



# Head injury and associated disability in adults undergoing pre-sentencing assessment by criminal justice social work

Holly de Mora, Jean McFarlane, Tom M. McMillan\*

*Institute of Health and Wellbeing, University of Glasgow, Gartnavel Royal Hospital, 1055 Great Western Road, G12 0XH, UK*

## ARTICLE INFO

### Keywords:

Head injury  
Traumatic brain injury  
Crime  
Prisoners  
Criminal justice social work  
Court reports

## ABSTRACT

Although evidence indicates that head injury (HI) is prevalent in prisoners, little is known about HI in defendants during the Court process. This study assesses history of HI and persisting sequelae in defendants undergoing Criminal Justice Social Work (CJSW) assessment for Court.

A cross sectional, between subjects design was used. HI history was assessed using the Ohio State University TBI Identification-Method and disability with the Glasgow Outcome Scale-Extended in 46 adult defendants undergoing a CJSW assessment in Scotland. Assessments of mental health, cognitive function, effort on tests and dysexecutive behaviour were also carried out. Comparisons were made between defendants with and without significant HI.

Significant HI (SHI) was found in 33/46 (72%) participants and 39% (13/33) of these had persisting disability. Those with SHI were more likely to have moderate-severe mental health difficulties, problematic alcohol or drug use and impairment on the Dysexecutive Questionnaire. Group differences were not found on cognitive tests or in offending history. No CJSW report identified HI.

Disability, psychological distress, dysexecutive behaviour and potentially harmful substance use are more common in defendants with SHI. Training and a screening process for HI in CJSW assessments is needed to inform Court disposals and interventions.

## 1. Introduction

There is growing research interest in the prevalence and effects of head injury (HI) in prisoners (Williams, Mewse, et al., 2010), but less so in offenders in other parts of the criminal justice system (O'Rourke et al., 2018). In prisoners, the prevalence of HI is high, with meta-analyses suggesting 50–60% (Farrer & Hedges, 2011; Shiroma, Ferguson, & Pickelsimer, 2010).

The Criminal Justice Social Work (CJSW) Service in Scotland provide reports in a significant number of criminal cases that are being tried in Scottish Courts. There were 75,251 criminal convictions in Scotland in 2019–2020 and during that time period, 28,500 CJSW reports were submitted (Scottish Governmenta; Scottish Governmentb). The CJSW service in Scotland provides information to the sentencer, including a court report based on interview and can be important in determining sentence decisions, including custodial, community or remand disposals and risk. An aim of the CJSW service is to help offenders to reduce offending behaviour and promote social responsibility through social integration and community resources (Scottish Governmentb; Mair,

2004). CJSW liaise with medical and nursing staff and family, including regarding mental health issues and substance use (Scottish Government, 2023). Their report provides information on risk of re-offending, risk of harm, needs and interventions. With regards to health, the CJSW report includes issues of relevance to the offence, such as whether the individual has mental health problems, behavioural problems or learning disability and implications of these for potential disposals by the Court. In order to do this they may seek advice from health professionals. The report can recommend supports, interventions or that a psychological or medical report is obtained (Scottish Government, 2023).

Persisting effects of HI could require adaptations to CJSW interventions. For example, deficits in executive function and memory can make it difficult to keep appointments, to monitor, plan, reflect and problem solve. Difficulties with self-control are common after HI and are known to increase risk of offending (Raine, 2019; Wood & Worthington, 2017). Identification, support, intervention and management of effects of HI offenders may reduce reoffending and the need for ongoing contact with the criminal justice service by improving disposals from courts, engagement within prison systems and engagement with CJSW and

\* Corresponding author.

E-mail address: [Thomas.mcmillan@glasgow.ac.uk](mailto:Thomas.mcmillan@glasgow.ac.uk) (T.M. McMillan).

<https://doi.org/10.1016/j.fsimpl.2024.100129>

Received 10 November 2022; Received in revised form 14 January 2024; Accepted 7 February 2024

Available online 23 February 2024

2666-3538/© 2024 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

ongoing community support (McMillan et al., 2021a).

As the CJSW report is written in the early stages of the criminal justice process, identifying a history of SHI at this point would provide opportunity to inform the Court with regard to disposal, and for developing appropriate intervention and support. However there are no published findings on the occurrence or persisting sequelae of HI in defendants undergoing CJSW assessment for Court and the aim of this study is to investigate this. The work was part of a programme aimed at developing services for people with HI in the CJSW in Scotland (National Prisoner Healthcare Network, 2016).

## 2. Methods

### 2.1. Design

The study used a quantitative, cross-sectional design. This is an observational design where exposures and outcomes are assessed in the participant sample at the same time.

### 2.2. Participants

Recruitment took place in a CJSW Department in the West of Scotland. Participants were eligible if undergoing a CJSW assessment for a Court report, were aged 18 or over, fluent in English, had capacity to consent and able to complete assessments (not having severe communication or current severe mental health difficulties, or a deteriorating neurological diagnosis such as dementia).

### 2.3. Measures

The assessment took place in a single 1 h session. Information on age, ethnicity, education, occupation, offence history, time spent in custody, length of hospital stay and follow-up after HI and data to be extracted from CJSW reports were obtained on a form designed for the study (Appendix 1).

**Mental Health:** The Clinical Outcomes in Routine Evaluation System (CORE-10) is a self-report screening of distress through commonly experienced symptoms of anxiety and depression. Participants rate their experience over the past seven days and scores above 10 indicate clinical levels of distress (Barkham et al., 2013).

**Substance Use:** The Alcohol Use Disorders Identification Test (AUDIT) is a self-report screening of alcohol use. Scores of 0–7 on the AUDIT categorise risk from drinking as low, and 8 or higher as hazardous or worse (Babor et al., 2001). Drug use was assessed using the Drug Abuse Screening Test (DAST-10). Scores of 1–2 on the DAST-10 categorise risk as low and 3 or more as a higher risk (Skinner, 1982).

**Cognitive Function:** Memory and learning were assessed with the Auditory Verbal Learning Test (Coughlan & Hollows, 1985). The Symbol Digit Modalities Test (SDMT) requires processing speed, attention, visual scanning and learning (Smith, 1982) and the Trail Making Test (TMT) requires attention and mental flexibility (Tombaugh, 2004). Performance validity on cognitive tests was assessed using the Word Memory Test (Green et al., 2003).

**Dysexecutive Problems:** The Dysexecutive Questionnaire (DEX) is a self-report questionnaire of problems in cognition, emotions and behavior commonly associated with impaired executive function. Scores above 27 were classified as impaired (Burgess et al., 1998).

**History of Head Injury:** The Ohio State University Traumatic Brain Injury Identification Method (OSU TBI) is a structured interview of history of head injury which has been successfully used in forensic samples including in the US (Bogner & Corrigan, 2009) and Scotland (McGinley et al., 2019; McMillan et al., 2021b, 2023). It uses self-report to establish the history and severity of HI and other causes of central nervous system (CNS) compromise.

**Disability:** The Glasgow Outcome Scale Extended (GOS-E) is a widely used assessment of disability after HI. It considers independence in

activities of daily living, work ability, social and leisure activities, social relationships and whether any ongoing symptoms of HI are having a persisting effect on daily life. For those with moderate disability there are significant restrictions in lifestyle outside of the home (eg social and/or work) but independence in the home. Those with severe disability cannot support themselves independently in the community over a 24 h period (McMillan et al., 2016; Wilson et al., 1988).

### 2.4. Procedure

Individuals undergoing a CJSW court report were provided with an information sheet by their social worker and they indicated interest in participating verbally or through a sign-up sheet. Recruitment took place between February and July 2019. The researcher (HdM) met potential participants, reviewed the information sheet with them, obtained written informed consent and carried out the study assessments. Participants were invited to ask questions or report any distress caused by participating. None reported distress. The CJSW Court report for each individual was subsequently reviewed by the researcher and data extracted.

Based on the OSU TBI-ID assessment, participants with a history of loss of consciousness or impacts to the head that were repeated within short time intervals were classified as having significant head injury (SHI) (Bogner & Corrigan, 2009; McMillan et al., 2021). More specifically, those who reported a history of mild head injury with loss of consciousness for less than 30 min, or moderate or severe head injury with loss of consciousness for at least 30 min, or head injury without loss of consciousness on more than two occasions were included in the SHI group. The no significant head injury group (NoSHI) comprised those with no history of head injury, or mild head injury on fewer than three occasions and no history of head injury with loss of consciousness (Cassidy et al., 2004; Guskiewicz et al., 2005). The OSU TBI-ID defines moderate HI as any resulting in loss of consciousness (LoC) for 30 minutes–24 h, and severe HI as LoC > 24 h.

### 2.5. Data analysis

Analyses were carried out using SPSS (version 28). Outcome measures were assessed for normality using the Kolmogorov–Smirnov Test and parametric (paired *t*-test or Pearson correlation) or non-parametric tests (Chi Square, Mann Whitney U or Spearman correlation) used as appropriate.

### Ethics approval

The MVLS Ethics Committee at the University of Glasgow gave ethics approval (Ref., 200180023).

## 3. Results

### 3.1. Demographic data

Forty-six participants were recruited. None who expressed interest were excluded. Most participants self-identified as male (41/46; 89%) and of white ethnicity (44/46; 96%). The mean age was 37.6 years (SD 12.4; range 19–74) and mean years of education 10.6 (SD 2.3; range 7–22). Over half (28/46; 61%), reported having attended mainstream schooling, 20% received support and 20% specialist education. Differences between groups were not significant for age, having had educational support or special schooling, years of education or employment (see Table 1).

### 3.2. Head injury

Most participants (42/46; 91%) reported a history of HI. LoC after HI was reported in 32/46 (70%), and was for less than 30 min in 24/46

**Table 1**  
Demographic comparisons between groups; N and (%) or Mean and (SD).

		SHI (n = 33)	NoSHI (n = 13)	P
Gender	Male	30 (91%)	11 (85%)	–
Ethnicity	White	32 (97%)	12 (92%)	–
Age (years)		36.64 (11.48)	40.15 (14.74)	0.393
Years of education		10.42 (1.79)	11.0 (3.39)	0.456
Schooling	Mainstream	20 (61%)	8 (61%)	0.953 <sup>a</sup>
	Mainstream and 1/1 support	5 (15%)	4 (31%)	
	Special school	8 (24%)	1 (08%)	
Employment	Employed	13 (39%)	6 (46%)	0.208
	Unemployed	20 (61%)	7 (54%)	

<sup>a</sup> (Mainstream schooling vs other).

(52%), 30 min to 24 h in 6/46 (13%) and longer than 24 h in 2/46 (4%). Multiple HI were reported by 24/46 (52%), all but one of these reporting a history of LoC. Overall, the SHI group comprised 33/46 (72%) and the NoSHI group 13/46 (28%). In the SHI group 16/33 (49%) had a HI by the age of 10 and 24/33 (73%) before the age of 18. The most common cause of SHI was fighting (24/33; 73%), with falls (21/33; 64%) and motor vehicle accidents (19/33; 58%) also common.

### 3.3. Physical health and other central nervous system (CNS) history

A wide range of physical health complaints were self-reported by 19/46 (41%), with group differences not significant (p = 0.806). Almost half of the sample (22/46; 48%) reported a history of CNS disorder other than HI, with differences in overall prevalence not significant between groups (p = 0.887). The CNS conditions reported were ADHD (11/46; 24%), learning difficulty (4/46; 9%), autistic spectrum disorder (1/46; 2%), epilepsy (2/46; 4%), meningitis (1/46; 2%), cerebral hypoxia (1/46; 2%) and stroke (2/46; 4%).

### 3.4. Mental health and substance use

Difficulties with mental health were self-reported by 24/33 (73%) in the SHI group and 6/13 (46%) in the NoSHI group, with differences not significant (p = 0.088). More in the SHI group were above the cut-off on the CORE-10 indicating clinical levels of distress (Chi Squared 9.898; r = 0.464; p = 0.002), (Table 2).

Potentially harmful use of substances was high amongst the sample. The DAST-10 identified that 22/46 (48%) were at risk of harm. Alcohol use on the AUDIT was potentially harmful or worse in 33/46 (72%). Group differences between those rated as low risk or higher risk on the DAST-10 (p = 0.425) or at low or higher risk on the AUDIT (p = 0.091) were not significant. However a significant group effect was found when comparing those with scores indicating low versus higher risk on either the DAST-10 or AUDIT (Chi squared = 4.927; r = 0.327; p = 0.026),

**Table 2**  
Mental health and substance use (N; %).

Measure		SHI (n = 33)	NoSHI (n = 13)	Total Sample (n = 46)
CORE-10	Healthy	5 (15)	8 (62)	13 (28)
	Distressed	28 (85)	5 (38)	33 (72)
DAST-10	Low risk	16 (49)	8 (62)	24 (52)
	Higher risk	17 (51)	5 (38)	22 (48)
AUDIT	Low risk	7 (21)	6 (46)	13 (28)
	Higher risk	26 (79)	7 (21)	33 (72)
AUDIT or DAST-10	Low risk	5 (15)	6 (46)	11 (24)
	Higher risk	28 (85)	7 (54)	35 (76)

with those in the SHI group at higher risk.

### 3.5. Cognitive Function

Differences between groups on cognitive tests were not significant (p > 0.05; see Appendix 2). Self-report scores on the DEX questionnaire were higher in the SHI group (median 31; quartiles 22,39) than in the NoSHI group (23; 9,29), (Mann Whitney U = 290.5; p = 0.039) and more in the SHI group (20/32; 63%) than in the NoSHI group (3/13; 23%) were above the cut-off on the DEX that suggests executive impairment (Fisher’s Exact Test; r = 0.354; p = 0.023). The majority of participants (38/46; 83%) scored above the cut-off on the WMT suggesting reasonable effort on tests, with no significant difference between groups (p = 0.420). Group differences on cognitive tests remained non-significant if excluding participants below the cut-off on the WMT (p > 0.05).

### 3.6. Disability

Disability associated with SHI was found in 13/33 (39%) participants and was moderate in 11/33 (33%) and was severe in 2/33 (6%) of these.

### 3.7. Offence history

Almost half of participants had been arrested before the age of 18 (43%; 20/46); 52% had more than five previous convictions and 54% a previous prison sentence (25/46). Significant differences between SHI and NoSHI groups were not found in relation to offence history (p > 0.05; see Table 3).

### 3.8. CJSW court reports

No report noted a history of HI. Mental health difficulties were noted in 26/46 (57%) reports, physical health problems in 16/46 (35%), possible cognitive impairment in 4/46 (9%) and ‘disability’ was mentioned in general terms in 8/46 (17%).

## 4. Discussion

The prevalence of SHI was high in individuals undergoing a CJSW assessment for Court, being found in 72% of the sample. Almost all of these had a history of LoC and more than half of multiple head injury. The overall prevalence of SHI was somewhat higher than the 40–60% estimated in meta-analyses of studies on incarcerated adult offenders (Farrer & Hedges, 2011; Shiroma, Ferguson, & Pickelsimer, 2010). Although it is conceivable, that the higher prevalence in our sample reflects presentencing status, this may be unlikely given that the rate is similar to that found in adults in prison in Scotland (McGinley et al., 2019; McMillan, et al., 2021). In Scotland, fighting followed by falls as the most common cause of SHI is typical for male offenders (McGinley et al., 2019; McMillan et al., 2023), whereas domestic abuse is most common in female offenders (McMillan, et al., 2021a). The overall sample seems representative of the population of CJSW cases and of

**Table 3**  
History of offending (number and % or median and quartiles).

	SHI (n = 33)	NoSHI (n = 13)	P
Violent	21 (64%)	6 (46%)	0.278
Sexual	6 (18%)	1 (8%)	0.373
Property	9 (27%)	5 (45%)	0.458
Other	33 (100%)	12 (92%)	0.276
Age at first arrest (years)	18 (14,28)	21 (17,26)	0.183
Number of convictions	8 (2,14)	4 (2,10)	0.339
Previous conviction	28 (85%)	12 (92%)	0.499
Previous prison sentence	20 (61%)	5 (39%)	0.175

prisoners in Scotland in terms of gender, ethnicity and education (McGinley et al., 2019; McMillan et al., 2021b, 2023; Scottish Government, 2020a, 2020b; Scottish Prison Service, 2021).

Physical and mental health problems, alcohol and drug misuse are known to be common in offenders (Binswanger et al., 2009; Dirkzwager et al., 2021). The sample here was no exception, with 65% self-rating as having mental health difficulties and 41% physical health problems. On questionnaire measures 72% were clinically distressed and 76% had moderate or severe health risk from drug or alcohol use. Finding that the SHI group was more likely to have severe mental health problems and risk of hazardous drug or alcohol use is consistent with studies on offenders with HI in treatment programmes or in prison (Perron & Howard, 2008; Schofield et al., 2006; Vaughn, 2019; Williams, Cordan, et al., 2010). There has been increasing interest in other CNS problems in offenders including from a neurodevelopmental perspective (Hughes et al., 2020). A wide range of other CNS problems were prevalent in the sample in both groups, being reported in 48% overall and most commonly as ADHD. The low frequency of occurrence of most conditions and lack of detailed clinical information made it inappropriate to consider them further in relation to the outcome variables.

More than a third of participants in the SHI group had persisting disability. This prevalence is similar to that found in adult prisoners in Scotland (McGinley et al., 2019; McMillan, et al., 2021a), and there is little evidence about HI associated disability from other countries (McMillan et al., 2021b, 2023; Moynan & McMillan, 2017). Those in the SHI group more often self-rated as having behavioural problems arising from executive dysfunction than the NoSHI group. Others have reported executive dysfunction in prisoners (Schumlich et al., 2018), and that this is more severe in prisoners with HI (Pitman et al., 2014). Although it may seem surprising that scores on cognitive tests were not worse in the SHI group, this finding is consistent with several other studies and probably reflects poorer cognitive function more generally in offenders than in the general population (Kenny & Lennings, 2007; McMillan, et al., 2021; Vaughn, 2019). For example, in the present study performance on verbal list learning was significantly poorer in the overall sample than expected from test norms (see Appendix 2). A history of SHI was not noted in any of the CJSW reports despite the high prevalence and associated disability in more than a third of participants. Informal feedback from the social workers suggested that they lacked awareness of the high prevalence and potential impact of head injury in their client group and did not have training about HI or its impact.

These findings support a view that screening for SHI is relevant to Court processes in a number of ways. Problems with executive function are associated with impulsive behaviour, difficulty planning and organising, poor temper control, unconcern, repeating problem behaviour, confusing details of different events and being concrete and having difficulty with nuance (Burgess et al., 1998; Wood & Worthington, 2017). These characteristics may not be identified as neurobehavioural, particularly given the 'hidden nature' of disability after HI (Simpson et al., 2002), and as a consequence an individual may be perceived as 'difficult' or 'defiant'. Offenders are often not aware of the enduring impact of SHI and this may partly be because they may not attend hospital following injury (Buchan & McMillan, 2022; Schofield et al., 2006). However executive problems could clearly result in difficulty in following Court processes, being aggressive in custody, in giving responses during questioning that are not clear or consistent and not understanding nuance including with regard to the sentence. Indeed qualitative studies on offenders with HI point to lived experience of this kind (Eriksson et al., 2018; Lansdell et al., 2018). In the present study the head injuries often occurred in childhood or adolescence and given this, could have had enduring impact and potentially have affected social maturation (Catroppa et al., 2015; Moffitt et al., 1996). Those with SHI are also at risk of further HI given that they are likely to return to the same social and peer environment where the of risk factors for past head injury are likely to remain. Those with SHI were more likely to have clinical levels of distress and this may in part be due to an interaction

with impaired executive function resulting in a perceived lack of control. Indeed there was a strong association ( $r = 0.59$ ;  $p < 0.001$ ) between participant ratings for psychological distress (CORE-10) and ratings of dysexecutive behaviour (DEX). It seems clear that a history of SHI could be an important consideration when determining community sentences and prisoner release. Without support, those with impaired executive function are less likely to sustain employment, are at greater risk of using substances (which may exaggerate dysexecutive effects) (Weil et al., 2016), be forgetful and less well organised, be less able to sustain accommodation and be at risk of homelessness and overall be at greater risk of recidivism (Nagele et al., 2018; Stubbs, 2020). Furthermore, following imprisonment, people with a history of SHI are more likely to break prison rules and incur serious disciplinary charges (Matheson et al., 2020; Shiroma, Pickelsimer, et al., 2010). Provision of education about brain injury, facilitating a structured environment, use of mnemonic aids and supported employment might mitigate these risks. Even a single session of education can improve knowledge about HI in offenders (Buchan and McMillan, 2022). Screening for SHI by CJSW during the Court process may be a way forward in considering its potential significance early in the criminal justice process, including to inform diversionary sentences. The goal would be to reduce poor compliance, reoffending and unsuccessful probation, all of which are more likely in offenders with a history of head injury (Gorgens et al., 2021; Ray & Richardson, 2017).

Although this is the first study to look at history of HI in defendants undergoing the Court process, it is limited by the modest sample size. The sample was however representative of this population in terms of demographics, gender and ethnicity. Reliance was made on self-report regarding health history including that of HI and this could be unreliable. Attempts were made to reduce this potential source of bias by using validated questionnaires. It should also be noted that hospital records are not likely to accurately represent history of HI because offenders do not always attend hospital (Schofield et al., 2006). Finally, the causes of head injury in offenders often include violent assault including in childhood and this can be associated with psychological trauma. We did not explore this in this study but have done so in larger scale studies about head injury in offenders (McMillan et al., 2021a, 2023).

## 5. Conclusions

HI is common in criminal defendants, and is associated with disability, psychological distress and dysexecutive behaviour. There is a need for screening for HI in CJSW assessments and training of CJSW to improve awareness and understanding of neurobehavioural problems associated with executive dysfunction. There are implications for appropriate disposal, rehabilitation and diversionary programmes and the effectiveness of modifications to these need to be evaluated by research in relation to impact on wellbeing and recidivism.

## Funding

Scottish Government.

## Author declaration

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have

followed the regulations of our institutions concerning intellectual property.

We further confirm that any aspect of the work covered in this manuscript that has involved either experimental animals or human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs. We confirm that we have provided a current, correct email address which is accessible by the Corresponding Author and which has been configured to accept email from [thomas.mcmillan@glasgow.ac.uk](mailto:thomas.mcmillan@glasgow.ac.uk).

#### CRedit authorship contribution statement

**Holly de Mora:** Data curation, Investigation, Validation, Writing – review & editing, Methodology. **Jean McFarlane:** Investigation, Project administration, Supervision, Writing – review & editing. **Tom M. McMillan:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing.

#### Declaration of competing interest

The authors report there are no competing interests to declare.

#### Acknowledgements

Thanks are due to Angela Sprott for support in facilitating this study. HdeM was funded by NHS Education Scotland.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.fsml.2024.100129>.

#### References

- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *The alcohol use disorders identification test: Guidelines for use in primary care* (2nd ed.). Department of Mental Health and Substance Dependence. World Health Organisation.
- Barkham, M., Bewick, B., Mullin, T., Gilbody, S., Connell, J., Cahill, J., & Evans, C. (2013). The CORE-10: A short measure of psychological distress for routine use in the psychological therapies. *Counsel Psychother Res*, 13(1), 3–13.
- Binswanger, I. A., Krueger, R., & Steiner, J. F. (2009). Prevalence of chronic medical conditions among jail and prison inmates in the USA compared with the general population. *Journal of Epidemiology & Community Health*, 63, 912–919.
- Bogner, J., & Corrigan, J. D. (2009). Reliability and predictive validity of the Ohio State University TBI identification method with prisoners. *The Journal of Head Trauma Rehabilitation*, 24(4), 279–291.
- Buchan, L., & McMillan, T. M. (2022). Prisoner knowledge about head injury is improved by brief psychoeducation. *Brain Injury*, 36(3), 401–405. <https://doi.org/10.1080/02699052.2022.2034187>
- Burgess, P. W., Alderman, N., Evans, J., Emslie, H., & Wilson, B. A. (1998). The ecological validity of tests of executive function. *Journal of the International Neuropsychological Society*, 4(6), 547–558.
- Cassidy, J. D., Carroll, L. J., Peloso, P. M., et al. (2004). Incidence, risk factors and prevention of mild traumatic brain injury: Results of the WHO collaborating centre task force on mild traumatic brain injury. *J Rehabil Med*, 43(suppl), 28–60.
- Catroppa, C., Crossley, L., Hearn, S. J., Yeates, K. O., Beauchamp, M., Rogers, K., & Anderson, V. (2015). Social and behavioral outcomes: Pre-injury to six months following childhood traumatic brain injury. *J Neurotrauma*, 32(2), 109–115. <https://doi.org/10.1089/neu.2013.3276>
- Coughlan, A., & Hollows, S. (1985). *The adult memory and information processing battery (AMIPB): Test manual*. Leeds: St James' University Hospital.
- Dirkzwager, A. J. E., Verheij, R., Nieuwbeerta, P., & Groenewegen. (2021). Mental and physical health problems before and after detention: A matched cohort study. *The Lancet Regional Health - Europe*, 8, Article 100154.
- Eriksson, A., Saunders, B., Gaye Lansdell, G., & Rebecca Bunn, R. (2018). 'Short fuse and no filter': Acquired brain injury – how a medical disability transforms into a social and criminal justice concern. *Int J Law, Crime Justice*, 57, 126–136. <https://doi.org/10.1016/j.ijlcrj.2019.03.008>, 2019.
- Farrer, T. J., & Hedges, D. W. (2011). Prevalence of traumatic brain injury in incarcerated groups compared to the general population: A meta-analysis. *Progress In Neuro-Psychopharmacology & Biological Psychiatry*, 35(2), 390–394.
- Gorgens, K. A., Meyer, L., Dettmer, J., et al. (2021). Traumatic brain injury in community corrections: Prevalence and differences in compliance and long-term outcomes among men and women on probation. *Criminal Justice Behavior*, 48(12), 1679–1693. <https://doi.org/10.1177/00938548211010316>
- Green, P., Lees-Haley, P. R., & Allen, L. M. (2003). The Word Memory Test and validity of neuropsychological test scores. *J For Neuropsychology*, 2, 97–124.
- Guskiewicz, K. M., Marshall, S. W., Bailes, J., et al. (2005). Association between recurrent concussion and late-life cognitive impairment in retired professional football players. *Neurosurgery*, 57, 719–726.
- Hughes, N., Ungar, M., Fagan, A., et al. (2020). Health determinants of adolescent criminalisation. *Lancet Child Adolesc Health*, 4(2), 151–162.
- Kenny, D. T., & Lennings, C. J. (2007). The relationship between head injury and violent offending in juvenile detainees. *Crime and Justice Bulletin*, No 7, 1–15.
- Lansdell, G., Saunders, B., Eriksson, A., Bunn, R., & Baidawi, S. (2018). 'I am not drunk; I have an ABI': Findings from a qualitative study into systematic challenges in responding to people with acquired brain injuries in the justice system. *Psychiatr, Psychol Law*, 25(5), 737–758. <https://doi.org/10.1080/13218719.2018.1474818>
- Mair, G. (2004). *What matters in probation*. Devon: Willan Publishing.
- Matheson FI McIsaac, K. E., Fung, K., et al. (2020). Association between traumatic brain injury and prison charges: A population-based cohort study. *Brain Injury*, 34(6), 757–765. <https://doi.org/10.1080/02699052.2020.1753114>
- McGinley, A., Aslam, H., Walker, V., & McMillan, T. (2019). Head injury and associated disability in male prisoners 0448. *Brain Injury*, 33, 163–164, 2019.Issue sup.1.
- McMillan, T. M. (2021a). Head injury and offending. In J. M. Brown, & M. A. H. Horvath (Eds.), *Cambridge handbook of forensic psychology*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/9781108848916> (Chapter 3),6; pp. 573–570.
- McMillan, T. M., Aslam, H., Crowe, E., Seddon, E., & Barry, S. J. E. (2021b). Associations between significant head injury and persisting disability and violent crime in women in prison in Scotland, UK: A cross-sectional study. *Lancet Psychiatry*, 8, 512–520.
- McMillan, T. M., McVean, J., Aslam, H., & Barry, S. J. E. (2023). Associations between significant head injury in male juveniles in prison in Scotland UK and cognitive function, disability and crime: A cross sectional study. *PLoS One*, 18(7), Article e0287312. <https://doi.org/10.1371/journal.pone.0287312>
- McMillan, T. M., Wilson, L., Teasdale, G. E., Ponsford, J., Levin, H., & Bond, M. R. (2016). The glasgow outcome scale: 40 Years of application and refinement. *Nature Reviews Neurology*, 12, 477–485. <https://doi.org/10.1038/nrneuro.2016.891>
- Moffitt, T. E., Caspi, A., Dickson, N., Silva, P., & Stanton, W. (1996). Childhood-onset versus adolescent-onset antisocial conduct problems in males: Natural history from ages 3 to 18 years. *Develop Psychopathol*, 8(2), 399–424. <https://doi.org/10.1017/S0954579400007161>
- Moynan, C. R., & McMillan, T. M. (2017). Associated disability in prison populations: A systematic review. *The Journal of Head Trauma Rehabilitation*, 33(4), 275–282.
- Nagele, D., Vaccaro, M., Schmidt, M. J., & Keating, D. (2018). Brain injury in an offender population: Implications for re-entry and community transition. *J Offender Rehabil*, 57(8), 562–585. <https://doi.org/10.1080/1059674.2018.1549178>
- National Prisoner Healthcare Network. (2016). *National prisoner Healthcare Network: Brain injury and offending report*. Edinburgh: NPHN. <https://www.sabin.scot.nhs.uk/wp-content/uploads/2019/05/Brain-Injury-Offending-Final-Report-2016-1.pdf> (checked January 2024).
- O'Rourke, C., Linden, M., & Lohan, M. (2018). Misconceptions about traumatic brain injury among probation services. *Disability & Rehabilitation*, 40(10), 1119–1126. <https://doi.org/10.1080/09638288.2017.128827>
- Perron, B. E., & Howard, M. O. (2008). Prevalence and correlates of traumatic brain injury among delinquent youths. *Criminal Behaviour and Mental Health*, 18(4), 243–255.
- Pitman, I., Haddlesley, C., Ramos, S. D. S., Oddy, M., & Fortescue, D. (2014). The association between neuropsychological performance and self-reported traumatic brain injury in a sample of adult male prisoners in the UK. *Neuropsychological Rehabilitation*, 25(5), 763–779.
- Raine, A. (2019). A neurodevelopmental perspective on male violence. *Infant Mental Health Journal*, 40, 84–97.
- Ray, B., & Richardson, N. J. (2017). Traumatic brain injury and recidivism among returning inmates. *Criminal Justice and Behavior*, 44(3), 472–486. <https://doi.org/10.1177/0093854816686631>
- Schofield, P. W., Butler, T. G., Hollis, S. J., Smith, N. E., Lee, S. J., & Kelso, W. M. (2006). Neuropsychiatric correlates of traumatic brain injury (TBI) among Australian prison entrants. *Brain Injury*, 20(13–14), 1409–1418. <https://doi.org/10.1080/02699050601130443>
- Schumlich, E. J., Reid, G. J., Hancock, M., & Hoaken, P. N. S. (2018). Executive dysfunction in criminal populations: Comparing forensic psychiatric patients and correctional offenders. *Int J Forensic Mental Health*, 18(3), 243–259. <https://doi.org/10.1080/14999013.2018.1495279>
- Scottish Government. National Care Service - justice social work: overview; <https://www.gov.scot/publications/national-care-service-justice-social-work-scotland/pages/8/> (checked January 2024).
- Scottish Government. Criminal Proceedings in Scotland 2019-20; <https://www.gov.scot/news/criminal-proceedings-in-scotland-2019-20/> (checked January 2024).
- Scottish Government. (2020a). Scottish prison population statistics 2019-2020. Edinburgh <https://www.gov.scot/publications/scottish-prison-population-statistics-2019-20/pages/3/> <https://scotland.shinyapps.io/sg-prison-population-statistics/> (checked January 2024).

- Scottish Government. (2020b). *Criminal justice social work statistics 2019-2020*. Edinburgh <https://www.gov.scot/publications/criminal-justice-social-work-statistics-additional-tables-back-to-2004-2005/>. checked January 2024).
- Scottish Government. (2023). *Justice social work - reports and court-based services: Practice guidance*. <https://www.gov.scot/publications/justice-social-work-reports-court-based-justice-social-work-services-practice-guidance/pages/6/> (checked January 2024).
- Scottish Prison Service. (2021). *17<sup>th</sup> prison survey 2019*. *Scottish prison service*. Edinburgh. Checked May 2022 <http://www.sps.gov.uk/Corporate/Publications/Publication-7196.aspx>.
- Shiroma, E. J., Ferguson, P. L., & Pickelsimer, E. E. (2010). Prevalence of head injury in an offender population; a meta-analysis. *J Corr Health Care*, *16*, 147–159.
- Shiroma, E. J., Pickelsimer, E. E., Ferguson, P. L., Gebregziabher, M., Lattimore, P. K., Nicholas, J. S., Dukes, T., & Hunt, K. J. (2010). Association of medically attended traumatic brain injury and in-prison behavioral infractions: A statewide longitudinal study. *J Corr Health Care*, *16*(4), 273–286.
- Simpson, G., Simons, M., & McFadyen, M. (2002). The challenges of a hidden disability: Social work practice in the field of traumatic brain injury. *Australian Social Work*, *55* (1), 24–37. <https://doi.org/10.1080/03124070208411669>
- Skinner, H. A. (1982). The drug abuse screening test. *Addictive Behav*, *7*(4), 363–371.
- Smith, A. (1982). *Symbol Digit Modalities test*. Los Angeles, CA: Western Psychological Services.
- Stubbs. (2020). Traumatic brain injury in homeless and marginally housed individuals: A systematic review and meta-analysis. *The Lancet Public Health*, *5*, e19–e32. [https://doi.org/10.1016/S2468-2667\(19\)30188-4](https://doi.org/10.1016/S2468-2667(19)30188-4)
- Tombaugh, T. (2004). Trail making test A and B: Normative data stratified by age and education. *Archiv Clin Neuropsychology*, *19*(2), 203–214.
- Vaughn, M. G. (2019). Traumatic brain injury and psychiatric Co-morbidity in the United States. *Psychiatr Quarterly*, *90*, 151–158.
- Weil, Z. M., Corrigan, J. D., & Karelina, K. (2016). Alcohol abuse after traumatic brain injury: Experimental and clinical evidence. *Neuroscience & Biobehavioral Reviews*, *62*, 89–99.
- Williams, H. W., Cordan, G., Mewse, A. J., et al. (2010). Self-reported traumatic brain injury in male young offenders: A risk factor for re-offending, poor mental health and violence? *Neuropsychol Rehabil*, *20*(6), 801–812.
- Williams, W. H., Mewse, A. J., Tonks, J., Mills, S., Burgess, C. N. W., & Cordan, G. (2010). Traumatic brain injury in a prison population: Prevalence and risk for re-offending. *Brain Injury*, *24*(10), 1184–1188.
- Wilson, J. T., Pettigrew, L. E., & Teasdale, G. M. (1988). Structured interviews for the glasgow outcome scale and the extended glasgow outcome scale: Guidelines for their use. *J Neurotrauma*, *15*, 573–585.
- Wood, R. L., & Worthington, A. (2017). Neurobehavioral abnormalities associated with executive dysfunction after traumatic brain injury. *Front Behav Neuroscience*, *11*, 195.