Understanding the Educational Needs of Young Offenders: A Prevalence Study of Traumatic Brain Injury and Learning Disabilities

Winnie Nkoana[1], Huw Williams[2], Nina Steenkamp[1], Betony Clasby[3,4], Helen Knowler[5], & Leigh Schrieff[1]

[1]ACSENT Laboratory, Department of Psychology, University of Cape Town, South Africa
[2] Centre for Clinical Neuropsychology Research, University of Exeter, UK
[3] Department of Sociological Studies, University of Sheffield, UK, and
[4] Department of Neuropsychology, Murdoch Children's Research Institute, Melbourne, Australia
[5] Graduate School of Education, University of Exeter, UK

Corresponding author: Dr Leigh Schrieff
3.11 Department of Psychology
Applied Cognitive Science and Experimental Neuropsychology Team (ACSENT)
University of Cape Town
South Africa
7707
Email: leigh.schrieff-elson@uct.ac.za

Funding acknowledgement: National Research Foundation Thuthuka Grant (TTK170418227316) and the MRC Confidence in Global Mental Health: Trauma and Adverse Childhood Experiences Springboard (TrACES) grant (MC_PC_MR/R019991/1).

Understanding the Educational Needs of Young Offenders: A Prevalence Study of Traumatic Brain Injury and Learning Disabilities

Factors which Shape Educational Needs in Custody

Offenders in custody are often disadvantaged in terms of education; most young offenders are more likely to be low-skilled and unqualified when compared to non-offenders of a similar age (Machin, Marie, & Vujic, 2011; Rogers, Hurry, Simonot & Wilson, 2014). In spite of this, their educational needs in custody are often not addressed (Geib, Chapman, D'Amaddio & Grigorenko, 2011). Research shows that providing and improving education in custody can help reduce the possibility of recidivism and high crime rates in young offenders (Machin et al., 2011).

There are various factors that can impact on youth's ability to engage effectively with education in custody. These include, for example, the degree of disengagement of youth with education (with dropout being a proxy for such disengagement; Cobb, 2011; Shafi, 2019), the quality of education provided and equal and fair access for all to engage in such education, appropriate staff qualifications, shared goals and understanding amongst staff and educators at institutions, maximising the time for learning while in custody (White et al., 2019), broader "system dynamics" (Lanskey, 2014) , limits to the kind of educational programs that can be offered, security challenges, catering for various interests among offenders, issues with attendance, varying lengths of stay, and catering for various levels of educational ability that demand different levels of engagement (Cobb, 2011; Rogers, et al. 2014).

In addition to these important factors, high prevalence rates of neurodisabilities among young people in custody (Collin-Smyth, 2018), can also impact significantly on youth's ability to engage effectively with education in custody. Neurodisability is an umbrella term that is used to define conditions that occur in childhood and adolescence that involve impairment to the central or the peripheral nervous system as a result of pre-birth, birth trauma, injury and illness, with consequent impairment in functioning. In addition to learning disabilities and traumatic brain injury, these conditions also include intellectual disability, communication disorders, autism spectrum disorders, attention hyperactivity disorder, foetal alcohol spectrum disorders, other acquired brain injuries and associated emotional and behavioural problems (such as lack in inhibition; American Psychiatric Association, 2013; Hughes et al., 2012). Hence, young offenders with neurodisabilities may present with various developmental, cognitive, intellectual, social functioning, language and communication deficits, that may impact on learner-teacher relationships and learning acquisition (Sentenac, Lach, Gariepy &

Elgar, 2019). For the purpose of this paper, we will focus on learning disabilities as developmental neurodisability and traumatic brain injury (TBI) as an acquired neurodisability, given high prevalence rates for these neurodisabilities reported in the literature (Borschmann et al., 2020; Chitsabesan et al., 2007; Einat and Einat, 2008; Hall, 2000; Hughes et al., 2012; Hughes et al., 2017; Shelton 2006, Mallet, 2014; Young et al., 2018).

Neurodisabilities: Learning disabilities and traumatic brain injury

Learning disabilities. Learning disability is defined in terms of three criteria: an IQ score of <70, having prominent and significant difficulties with carrying out everyday tasks which are regarded as important to one's success in school and general life, and an onset prior to childhood (Hughes et al., 2012; Pullen, Lane, Ashworth & Lovelace, 2017). Learning disability is further characterised by significant impairment in skills such as reading and reading comprehension, writing and written expression, speaking, and mathematical skills.

Learning disabilities and young offenders. Adolescents with learning disabilities have higher risk of offending and re-offending as compared to adolescents without learning disabilities (Mallet, 2014) and they also engage in offending behaviour at an early age (Chitsabesan et al., 2007; Einat & Einat, 2008). In a recent review, reported rates of learning difficulties among adolescents in custody ranged from 10-32%, which was higher than rates for the general population (Borschmann et al., 2020). Hughes et al., (2012) previously reported prevalence rates of LDs of 23-32% in young offender population as compared to 2-4% in the general population. Specifically, researchers have found that young offenders have poor reading ability and reading comprehension, alongside lower verbal IQ scores to the general population (Chitsabesan et al., 2007). In line with this, one in four offenders in North West England are reported to have reading and spelling difficulties (Chitsabesan et al., 2012). Deficits in language and communication, verbal skills, attention and impulse control, and low IQ scores, are often unrecognized in the young offender population, because these problems are often overshadowed by behavioral problems and lack of awareness from the staff that work with this group of young people (Chitsabesan et al., 2007). Further, language "needs" (indicating forms of learning disability) are associated with impairment in social communication and nonverbal cognition, as well as higher risk of self-harm and substance misuse amongst young offenders (Hughes et al., 2017). Young offenders with learning disabilities in custody, often find themselves in trouble with the prison officials, due to violations of rules, including maintaining proper hygiene and getting into fights (Hall, 2000).

Previous research has shown a strong relationship between poor academic achievement, psychiatric disorders, conduct problems, poor literacy and numeracy skills, and

young people offending (Snowling, Adams, Bowyer-Crane & Tobin, 2000). However, some research in this area suggests that if comorbid conditions are controlled for the degree of delinquency among adolescents with learning disabilities as compared to adolescents without learning disabilities may not differ significantly (Evans, Clinkinbeard and Simi, 2015). Others however argue that it may be difficult to identify those with learning disabilities because of comorbidity with psychiatric and mental health problems and behavioral problems (Hall, 2000; Mallet, 2014). Research in this area in resource-poor settings remains limited compared to higher income states, and is necessary, especially given that deprivation may play a key role in crime.

Traumatic brain injury (TBI). A TBI is an injury to the head caused by a direct impact such as a violent blow to the head, skull penetration, or a force that results in the moving of the brain in the skull, causing disturbance in normal brain functioning (Farrer, Frost & Hedges, 2013; Shiroma, Ferguson & Pickelsimer, 2010; Williams et al., 2010; 2015). Common causes of TBI include falls, motor vehicle accidents, assaults or physical aggression (Hughes et al., 2015). The severity of TBI is often determined in terms of degree of loss of consciousness (LOC) and length of post-traumatic amnesia (Williams et al., 2015). TBI with loss of consciousness (LOC) is more concerning than TBI without LOC, given higher risk of pathological vulnerability in the brain associated with the former (Kelly, 2001).

TBI and young offenders. TBI is a public health problem globally and a leading cause of death and disability in children and young adults, with an estimated 1.4 million people falling victims of TBI each year in the United States, with males having twice the incidence rates of TBI than females (Clasby et al., 2019; Shiroma et al., 2010 & Hughes et al., 2015). Research studies show that in addition to neurodevelopmental disorders, acquired neurodisabilities (such as TBI) are also rife among young offenders compared to those in the general population (Hughes et al., 2012; 2015; Shiroma et al., 2010; Williams et al., 2010; 2015; 2018). A recent review reports on rates of TBI with LOC in 32-50% of adolecsents in custody being significantly higher than rates for the general population, which range from 5-24% (Borschmann et al., 2020).

Williams et al. (2010) showed that there is a relationship between self-report of three or more TBIs and violent offences, and between severe TBI and offending and re-offending behaviour. Related to this, results of a 35-year population-based study in Sweden showed that those who had sustained a TBI were 3-times more likely to commit a violent crime in comparison to age- and gender-matched controls (Fazel, Lichtenstein, Grann, and Långström, 2011). However, studies suggesting a link between TBI and criminality, show that history of

TBI is significantly associated with violent and non-violent criminal behaviour (Allely, 2016; Chitsabesan et al., 2015; Hughes et al. 2012; Williams et al. 2010).

Research also shows that young people who sustain TBIs have more problems with substance use than those without TBI (Moore, Indig, & Haysom, 2014). Indeed, the onset of alcohol misuse actually partially mediates the relationship between TBI and offending (Clasby et al., 2019).

Besides TBI, there is also a spike in crime during adolescence; a developmental stage at which point the brain is not yet fully mature and in which increased impulsivity, risk-taking, and reward-seeking behaviour is commonly described (National Research Council and Institute of Medicine, 2001; O'Rourke et al., 2020; Romer et al., 2017; Sariaslan et al., 2016), which can be exacerbated by TBIs either before or during this period.

Neurodisabilities in South Africa

There is a dearth of literature on neurodisabilities and its associated impact on education for young offenders in South Africa, which is surprising, given the contextual vulnerabilities. Regarding learning disabilities, the prevalence rate of thereof in the general population of South Africa is unclear. A previous report on the Census 2011 data by Statistics South Africa showed that the national prevalence rate for disabilities generally was 7.5% (of 51.8 million people at the time) and that 4.2% had difficulties related to memory and attention, and 2% had difficulties with walking, self-care and communication (Statistics South Africa, 2014). Furthermore, the report also showed that 0.9% of individuals between the ages 15-19 years had a communication / speech disability, while 1.6% of people in the same age group had a cognitive disability (Statistics SA, 2014). Considering the scarcity of data on learning disabilities in South Africa generally, it comes as no surprise that data on learning disabilities in South African young offenders is also very limited.

Regarding TBI, South Africa has high rates of crime and violence and motor vehicle accidents, common mechanisms for TBI. In fact, interpersonal violence is especially rife in low- to middle-income countries like South Africa (De Ribera, Trajtenberg, Shenderovich, & Murray, 2019). It is therefore also presumed that there are also high rates of TBIs in the country. However formal incidence rates are not available. TBI-related morbidity and mortality among youth is frequently reported, as well as higher rates thereof in low- to middle-income countries (Dewan et al, 2018).

In sum, given that rates of neurodevelopmental delay and neurodisabilities (related, for example, to HIV, alcohol dependence and fetal alcohol syndrome, and traumatic brain injuries (TBI)) are generally expected to be high in the country (Gladstone et al., 2014;

Schrieff-Elson & Thomas, 2017), more research is needed in this area and the potential impact on education among young offenders in the South African criminal justice system.

Study Aims and Objectives

Against this backdrop, we investigated, cross-sectionally, the prevalence of self-reported developmental and acquired neurodisabilities (specifically, learning disabilities and TBI, respectively, in this case) in a sample of male young offenders from a youth centre and community controls from local schools in the Western Cape, South Africa, and discuss how these findings might impact educational needs and the consequent need for screening for neurodisabilities, in custody, particularly in this context. Although an intellectual disability is not required for a diagnosis of a learning disability, some research suggest that there may be an association between specific learning disabilities and general intellectual functioning (Siegel, 1989; Jiménez, Siegel, & López, 2003). Further, our definition of learning disabilities makes reference to general intellectual functioning. We therefore include a measure thereof.

Methods

Participants

Purposive sampling method was used to recruit the young offender and community control participants. The former were male young offenders who were incarcerated at a youth correctional center in Cape Town, and the community controls were from two Cape Town high schools. All participants (N=81) were 13-20 years of age, fluent in Afrikaans and/or English, and from low to middle socio-economic status backgrounds. Young offenders were defined as adolescents who have been in conflict with the SA law, and were convicted as such.

Measures

We used the neurodisability section of the Comprehensive Health Assessment Tool (CHAT; Chitsabesan et al., 2014; Williams, et al., 2015) to assess learning disabilities and TBI. Regarding learning disabilities, we used three items within this self-report section of the CHAT as a rough indicator of possible learning disabilities – that the participant was told that he had a learning disability, that he struggles with reading and/or writing, and /or that he struggles to tell time. We used the Wechsler Abbreviated Scale of Intelligence second edition (WASI-II; Wechsler, 1999) as a measure of general intellectual functioning. The WASI-II has four subtests. Vocabulary and Similarities measure crystalized intelligence in the form of knowledge of words, abstract reasoning and development of verbal concepts, and together

form the Verbal Comprehension Index, a measure of verbal IQ (VIQ). Block Design and Matrix Reasoning, measure fluid intelligence in the form of spatial and visual perception, which together form the Perceptual Reasoning Index, a measure of performance IQ (PIQ) (McCrimmon & Smith, 2012). Together, VIQ and PIQ determine full scale IQ (FSIQ). In addition, we used the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), Maudsley Addiction Profile (MAP; Marsden et al., 2002), and the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) to measure alcohol use, substance use, and depression, respectively.

Procedure

We requested consent from parents/legal guardians of the under 18 participants, and those who were over 18 consented to their own participation. In the case of young offenders, we sought consent from the head of the youth center as legal guardians of the young offenders, in the absence of their parents. Participants were also ensured that they could withdraw from the study at any point without any consequences.

Statistical Analysis

We used the Statistical Package for Social Sciences (SPSS) version 25 to analyze the results obtained from the participants. Descriptive and the inferential statistics as well as graphs and tables were used to analyze, interpret and present the data. Mann-Whitney *U* tests were conducted to compare the young offender group to the community controls on continuous data, and Chi-square tests for categorical data. Variables identified as significantly different between the young offender and non-offender groups were added as covariates in the ANCOVA analyses. A series of ANCOVAs compared WASI verbal IQ, performance IQ, and full scale IQ between young offenders and non-offenders whilst controlling for the significant covariates, mentioned above.

Ethical Considerations

Ethical approval for this study was granted by the relevant University Departmental Research Ethics Committee and permission was obtained from two institutions; Department of Education and the Department of Correctional Services.

Results

Assessment of general intellectual functioning, TBI and possible learning disabilities

Sample demographics

The final sample included *N*=81 participants, with *n*=25 young offenders and *n*=56 controls. Although the groups were matched on sex, SES and language, the control group was

on average 5 years younger than the offender group; this represents a significant difference in age between the two groups (see Table 1), which we discuss later. Furthermore, the average grade completed by the young offenders was grade 7 (UK year 8 (second year of secondary school)[1]; US middle school[2]), with the range being from grades 4-8 (UK years 5-9; US elementary to middle school), and the average grade for controls was grade 9 (UK year 10; US high school), with the range being from grades 8-12 (UK years 9-13; US high school). Only 12 of the 20 young offenders were able to recall their last attended grade (possibly due to the difference in age), whereas all of the controls reported their current grade.

Between-group comparisons of all study measures

Table 1 also shows significant differences in TBI (CHAT), alcohol use (AUDIT), substance use (MAP), and reported possible learning disabilities (frequency; CHAT), with higher scores and rates for these factors in the young offender as compared to the control group. More control participants recalled having lost consciousness at the time of sustaining their TBI than young offenders, however. There was also a significant difference in VIQ (and both subtests making up this index: Vocabulary and Similarities) and FSIQ from the WASI (likely as a function of VIQ), with the young offender group achieving substantially lower scores on the VIQ (and FSIQ) as compared to the controls. Relative to the significant differences in Vocabulary and Similarities scores and consequently, the VIQ index, the mean scores for performance IQ (PIQ) index, and associated subtests, Block design and Matric Reasoning, are more similar across the groups.

Insert Table 1 here

We then ran an ANCOVA given that there were not only significant differences in possible learning disabilities and general intellectual functioning, but also for a number of other variables. There was a significant difference in mean WASI VIQ [$F(1,72) = 10.68$, $p = .002$] between the non-offender and young offender groups whilst adjusting for age, AUDIT and BDI-II score, presence of TBI and LOC, number of TBIs, and the presence of substance use or a learning disability. The young offenders scored significantly lower than the controls (see Table 2). There was a trend towards a significant difference in mean WASI FSIQ [$F(1,72)= 3.70$, $p = .058$], again with the young offender group scoring lower. There was however no

[1] https://myonlineschooling.co.uk/news/south-african-vs-uk-education-systems/
[2] https://prezi.com/osrqphg9wp3-/education-in-south-africa-vs-the-us/

significant difference in mean WASI PIQ [$F(1,72) < 0.01$, $p = .980$] between the control and young offender groups, whilst adjusting for the covariates.

Insert Table 2 here

Learning Difficulties. The CHAT includes five questions in the section on 'Information from the young person'. Table 3 displays the frequencies of learning difficulties reported by participants using these five questions in the CHAT, across the offender and control groups. There were no statistically significant differences between the two groups in terms of participants reporting struggling with schoolwork and being previously told they had a learning disability. However, there was a statistically significant difference between the groups in terms of reportedly having had received additional support at school, with 92% and 57% of young offenders and controls, respectively, reporting that they had not received such support. Furthermore, 64% vs 5% of young offenders and control participants respectively, reported struggling with reading and writing. Moreover, 52% vs 11% of young offenders and control participants respectively, reported that they found it a struggle to tell the time. Given that participants might typically be expected to be able to read and write, and to tell the time, at their age (Burny, Valcke, & Desoete, 2012; Juel, 1988), we used these variables together with whether or not participants had been told that they had a learning disability as indicators of possible learning disabilities. We did not include 'struggles with schoolwork' and 'has additional support at school' because these were less specific, and may not necessarily indicate a learning disability (as evidenced by the results for these variables in both groups). The sum of the outcomes on these variables suggest that the possibility of learning disabilities may be more than double the rate in the young offender (68%) vs the control groups (30%) if one considers these three variables as potential indicators.

Insert Table 3 here

Discussion

Crime is highly prevalent in SA and youth are overrepresented in the country's criminal justice system. International studies report on how prevalent neurodisabilities are in the young offender population, and yet there have been few, if any, studies of this nature in the SA context, with its unique sociocultural climate (Einat and Einat, 2008; Hughes et al., 2017). This study assessed for possible learning disabilities (and rates of general intellectual

functioning) and self-reported TBI amongst offenders and controls as an introductory marker of how significant this issue is in South Africa, and the subsequent consequences for learning and educational engagement.

Learning Disabilities

Results suggest that whilst the majority of both groups were not told that they had a learning disability, higher percentages of young offenders as compared to control participants reported difficulties with reading, writing, and telling time. These findings are consistent with previous literature that highlights reading, writing, and time telling difficulties amongst young offenders (Ball & Connolly, 2000; Chitsabesan et al., 2012). This highlights potential unmet educational needs; despite the young offender population struggling with basic skills there were low identification rates of learning disability. In line with this conclusion, the highly significant differences in VIQ (and consequently FSIQ) outcomes for the young offenders and control participants is also suggestive of possible unidentified learning disabilities, given that learning disabilities may occur comorbidly with intellectual disabilities (Siegel, 1989; Jiménez, Siegel, & López, 2003). Importantly, the significant differences in VIQ were upheld even when controlling for age and other screening variables (including identified learning disabilities). These findings are consistent with those reported by Anderson, Hawes and Snow (2016), which show young offenders displayed substantially low Verbal IQ. These results are important to note, as difficulties in this domain can impact on the manner and accuracy with which learners receive and convey information.

Mainstream schooling puts great pressure on the ability of the learner to process information verbally through interactions with teachers and peers. Without other more accessible (e.g., visual and other sensory) stimuli to support learning, this form of acquiring information may disadvantage learners with lower verbal abilities. This highlights an area whereby learners may have educational needs that were unmet during their experience of schooling, but also indicates a problem with accessibility which current forms of further education may not address. This is further supported by Snow and Powell's (2008) finding that approximately 80% of young offenders had experienced school exclusion.

In our results, young offenders were on average 5 years older than non-offenders (which we acknowledge as a major limitation), but the average grade completed / when school was last attended was lower at grade 7, which shows many students did not attend high school (UK year 8; US middle school). This is in comparison to grade 9 (UK year 10; US high school) for control participants, who were currently at school. Such early school departure can also result in poor literacy and low performance in Verbal IQ, given that

measuring these cognitive areas largely rely on crystalized knowledge gathered over time. The (older on average) young offenders in the current study performed more poorly compared to the (younger on average) controls; one could conjecture here that their performance would appear even worse compared against peers of the same age.

One might also consider the 'School Failure hypothesis' when considering the significant differences in age and grade between the study groups. The hypothesis states that failure in school may lead to events such as rejection by school peers, disappointment by parental figures, lowered self-esteem, as well as school dropout. These outcomes can increase the risk of delinquent behavior (Morris & Morris, 2006). Further, research also shows a relationship between school suspensions and expulsions and offending behaviour (Forsyth, 2014), which may also explain the discrepancy between the older age and the lower grade completed, for the young offenders relative to the controls.

TBI

The result of higher reported prevalence of TBI among the offenders as compared to controls is also in line with the extant literature (e.g., Maas et al., 2017). It is consistently reported that TBI rates are higher in young offender samples than in the general population (Vaughn et al., 2014) and our results fit this trend. This highlights that TBI remains a pervasive problem in the criminal justice system and society itself; without appropriate support TBI can potentially contribute to learner disengagement and subsequent entrance into the criminal justice system. However, the prevalence of TBI in the general population is unknown in SA, and therefore also unavailable for young offenders. Just as for learning disabilities, identifying the rates at which TBI is occurring in this vulnerable population is important in terms of intervening. It is critical to know what support learners need at every stage of their educational career to ensure the best possible environment to reach their potential. Although in this study a higher percentage of controls reported having lost consciousness when sustaining their TBI, this may be a function of offenders not always remembering that they did. Furthermore loss of consciousness is not a comprehensive measure of TBI severity; symptoms of post traumatic amnesia (for instance headache, confusion, forgetfulness or disorientation) which can occur with or without loss of consciousness can also indicate severity of injury. Indeed, a recent study used structural equation modelling to show that TBI statistically mediated the relationship between educational attainment and frequency of convictions in a young offender population (Clasby et al., 2019), highlighting further how it is important both in educational and offending trajectories. Post-TBI sequelae can result in wide-ranging possible long-term complications

in personality, cognitive, behavioural and socioemotional outcomes (Farrer et al., 2013), which each may have significant consequences for learning and engagement. Further, and consistent with our findings, VIQ can also be affected post TBI (Hawkins et al., 2002). Identifying the TBI itself at the earliest stage is therefore critical to ensure that targeted and accessible learning strategies can be used to intervene before offending, reoffending, but most importantly to ensure all students have equal access to education regardless of their health status and educational needs.

Last, yet also important to highlight, is that the results indicated significantly higher reports of alcohol and substance use for young offender as compared to controls, a finding which is consistent with the literature (Hughes et al., 2015). Furthermore, the fact that young offenders and controls also differ on reported possible learning disabilities and TBIs is consistent with literature on the comorbidity between both learning disabilities and TBI, and substance misuse (Clasby et al., 2019; Hughes et al., 2012; 2017).

Implications of Findings for Education for Youth in Custody

Given the highest reported grade completed, the majority of young offenders do not have the necessary educational skills to prepare them for adult life, which emphasizes the need for providing education for these young offenders in custody. Not only can such provision of education help with vocational and communication skills (Maniadaki & Kakouros, 2011), but it can also lead to a decrease in re-offending rates, and it also improves the likelihood of employment after prison (James and Crabbe, 2016).

Given the importance of the provision of education in custody, identifying factors that may impact on educational needs in custody is critical. Knowledge of such factors and how they affect young offenders' ability to engage effectively with education in custody is therefore needed, given the potential negative effects if such factors are overlooked. Amongst a host of factors that can impact on youth's ability to engage effectively with education in custody (Cobb, 2011; Lanskey, 2014; Rogers, et al. 2014; Shafi, 2019; White et al., 2019) are the high prevalence rates of neurodisabilities (Collin-Smyth, 2018). In this study, we specifically focused on learning disabilities and TBI.

The consistent reports of high rates of neurodisabilities among young offenders in the literature and in the current study, has a number of implications for screening and consequently for the educational approaches and practices for youth in custody, who may present with neurodisabilities. With this, there is a need for all professional prison staff to get training in terms of the type of education to provide for the offenders, and strategies they will implement, depending on their needs. This could enable optimal learning. This will also

ensure that those who are assigned to work with offenders who may have neurodisabilities are able to identify these difficulties and work with them in a more structured way as part of more targeted intervention and support. Additionally, the provision of mainstream basic education in the prison may not be as beneficial to young offenders given high rates of neurodisabilities; much greater rehabilitation could be achieved through the provision of specialized programs that are able to directly focus on the problems that young offenders with these special educational needs experience (Rucklidge, McLean & Bateup, 2009).

Importance of Screening for Neurodisabilities among Youth in Custody

Given the reported rates described in the literature and in our study and the implications of the findings for education for youth in custody, as discussed above, there is a dire need for research on screening, identification and recognition of neurodisabilities among young offenders in custody (Billstedt, Anckarsater, Wallinius & Hofvander, 2017; Young, 2018; Young et al., 2014). Hughes et al. (2012) report that both health and educational needs of young offenders often go unmet or are not given much attention. Researchers argue that this may occur as a result of lack of routine screening for, and proper identification of, neurodisabilities, that may be present on admission and during their stay at youth offender institutions (Chitsabesan et al., 2014; Hughes et al., 2012). That young offenders in custody with neurodisabilities often go unrecognised has been related to prison staff feeling inadequately trained or qualified to conduct necessary assessments or carry out specialised services. Further, access to specialist services for young offenders with neurodisabilities in the criminal justice system are also often lacking (Hughes et al., 2012; McCarthy et al., 2015).

Early identification or recognition of young offenders with neurodisabilities will provide better understanding and evidence of who should be screened and targeted for further assessment and possible intervention, which include educational interventions (Hughes et al., 2012 & McCarthy et al., 2015). Furthermore, increasing awareness and training of prison staff, and the use of standardised and comprehensive screening tools, may improve recognition of neurodisabilities in young offenders, so that all the prison staff may have a better understanding of the needs of young offenders, who present with neurodisabilities. Additionally, screening and assessment can help identify those who are at more risk and who show poorer long-term outcomes, that may result in persistent offending and getting into trouble with the youth justice system (Hughes et al., 2012). Further, such information can then inform individual care (which could also be extrapolated to educational) plans, suited to

each young person, rather than more broad-based, generic care and intervention that may miss individual needs (Hughes et al., 2012).

Screening for neurodisabilities in South Africa

As outlined, many youth offenders face multiple risks which undermine their education pre-incarceration. There are a range of reasons for less than optimal neurocognitive functioning in this population (e.g., effects of social disadvantage and poor schooling, higher rates of TBI and associated cognitive, behavioural and psychiatric sequalae (established internationally), high rates of alcohol and drug use) (Chitsabesan et al., 2007; Maniadaki & Kakouros, 2011; Williams et al., 2010; Williams et al., 2018). In countries, like South Africa, which has one of the highest crime rates globally (Souverein, Ward, Visser & Burton, 2016), with young people being overrepresented in the criminal justice system in SA (Statistics SA, 2018), and with aggravated social problems (with education being at the forefront; Mobius 2017), investigating factors such as neurodisablity which impact on educational outcomes in this population is even more pressing. Understanding how young offenders navigate the criminal justice system may help improve rates of rehabilitation and decrease recidivism. Hence, research on factors that facilitate or hinder such progress, such as neurodisabilities, is important, especially if they could potentially contribute to offending behavior.

Limitations and Recommendations

The study findings and generalization thereof are not without limitations. First, we note the significant difference in age between the young offenders and controls in the sample, although we attempted to control for this using the ANCOVA analysis. Additionally, the study made use of self-report as a method of data collection, in exploring learning disabilities and TBI, with no collateral information. Although there are recognized problems with social desirability and self-report measures (Van de Mortel, 2008), self-reported information in young offenders has previously been shown to be fairly accurate and relatively reliable (Loza, MacTavish, and Loza-Fanous, 2007). Further, the CHAT is recognized tool in screening for neurodisability with sound psychometric properties (Chitsabesan et al., 2014; 2015). The study is of course also limited by the sample size, which restricts the generalizability of the findings.

In terms of future directions, although we focused on learning disabilities and TBIs (as these are most common) in terms of possible neurodisabilities in our study sample, future studies could explore neurodisability more comprehensively to be able to better encapsulate learner needs. Screening in other areas of neurodisability and also understanding failures in

previous educational history may help to guide development of practices regarding supporting young people with neurodisability in this setting.

Conclusion

The study aimed to contribute to literature on neurodisabilities among young offenders, which is currently lacking in South Africa, and to discuss implications for these findings in terms of the possible impact on education for these youth in custody. The main findings of this study suggest high possible rates of reading and writing difficulties among young offenders as compared to controls in the sample and significantly low general intellectual functioning in the verbal as compared to the performance domain. Further, rates of TBI were significantly higher amongst the young offender as compared to the control group.

Results of this nature can potentially be used to inform rehabilitative efforts in our local youth centres for offenders in the hope of screening for various developmental and acquired neuro-disabilities so that rehabilitation strategies may be even more targeted for those with special education needs in of an already vulnerable population. Such results may also inform the schooling structures within such centres by providing profiles needs of offenders in custody based on screenings of neurodisabilities. The results of this study speak to the critical international debate on education for incarcerated youth. More broadscale implications is that these results may contribute towards a global understanding of effective policy and practice around the education of incarcerated youth.

International literature has shown that access to education for young offenders in custody may reduce the chances of youth reoffending (Cruise et al., 2011; James & Crabbe, 2016; Maniadaki, & Kakouros, 2011), hence understanding factors that may impact on youth accessing and engaging in education, is pertinent.

References

Allely, C. S. (2016). Prevalence and assessment of traumatic brain injury in prison inmates: A systematic *PRISMA review. Brain Injury, 30(10*), 1161-1180. doi:10.1080/02699052.2016.1191674

American Psychiatric Association (2013), The Diagnostic and Statistical Manual of Mental Disorders, 5th ed. American Psychiatric Association, Washington, DC.

Anderson, S. A., Hawes, D. J., & Snow, P. C. (2016). Language impairments among youth offenders: A systematic review. *Children and Youth Services Review, 65*, 195-203. doi:10.1016/j.childyouth.2016.04.004

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *The Alcohol Use Disorder Identification Test: Guidelines for Use in Primary Care* (2nd ed.). Geneva, Switzerland: World Health Organisation.

Ball, C., & Connolly, J. (2000). Educationally disaffected young offenders: Youth Court Agency Responses to Truancy and School Exclusion. *The British Journal of Criminology, 40(4),* 594-616. doi:10.1093/bjc/40.4.594.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio, TX: Psychological Corporation.

Billstedt, E., Anckarsäter, H., Wallinius, M., & Hofvander, B. (2017). Neurodevelopmental disorders in young violent offenders: Overlap and background characteristics. *Psychiatry Research, 252*, 234–241.doi.org/10.1016/j.psychres.2017.03.004

Borschmann, R., Janca, E., Carter, A., Willoughby, M., Hughes, N., Snow, K., Stockings, E., Hill, N., Hocking, J., Love, A., Patton, G. C., Sawyer, S. M., Fazel, S., Puljević, C., Robinson, J., & Kinner, S. A. (2020). The health of adolescents in detention: a global scoping review. *The Lancet. Public health*, *5*(2), e114–e126. https://doi.org/10.1016/S2468-2667(19)30217-8

Burny, E., Valcke, M., & Desoete, A. (2012). Clock Reading: An Underestimated Topic in Children With Mathematics Difficulties. *Journal of learning disabilities, 45*, 351-60. 10.1177/0022219411407773.

Chitsabesan, P., Bailey, S., Williams, R., Kroll, L., Kenning, C., & Talbot, L. (2007). Learning disabilities and educational needs of juvenile offenders. *Journal of Children's Services, 2(4),* 4-17. doi: 10.1108/17466660200700032

Chitsabesan, P., Rothwell, J., Kenning, C., Law, H., Carter, L. A., Bailey, S., & Clark, A. (2012). Six years on: A prospective cohort study of male juvenile offenders in secure care. *Eur Child Adolescent Psychiatry*, *21*, 339-347. doi:10.1007/s00787-012-0266-9

Chitsabesan, P., Lennox, C., Theodosiou, L., Law, H., Bailey, S., & Shaw, J. (2014). The development of the comprehensive health assessment tool for young offenders within the secure estate. *The Journal of Forensic Psychiatry and Psychology*, *25*, 1–25. doi: 10.1080/14789949.2014.882387.

Chitsabesan, P., Lennox, C., Williams, H., Tariq, O., & Shaw, J. (2015). Traumatic Brain Injury in Juvenile Offenders: Findings From the Comprehensive Health Assessment Tool Study and the Development of a Specialist Linkworker Service. *Journal of Head Trauma Rehabilitation*, *30*(2), 106–115.doi.org/10.1097/HTR.0000000000000129

Clasby, B., Bennett, M., Hughes, N., Hodges, E., Meadham, H., Hinder, D., Mewse, A. (2019). The consequences of traumatic brain injury from the classroom to the courtroom: understanding pathways through structural equation modelling. *Disability and Rehabilitation*, 1–10. doi.org/10.1080/09638288.2019.1635214

Cobb, E. (2011). Education for young offenders. *Prison Service Journal*. https://marisluste.files.wordpress.com/2010/11/psj_september_2011_no-_197.pdf p.43

Collin-Smyth, S. (2018). A framework for young people with neurodisability who engage in antisocial behaviour: Introducing the PAM-NEXT.

Cruise, K. R., Evans, L. J., & Pickens, I. B. (2011). Integrating Mental Health and Special Education Needs into Comprehensive Service Planning for Juvenile Offenders in Long-Term Custody Settings. *Learning and Individual Differences*, *21*(1), 30-40. doi:10.1016/j.lindif.2010.11.004

De Ribera, O. S., Trajtenberg, N., Shenderovich, Y., & Murray, J. (2019). Correlates of youth violence in low- and middle-income countries: A meta-analysis. Aggression and Violent Behavior, 49, 101306. https://doi.org/10.1016/j.avb.2019.07.001

Dewan, M. C., Rattani, A., Gupta, S., Baticulon, R. E., Hung, C., Punchak, M., Park, K. B. (2018). Estimating the global incidence of traumatic brain injury. *Journal of Neurosurgery*, 1-18. Advanced online publication. doi:10.3171/2017.10.JNS17352

Einat, T., & Einat, A. (2008). Learning disabilities and delinquency. *International Journal Of Offender Therapy And Comparative Criminology*, *52*(4), 416-434. doi:10.1177/0306624X07307352.

Evans, M. K., Clinkinbeard, S. S., & Simi, P. (2015). Learning disabilities and delinquent behaviors among adolescents: a comparison of those with and without comorbidity. *Deviant Behavior, 36,* 200-220. doi:10.1080/01639625.2014.924361

Farrer, T., Frost, R., & Hedges, D. (2013). Prevalence of traumatic brain injury in juvenile offenders: A meta-analysis. *Child Neuropsychology*, *19*(3), 225-234. doi:10.1080/09297049.2011.647901

Fazel, S., Lichtenstein, P., Grann, M., & Långström, N. (2011). Risk of Violent Crime in Individuals with Epilepsy and Traumatic Brain Injury: A 35-Year Swedish Population Study. *PLoS Medicine, 8(12):* e1001150. doi:10.1371/journal.pmed.1001150

Forsyth, C. J., Asmus, G., Howat, H., Pei, L.K., Forsyth, Y. A., & Stokes, B. R. (2014). Examining the relationship between school suspensions/expulsions and felonies, *Criminal Justice Studies, 27:2*, 149-158, DOI: 10.1080/1478601X.2013.844463

Geib, C., Chapman, J., D'Amaddio, A., & Grigorenko, E. (2011). The education of juveniles in detention: Policy considerations and infrastructure development. *Learning and Individual Differences*, *21*(1), 3–11.doi.org/10.1016/j.lindif.2010.05.002

Gladstone, M., Mallewa, M., Jalloh, A. A., Voskuijl, W., Postels, D., Groce, N., & Molyneux, E. (2014, March). Assessment of neurodisability and malnutrition in children in Africa. In *Seminars in pediatric neurology* (Vol. 21, No. 1, pp. 50-57). WB Saunders.doi.org/10.1016/j.spen.2014.01.002

Hall, I. (2000). Young offenders with a learning disability. *Advances in Psychiatric Treatment, 6*(4), 278-285. doi:10.1192/apt.6.4.278.

Hawkins, K., Plehn, K., & Borgaro, S. (2002). Verbal IQ–performance IQ differentials in traumatic brain injury samples. *Archives of Clinical Neuropsychology*, *17*(1), 49–56.doi.org/10.1016/S0887-6177(00)00099-8

Hughes, N., Williams, P., Chitsabesan, P., Davies, R., & Mounce, L. (2012). *Nobody made the connection; the prevalence of neurodisability in young people who offend.* London: Office for the Children's Commissioner.

Hughes, N., Williams, W. H., Chitsabesan, P., Walesby, R. C., Mounce, L. T. A., & Clasby, B. (2015). The prevalence of traumatic brain injury among young offenders in custody: A systematic review. *Journal of Head Trauma Rehabilitation*, *30*(2), 94–105. doi:10.1097/HTR.0000000000000124

Hughes, N., Chitsabesan, P., Bryan, K., Borschmann, R., Swain, N., Lennox, C., & Shaw, J. (2017). Language impairment and comorbid vulnerabilities among young people in

custody. *Journal of Child Psychology and Psychiatry*, *58*(10), 1106-1113. doi:10.1111/jcpp.12791

James, M., & Crabbe, C. (2016). Education for Offenders in Prison. *Journal of Pedagogic Development*, *6*(3), 3-7. *

Jiménez, J.E, Siegel, L.S, & López, M.R. (2003). The relationship between IQ and reading disabilities in English-speaking Canadian and Spanish children. *Journal of Learning Disabilities.36(1),*15-23.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology*, *80*(4), 437–447. doi.org/10.1037/0022-0663.80.4.437

Kelly J. P. (2001). Loss of Consciousness: Pathophysiology and Implications in Grading and Safe Return to Play. *Journal of athletic training*, *36*(3), 249–252.

Lanskey, C. (2014). Up or down and out? A systemic analysis of young people's educational pathways in the youth justice system in England and Wales. *International Journal of Inclusive Education, 19(6), 568–582.* doi:10.1080/13603116.2014.961675

Loza, W., MacTavish, A., ,and Loza-Fanous, A. (2007). Nine year follow up study on the predictive validity of the self-appraisal questionnaire for predicting violent and non-violent recidivism. *Journal of Interpersonal Violence, 22*, 114–1155.

Maas, A. I. R., Menon, D. K., Adelson, D. P., Andelic, N., Bell, M. J., Belli, A., Yaffe, K. (2017). Traumatic brain injury: integrated approaches to improve prevention, clinical care, and research. *Lancet Neurology*, *16*(12), 987-1048. doi.org/10.1016/S1474-4422(17)30371-X

Machin, S., Marie, O., & Vujić, S. (2011). The Crime Reducing Effect of Education *. *Economic Journal*, 121(552), 463–484.doi.org/10.1111/j.1468-0297.2011.02430.x

Mallett, C. A. (2014). The "learning disabilities to juvenile detention" pipeline: A case study. *Children & Schools, 36(3),* 147-154. doi: 10.1093/cs/cdu010.*

Maniadaki, K., & Kakouros, E. (2011). Attention problems and learning disabilities in young offenders in detention in Greece. *Psychology*, *2*(1), 53-59. doi:10.4236/psych.2011.21009.

Marsden, J., Gossop, M., Stewart, D., Best, D., Farrell, M., Lehmann, P., Strang, J. (2002). The maudsley addiction profile (MAP): A brief instrument for assessing treatment outcome. *Addiction, 93,* 1857-1867.

* DOI unavailable

Mccarthy, J., Chaplin, E., Underwood, L., Forrester, A., Hayward, H., Sabet, J., Murphy, D. (2015). Screening and diagnostic assessment of neurodevelopmental disorders in a male prison. *Journal of Intellectual Disabilities and Offending Behaviour*, *6*(2), 102–111. doi.org/10.1108/JIDOB-08-2015-0018

McCrimmon, A., & Smith, A. (2012). Review of the Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II) Wechsler, D. (2011). San Antonio, TX: NCS Pearson. *Journal of Psychoeducational Assessment, 31*(3), 337-331. doi: 10.1177/0734282912467756

Mobius, M. (2017). South Africa: Key Issues and Challenges. *Advisor Perspectives,* https://emergingmarkets.blog.franklintempleton.com/2017/03/16/south-africa-key-issues-and-challenges/

Moore, E., Indig, D., & Haysom, L. (2014). Traumatic Brain Injury, Mental Health, Substance Use, and Offending Among Incarcerated Young People. *Journal of Head Trauma Rehabilitation*, *29*(3), 239–247.doi.org/10.1097/HTR.0b013e31828f9876

Morris, K. A., & Morris, R. J. (2006). Disability and juvenile delinquency: Issues and trends. *Disability and Society 21*, 613–627. doi: 10.1080/09687590600918339.

National Research Council and Institute of Medicine. 2001. Juvenile Crime, Juvenile Justice. Washington, DC: The National Academies Press. doi.org/10.17226/9747.

O'Rourke, S., Whalley, H., Janes, S., MacSweeney, N., Skrenes, A., Crowson, S., MacLean, L., & Schwannauer, M. (2020). The development of cognitive and emotional maturity in adolescents and its relevance in judicial contexts. Scottish Sentencing Council: UK. https://www.scottishsentencingcouncil.org.uk/media/2044/20200219-ssc-cognitive-maturity-literature-review.pdf

Pullen, Lane, Ashworth, & Lovelace. (2017). Specific learning disabilities. In *Handbook of special education* (2nd ed., pp. 286-299). Taylor & Francis.

Rogers, L., Hurry, J., Simonot, M., & Wilson, A. (2014). The aspirations and realities of prison education for under-25s in the London area. *London Review of Education*, *12*(2), 184–196.doi.org/10.18546/LRE.12.2.04

Romer, D., Reyna, V. F., & Satterthwaite, T. D. (2017). Beyond stereotypes of adolescent risk taking: Placing the adolescent brain in developmental context. Developmental Cognitive Neuroscience, 27(July), 19–34. https://doi.org/10.1016/j.dcn.2017.07.007

Rucklidge, J. J., McLean, A. P., & Bateup, P. (2009). Criminal Offending and learning disabilities in New Zealand youth: Does reading comprehension predict recidivism? *Crime & Delinquency, 59*(8), 1263-1286. doi:10.1177/0011128709336945.

Sariaslan, A., Sharp, D. J., D'Onofrio, B. M., Larsson, H., & Fazel, S. (2016). Long-term outcomes associated with traumatic brain injury in childhood and adolescence: a nationwide Swedish cohort study of a wide range of medical and social outcomes. *PLoS medicine*, *13*(8).doi:10.1371/ journal.pmed.1002103

Schrieff-Elson, L. E., & Thomas, K. (2017). Neuropsychological Rehabilitation in South Africa (chapter section). In B. Wilson, J. Winegardner, C. van Heugten, and T. Ownsworth. International Handbook of Neuropsychological Rehabilitation. Routledge: New York.

Sentenac, M., Lach, L., Gariepy, G., & Elgar, F. (2019). Education disparities in young people with and without neurodisabilities. *Developmental Medicine and Child Neurology*, *61*(2), 226–231.doi.org/10.1111/dmcn.14014

Shafi, A. A. (2019). The complexity of disengagement with education and learning: A case study of young offenders in a secure custodial setting in England. *Journal of Education for Students Placed at Risk (JESPAR)*, *24*(4), 323-345. doi.org/10.1080/10824669.2019.1613897

Shelton, D. (2006). A study of young offenders with learning disabilities. *Journal of Correctional Health Care*, *12* (1), 36–44. doi:10.1177/1078345806287573

Shiroma, E., Ferguson, P., & Pickelsimer, E. (2010). Prevalence of Traumatic Brain Injury in an Offender Population: A Meta-Analysis. *Journal of Correctional Health Care*, *16*(2), 147–159.doi.org/10.1177/1078345809356538

Siegel, Linda. (1989). IQ is irrelevant to the definition of learning disabilities. Journal of Learning Disabilities, 22, 469-78, 486. 10.1177/002221948902200803.

Snow, P. C., & Powell, M. B. (2008). Oral language competence, social skills and high-risk boys: What are juvenile offenders trying to tell us?. *Children & Society*, *22*(1), 16-28. doi:10.1111/j.1099-0860.2006.00076.x

Snowling, M. J., Adams, J. W., Bowyer- Crane, C., & Tobin, V. (2000). Levels of literacy among juvenile offenders: The incidence of specific reading difficulties. *Criminal behaviour and mental health*, *10*(4), 229-241. doi.org/10.1002/cbm.362

Souverein, F. A., Ward, C. L., Visser, I., & Burton, P. (2016). Serious, Violent Young Offenders in South Africa: Are They Life-Course Persistent Offenders? *Journal of Interpersonal Violence, 31*(10), 1859-1882. doi: 10.1177/0886260515570748.

Statistics SA. (2014). *Census 2011: Profile of persons with disabilities in South Africa* (pp. 1-210, Rep. No. 03-01-59). Pretoria: Statistics South Africa.

Statistics South Africa. (2018). *Victims of Crime Survey.* Pretoria: Statistics South Africa.

van de Mortel, T. F. (2008). Faking it: social desirability response bias in self-report research', *Australian Journal of Advanced Nursing*, vol. 25, no. 4, pp. 40-48.

Vaughn, M. G., Salas-Wright, C. P., Delisi, M., & Perron, B. (2014). Correlates of traumatic brain injury among juvenile offenders: a multi-site study. *Criminal Behaviour and Mental Health, 24*(1), 188-203. doi:10.1002/cbm.1900

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence (WASI).* San Antonio, TX: The Psychological Corporation.

Williams, W. H., Cordan, G., Mewse, A. J., Tonks, J., & Burgess, C. N. (2010). Self-reported traumatic brain injury in male young offenders: A risk factor for reoffending, poor mental health and violence? *Neuropsychological Rehabilitation*, *20,* 801-812. doi: 10.1080/09602011.2010.519613

Williams, W. H., Mcauliffe, K. A., Cohen, M. H., Parsonage, M., & Ramsbotham, J. (2015). Traumatic Brain Injury and Juvenile Offending. *Journal of Head Trauma Rehabilitation, 30* (2), 69-74. doi: 10.1097/HTR.0000000000000134

Williams, W. H., Chitsabesan, P., Fazel, S., McMillan, T., Hughes, N., Parsonage, M., & Tonks, J. (2018). Traumatic brain injury: a potential cause of violent crime? *The Lancet Psychiatry, 5 (10),* p. 836-844. doi.org/10.1016/S2215-0366(18)30062-2.

White, J., te Riele, K., Corcoran, T., Baker, A., Moylan, P., & Manan, R. A. (2019). Improving educational connection for young people in custody.

Young, S., Gudjonsson, G. H., Goodwin, E. J., Jotangia, A., Farooq, R., Haddrick, D., & Adamou, M. (2014). Beyond the gates: identifying and managing offenders with attention deficit hyperactivity disorder in community probation services. *AIMS public health, 1*(1), 33. doi:10.3934/publichealth.2014.1.33

Young, S., Gonzalez, R., Mullens, H., Mutch, L., Malet-Lambert, I., & Gudjonsson, G. (2018). Neurodevelopmental disorders in prison inmates: comorbidity and combined associations with psychiatric symptoms and behavioural disturbance. *Psychiatry Research. 261,* 109-115, https://doi.org/10.1016/j.psychres.2017.12.036.

Table 1

Between Groups Comparisons: Young Offenders and Controls for Age, Screening, Learning Disability And General Intellectual Functioning Outcomes (*N* = 81)

	Non-offenders *n* = 56	Controls *n* = 25	U/χ^2	*p*	ESE
Age[a]	15 (14 - 17)	20 (19 – 20.5)	51.5	<.001**	6.693
AUDIT[a]	3 (0 – 10.75)	17 (13 – 27.5)	183	<.001**	5.335
BDI-II[a]	13 (9.25 – 17.75)	17 (14 – 21.5)	472	.020*	2.335
Grade[a]	8 (8 – 11)	7.5 (5 – 8)[c]	90	<.001**	4.313
Possible Learning Disability, yes[b]	17 (30.4%)	17 (68%)	10.06	.002*	.352
Number of TBI's[a]	0 (0 – 1)	1 (0 – 2)	469.5	.010*	2.568
TBI LOC[b]			17.79	<.001**	.469
No TBI	32 (57.1%)	7 (28%)			
TBI + LOC	16 (28.6%)	3 (12%)			
TBI but no LOC	8 (14.3%)	15 (60%)			
TBI, yes[b]	24 (42.9%)	18 (72%)	5.88	.015*	.269
WASI					
Vocabulary[a,d]	7 (5 - 9)	3 (1.5 - 4)	90.5	<.001**	6.264
Similarities[a,d]	7 (5.25 - 9)	3 (2 - 4)	135	<.001**	5.808
Block Design[a,d]	8 (6 - 9)	7 (5.5 - 8)	506.5	.046*	1.996
Matrix Reasoning[a,d]	7 (6 - 9)	6 (5 - 8)	584	.229	1.204
VIQ[a]	85 (77 – 94.75)	64 (53.5 - 69)	82	<.001**	6.322
PIQ[a]	83.5 (77.25 – 94.75)	82 (74 – 87.5)	533.5	.088	1.705
FSIQ[a]	82.5 (76 – 90.75)	73 (63.5 – 75.5)	210.5	<.001**	5.008
Substance use, yes[b]	40 (71.4%)	25 (100%)	8.90	.003*	.331
Drugs, yes[b]	25 (44.6%)	25 (100%)	22.42	<.001**	.526
Cigarettes, yes[b]	21 (37.5%)	22 (91.7%)[d]	19.83	<.001**	.498
Alcohol, yes[b]	36 (64.3%)	23 (95.8%)[d]	8.64	.003*	.329
Cannabis, yes[b]	22 (39.3%)	24 (100%)[d]	25.34	<.001**	.563
Mandrax Buttons, yes[b]	0 (0%)	1 (4.2%)[d]	-[e]	.300	.172
Tik, yes[b]	3 (5.4%)	23 (95.8%)[d]	62.69	<.001**	.885
Opiods, yes[b]	3 (5.4%)	5 (20.8%)[d]	4.47	.034*	.236
Methadone, yes[b]	0 (0%)	5 (20.8%)[d]	-	.002*	.394
Sleeping pills, yes[b]	1 (1.8%)	4 (16.7%)[d]	-	.027*	.282
Glue, yes[b]	1 (1.8%)	12 (50%)[d]	28.70	<.001**	.599
Ecstacy, yes[b]	2 (3.6%)	23 (95.8%)[d]	66.56	<.001*	.912
Cocaine, yes[b]	2 (3.6%)	5 (20.8%)[d]	-	.023*	.280
Hallucinogens, yes[b]	1 (1.8%)	6 (25%)[d]	-	.002*	.376

Note. [a]Mann-Whitney *U* test performed (medians are presented with IQR in parentheses). [b]Chi-square test performed (number of participants are presented with proportions in parentheses). [c]Data based on 12 participants. [d]Data based on 24 participants. ESE effect size estimate (in this case, Cohen's *r* for Mann-Whitney *U* tests, and Cramer's *V* for Chi-square tests). [d] Scaled scores. [e] No chi square value because a Fisher's exact test was performed (20% of the cells had an expected value of <5). *Result is significant at the 0.05 level **Result is significant at the 0.01 level

Table 3

Frequencies of Reported Difficulties with Learning in Non-Offender and Control Groups (N=81)

	Controls (n=56)		Young offenders (n=25)		Test statistics	
Variables	No	Yes	No	Yes	χ^2	*p*
Struggled with schoolwork	14 (25.0)	42 (75.0)	10 (40.0)	15 (60.0)	1.87	.172
Had additional support at school	32 (57.1)	24 (42.9)	23 (92.0)	2 (8.0)	9.64	.002*
Told he has a learning disability	47 (83.9)	9 (16.1)	17 (68.0)	8 (32.0)	2.64	.104
Struggles with reading and writing	53 (94.6)	3 (5.4)	9 (36.0)	16 (64.0)	33.11	<.001**
Struggles with telling the time	50 (89.3)	6 (10.7)	12 (48.0)	13 (52.0)	16.41	<.001**
Possible[a] learning disability?	39 (69.6)	17 (30.4)	8 (32.0)	17 (68.0)	10.06	.002*

Note. [a] If participants responded yes to any of the underlined variables, they were coded as yes for possible learning disability. Frequencies are presented with percentages in parentheses.

Table 2

Mean WASI scores adjusted for significant covariates: Young Offenders and Controls (N=81)

	Controls *n* = 56			Young Offenders *n* = 25		
WASI IQ	*M*	SE	95% CI	*M*	SE	95% CI
VIQ	81.90	1.97	77.97 – 85.84	65.97	3.60	58.79 – 73.16
PIQ	83.88	1.88	80.13 – 87.62	83.76	3.43	76.93 – 90.59
FSIQ	81.27	1.70	77.88 – 84.65	73.20	3.10	67.02 – 79.38

Author statement

The authors report no conflicts of interest.