 I get tired more easily than I used to.

2 I get tired from doing almost anything.

3 I am too tired to do anything.

18.

0 My appetite is no worse than usual.

1 My appetite is not as good as it used to be.

2 My appetite is much worse now.

3 I have no appetite at all anymore.

19.

0 I haven't lost much weight, if any, lately.

1 I have lost more than five pounds.

2 I have lost more than ten pounds.

3 I have lost more than fifteen pounds.

20.

0 I am no more worried about my health than usual.

1 I am worried about physical problems like aches, pains, upset stomach, or constipation.

2 I am very worried about physical problems and it's hard to think of much else.

3 I am so worried about my physical problems that I cannot think of anything else.

21.

0 I have not noticed any recent change in my interest in sex.

1 I am less interested in sex than I used to be.

2 I have almost no interest in sex.

3 I have lost interest in sex completely.

#### INTERPRETING THE BECK DEPRESSION INVENTORY

Now that you have completed the questionnaire, add up the score for each of the twenty-one questions by counting the number to the right of each question you marked. The highest possible total for the whole test would be sixty-

three. This would mean you circled number three on all twenty-one questions. Since the lowest possible score for each question is zero, the lowest possible score for the test would be zero. This would mean you circles zero on each question. You can evaluate your depression according to the Table below.

Total Score \_\_\_\_\_ Levels of Depression

1-10 \_\_\_\_\_ These ups and downs are considered normal

11-16 \_\_\_\_\_ Mild mood disturbance

17-20 \_\_\_\_\_ Borderline clinical depression

21-30 \_\_\_\_\_ Moderate depression 31-

40 \_\_\_\_\_ Severe depression over

40 \_\_\_\_\_ Extreme depression

## Appendix N

### Comprehensive Health Assessment Tool

#### Traumatic Brain Injury

This section focuses specifically on Traumatic Brain Injury. Traumatic Brain Injury – is when the head receives a severe blow or jolt, for example in an accident, fall or assault, the brain can be damaged. There are other forms of Acquired Brain Injury which may have been caused by a stroke, haemorrhage, infection, hypoxic/anoxic brain injury and medical accidents. These are not included here, but check whether the young person has experienced any of these as they may influence their presentation.

Any loss of consciousness (LoC) over 30 minutes **OR** repeated loss of consciousness on more than three occasions (any length of time) where the young person has experienced symptoms following the injury:-

- **Review physical health/medical records and CHAT assessment (contact GP if necessary).**
- **Discuss with health worker need for further assessment of acquired brain injury (persistent symptoms for 3 months following a head injury requires further assessment and investigation • For all young people who have experienced traumatic head injuries and have ongoing while recent head injury also requires medical advice)**
- **symptoms (those with and without LoC) take account of their symptoms within the care plan e.g. daily living skills and occupational functioning**

Tick <b>No</b> or <b>Yes</b> as appropriate for each question and include additional notes	<b>No</b>	<b>Yes</b>
--	-----------	------------

**Have you ever had an injury to the head that caused you to be knocked out and/or dazed and confused?** E.g. from a fall, blow to the head (including boxing or fighting) or road traffic accident.

If **Yes**, please explain:

If **No**: move onto Learning Disability and Educational Needs

Tick **No** or **Yes** as appropriate for each question and include additional notes

**No**

**Yes**

**How many times have you been knocked out and/or dazed and confused?**

For each occasion ask how it happened.

**When was the last occasion?**

**Did you seek any medical attention after being knocked out and/or dazed and confused?**

If **Yes**, what treatment did you receive? Did you have to stay in hospital?

<b>Describe the worst time s/he has been knocked out and/or dazed and confused</b>					
	<b>Dazed or confused</b>	<b>Unconscious for &lt; 30 min</b>	<b>Unconscious for &gt; 30 but &lt; 60 min</b>	<b>Unconscious for &gt; 60 min but &lt; 24hrs</b>	<b>Unconscious &gt; 24hrs</b>
<b>Road accident (as a pedestrian, cyclist or by car)</b>					
<b>Fall when sober</b>					
<b>Fall when under the influence of drink/drugs</b>					
<b>Sports injury e.g. boxing</b>					
<b>Fight</b>					
<b>Other</b>					

After a head injury or accident some people experience symptoms. We would like to know if you now suffer from any of the symptoms below. As many of these symptoms can occur normally, we would like to compare yourself now with before the accident. For each one please check the box that best describes your experiences.

Compared with before the accident, do you **NOW** suffer from:-

	<b>Not experienced at all</b>	<b>No more of a problem</b>	<b>A mild problem</b>	<b>A moderate problem</b>	<b>A severe problem</b>
<b>Headaches</b>					
<b>Feelings of dizziness</b>					
<b>Nausea and/or vomiting</b>					
<b>Forgetfulness, poor memory</b>					
<b>Poor concentration</b>					
<b>Confusion</b>					
<b>Fogginess</b>					
<b>Difficulties recalling everyday events</b>					

<b>Is there a need in this area (Traumatic Brain Injury)?</b>	<b>NO</b>	<b>YES</b>
<b>If YES include need for further assessment</b>	<input type="checkbox"/>	<input type="checkbox"/>





<b>Has anyone told you that you have a learning disability or learning needs?</b>  If <b>Yes</b> please provide details below:	<input type="checkbox"/>	<input type="checkbox"/>
<b>Do you struggle with reading or writing?</b> (show them a story in a magazine and discuss it with them)  If <b>Yes</b> please provide details below:	<input type="checkbox"/>	<input type="checkbox"/>
<b>Do you struggle telling the time?</b> (check using non digital clock)  If <b>Yes</b> please provide details below:	<input type="checkbox"/>	<input type="checkbox"/>
<b>ADDITIONAL INFORMATION</b> Tick <b>No</b> or <b>Yes</b> as appropriate for each question and include additional notes	<b>No</b>	<b>Yes</b>
<b>Does the young person have difficulties following the conversation?</b>  If <b>Yes</b> please provide details below:          <b>Did you have to rephrase the questions to clarify?</b> (always check whether the young person has understood the information - use your observational skills)  If <b>Yes</b> please provide details below:	<input type="checkbox"/>          <input type="checkbox"/>	<input type="checkbox"/>          <input type="checkbox"/>

<p><b>Does the young person have difficulties expressing themselves?</b> (use your observational skills) If <b>Yes</b> please provide details below:</p>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>Information</b> Confirm information with parent/carer or other professional (provide details below)</p>		
<p><b>Is there a need in this area?</b> <b>If YES include need for further assessment</b></p>		

## Appendix O

### Hierarchical Regression Diagnostics

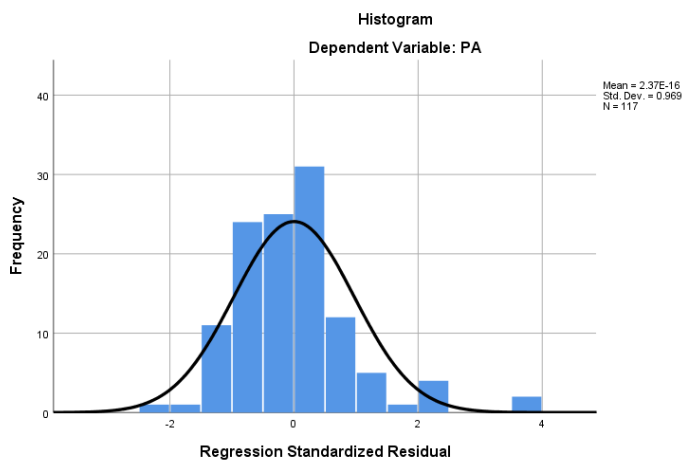


Figure 1. Distribution of standardized residuals for proactive aggression.

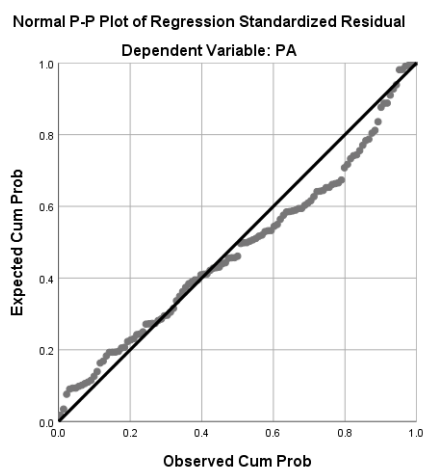


Figure 2. Normal P-P plot for proactive aggression.

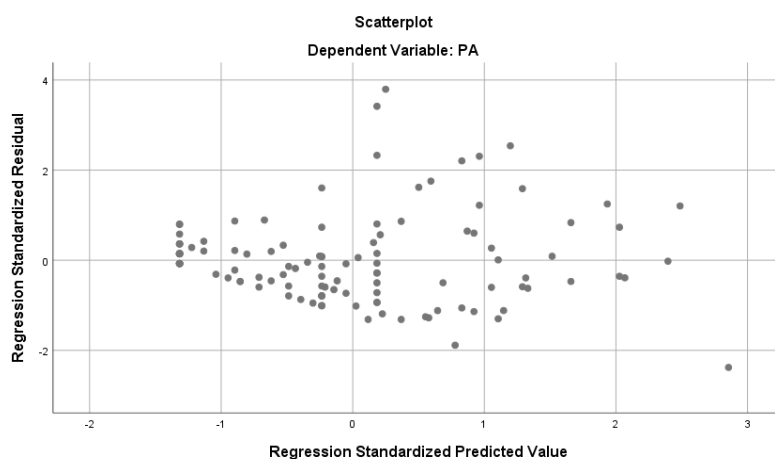


Figure 3. Scatterplot for proactive aggression.

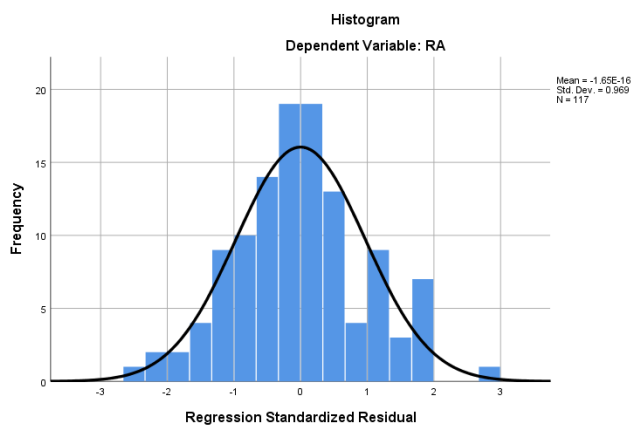


Figure 4. Distribution of standardized residuals for reactive aggression.

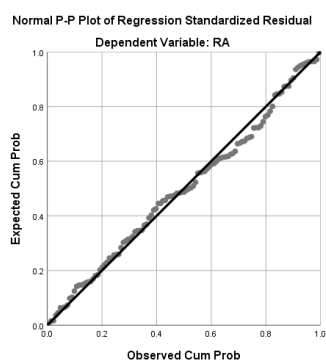


Figure 5. Normal P-P plot for reactive aggression.

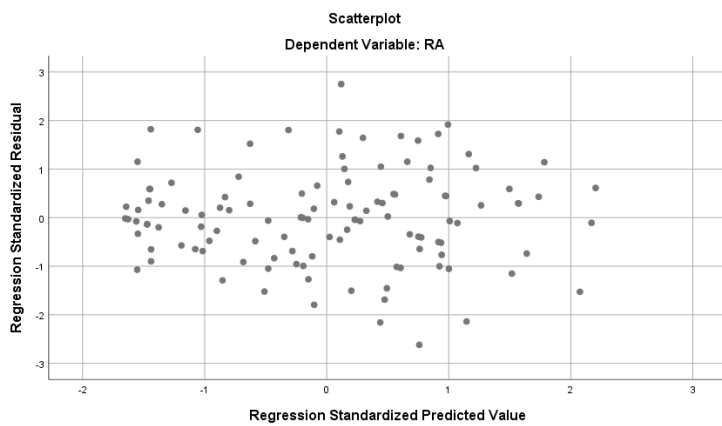


Figure 6. Scatterplot for reactive aggression.