# Exploring Associations between Head Injury and Violence in Juvenile Offenders and Investigating the Role of Protective Factors in their Desistance from Offending

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Submitted in partial fulfilment of the requirements for the degree of

Doctorate in Clinical Psychology

Institute of Health and Wellbeing

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March 2021

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# Acknowledgements

Completing this thesis during a global pandemic has been an emotional rollercoaster, filled with so much uncertainty. Many people have played various roles in helping me complete this research during these challenging times.

Firstly, I would like to offer a huge thank you to my research supervisor Professor Tom McMillan. Your continued knowledge, help, and support through the development of this thesis has been invaluable. To my field supervisor, Dr Leighanne Love, thank you so much for your sustained efforts with the compilation of data, this thesis would not have been possible without you. Thank you to the social workers based in the Intensive Support and Monitoring service for sourcing offence data at very short notice. Thank you to my fellow trainee Kirstin Ferguson for being the second-rater for the systematic review, it was very much appreciated! Thank you to Nicola Greenlaw from the Roberston Centre for Biostatistics who provided me with expert statistical advice. I am also grateful for the support provided by my research advisor Dr Breda Cullen and my clinical tutor Dr Gavin Richardson.

To my DClinPsy cohort, I appreciate all your support throughout training - particularly the APLs who helped me feel like we were all in this together. A big thank you to Suzanne Felix for always keeping me grounded with her sensible words and for being so patient with all my zoom calls about thesis. I am so pleased to have found a friend like you on the course.

Thank you to my mum and Allister for listening to all my thesis woes! Finally, I want to give a special thank you to my son, Mason, who has been incredibly patient throughout my studies, especially when I have been so preoccupied. I dedicate this thesis to you. I hope its completion allows us to spend more valuable time together.

# Foreword

Due to the Covid-19 pandemic and restrictions on social contact, the original proposal for the Major Research Project had to be abandoned (see appendix 3.2, pp. 103-120). The original proposal explored head injury and its correlates in juvenile offenders. This research was subsequently changed to a secondary data study investigating protective factors in risk assessment and their association with desistance in juvenile offenders. No recruitment process therefore took place and data was compiled from existing service records by a clinical psychologist.

# Chapter One: Systematic Review

## Head Injury and its Association with Violent Offending in Juveniles: A PRISMA Systematic Review

Prepared in accordance with the author requirements for the Journal of Aggression and Behavior, appendix 1.1 (pp. 72-77)

# Abstract

**Background**

Head injury (HI) is more common among juvenile offenders than in young people who do not offend. HI may be associated with cognitive, behavioural, and affective changes that can lead to criminal behaviours, including violent offences.

**Aim**

To systematically review the literature on associations between HI and violent offending in juveniles. Duration of loss of consciousness (LOC) and the number of injuries sustained were considered as potential influencing factors.

**Methods**

Four electronic databases were systematically searched from the date they began to 23rd January 2021 (Medline, EMBASE, PsychINFO and CINAHL). An additional hand search of the references of relevant papers was conducted. Studies were rated as having a low or high risk of bias using predetermined criteria.

**Results**

Eight studies were reviewed. Four high quality and two low quality found no significant association between HI and violent offending. Two low quality studies with a high risk of bias reported that presence of HI, LOC, and the number of HIs were significantly associated with more severe violent offences.

**Conclusion**

There is no clear evidence for an association between HI and violent offending in juvenile offenders. Further research is required.

**Keywords**

Juvenile, Violence, Offending, Head Injury, Traumatic Brain Injury

# Introduction

The onset of violent behaviour tends to occur in late childhood and adolescence (Liu et al., 2013). A greater proportion of common assault convictions in Scotland are for those under the age of 21 (23% female; 15% male) compared to those over 40 years (10% female; 9% male) (Scottish Government, 2020). Twenty-five percent of adult victims of violent crime report the offender to be under the age of 16 (Scottish Government, 2019). A total of 2,840 children aged between 8 and 17 were referred to the Children's Reporter for committing an offence in Scotland in 2019/2020, including 226 crimes of non-sexual violence (Scottish Children's Reporter Administration, 2020).

Head Injury (HI) is more prevalent in offenders than in the general population (Durand et al., 2017; McMillan et al., 2019). Approximately 30% of offending youth are estimated to have sustained a HI and their risk of having a HI is more than three times higher than in non-offending youth (Farrer et al., 2013). Juvenile offenders with a history of HI also report earlier onset of offending than those without HI (Perron & Howard, 2008) and paediatric HI has been found to be associated with higher rates of future anti-social behaviour, aggression, arrests, and offences (Bellesi et al., 2019).

HI can be associated with irritability and aggression (Rao et al., 2009; Tateno et al., 2003; Yang et al., 2012) and it has been suggested that the higher prevalence of HI in offending juveniles may be related to criminality, including violent offending (Williams et al., 2018). HI is associated with cognitive and behavioural sequelae that may increase offending behaviours, such as impulsivity, aggression, and poor decision making (Wood & Worthington, 2017). A recent review concluded that HI in childhood and adolescence is associated with personality changes, emotional lability, disinhibition, and poor social communication skills (Williams et

al., 2018). These factors may reduce the threshold for violence or contribute to factors that predispose a young person to violence (León-Carrión & Ramos, 2003). Frontal lobe lesions have been associated with greater aggression, violence, and antisocial behaviour (Brower, 2001; Grafman et al., 1996). This area of the brain continues to develop during adolescence (Arain et al., 2013) and may be more vulnerable to dysfunction as a result of a HI (Anderson et al., 2002).

A Swedish longitudinal population-based study found adults with HI had a threefold increased risk of violence compared to the general population (Fazel et al., 2011). A systematic review examining the link between adult female offenders and violent behaviour following a HI found some support for a positive relationship between HI and violence, however the methodological strength of available empirical research was weak so only limited conclusions could be made (O'Sullivan et al., 2015). Less is known about the association between HI and violent offending behaviour in juveniles. One systematic review and meta-analysis highlights a potential relationship between HI and violence in juvenile offenders, however violent offending was not the main focus of the review (Farrer et al., 2013). Considering the paucity of research, a systematic review examining associations between HI and violence in juveniles is warranted.

## Aim and Research Questions

### Aim

To systematically review the quality of empirical evidence that investigates associations between HI and violent offending in juveniles. It is anticipated that findings will inform youth justice services about the risks and needs of juvenile offenders who have sustained a HI.

**Research Questions**

1. Is violent offending more prevalent in those with a HI compared to those without a HI?
2. Is more severe HI associated with a higher prevalence of violent offending?
3. Is the number of HIs sustained associated with prevalence of violent offending?

# Methods

**Registration**

In accordance with PRISMA guidelines, a systematic review protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO) on 2nd November 2020 and was last updated on 8th December 2020 (registration number CRD42020198145).

**Inclusion Criteria**

Studies were selected for inclusion using a PECOS framework for systematic reviews (Morgan et al., 2018) which is outlined in the criteria below:

- The sample is juvenile offenders.
- The exposure to a prior history of a sustained HI is examined.
- Comparators include juvenile offenders without a prior history of HI or with less severe HI.
- The outcome is violent offending. This can include violent offences committed and violent offending behaviour displayed whilst incarcerated. The relationship between violent offending and HI is investigated.
- The study design is cross-sectional, case-control, or longitudinal and is quantitative in nature.

**Exclusion Criteria**

- Reviews or conference papers.
- Books or book chapters.
- Not written in the English language.
- Unpublished theses.

**Search Strategy**

The review follows PRISMA guidelines for developing a protocol and conducting a systematic review (Moher et al., 2009). Four electronic databases were searched on 23rd January 2021: OVID Medline (from 1964), OVID EMBASE (from 1806), OVID PsychINFO (from 1974) and Ebscohost CINAHL (from 1981). No date limits were imposed on the database searches and all were searched from the date they began. Searches were limited to the English language. Additionally, a hand search was conducted by searching the reference lists of suitable papers. Searches were conducted using a combination of subject headings included in database thesauri and a search of titles and abstracts using key terms with Boolean operators. Search terms included a combination of the following four searches:

i. child* OR young* OR juvenile* OR youth* OR adolescen* OR teen*
ii. offen* OR crimin* OR crime* OR prison* OR imprison* OR inmate* OR incarcerat* OR penitentiar* OR delinquen* OR perpetrat* OR jail* OR detain* OR forensic*
iii. brain injur* OR brain trauma* OR head injur* OR head trauma*
iv. violen* OR aggress*

Full search strategies for each database are included in appendix 1.2 (pp. 78-79). Suitable papers were identified by initially removing duplicate papers from the search and then

systematically excluding unsuitable papers based on screening titles, then remaining abstracts, then reading full articles that remained.

The initial database search was conducted by the author. The author and another final year Clinical Psychology trainee then screened eligible papers to increase validity of the search. The screening process was conducted using the online platform Rayyan (Ouzzani et al., 2016), which is a tool for collaboration in screening papers for systematic reviews.

In total, 523 papers were found and of these 206 were duplicates. The titles of the remaining 317 papers were screened and through this process 277 papers were excluded. The remaining 40 papers were read in full for eligibility to be included in the review. Six papers were finally included from the database search. One of these included two studies with different samples, and each study was included separately for the purposes of review (study numbers 2 and 3). An additional hand search of the references used by studies to be included in the review revealed one additional paper. Therefore, a total of 8 studies were included for review (figure 1.1).

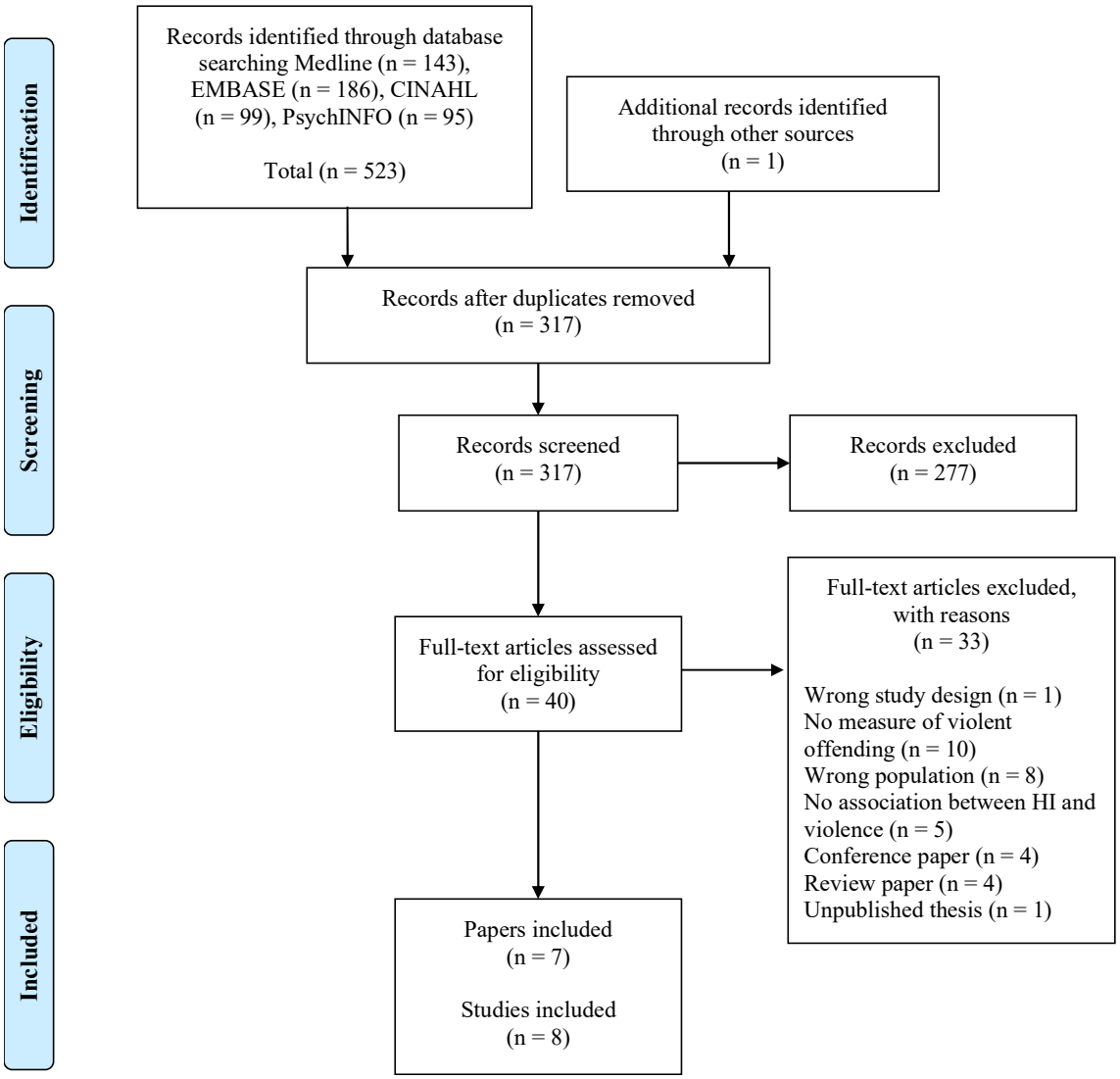


Figure 1.1: Prisma flow chart of search

## Quality Rating

Quality was assessed using a tool for rating the risk of methodological bias for observational studies (Sanderson et al., 2007). Adaptations to this rating tool were informed by its use in previous systematic reviews investigating HI in offenders (McGinley & McMillan, 2019; Moynan & McMillan, 2018). Included studies were independently assessed by the same two reviewers who had reviewed the papers for inclusion in the review. Initial interrater concordance was 86% (48/56). No systematic differences in ratings were found, with

differences occurring across a range of domains and studies (see appendix 1.3, pp. 80). Conflict in ratings were resolved through discussion. Risk of bias was rated as high or low according to the criteria in table 1.1.

Table 1.1: Risk of bias assessment domains and criteria

| Domain | Criteria |
|---|---|
| Method for selecting study participants | i. Inclusion and exclusion criteria for study participation is clearly defined<br>ii. Means of recruitment are clearly stated |
| Design-specific sources of bias | The study considers design-specific sources of bias, such as selection or information bias, and takes appropriate action to address these. This may include (but is not limited to):<br>i. The sample is representative of the population from which it is taken<br>ii. The sample is demographically representative of the larger juvenile offending population<br>iii. The study corroborates self-report of HI and/or violence with official records or vice-versa |
| Methods for assessing HI | i. A standardised tool is used to measure number and severity of HI<br>ii. An internationally recognised definition of HI is used i.e., LOC <30minutes = mild HI and LOC>30minutes = moderate-severe HI (Malec et al., 2007). |
| Methods for assessing violence | The definition of violence and the means of measurement are clearly stated. Measurements of violence could include:<br>i. Arrests for violent offences<br>ii. Charges for violent offences<br>iii. Current criminal offences of a violent nature<br>iv. Social work reports for violence<br>v. Police reports for violence<br>vi. Prison or secure care incident reports for violence |
| Methods to control confounding | Controlling of confounding variables through statistical methods. Confounders may include (but are not limited to):<br>i. Mental health difficulties<br>ii. Substance use<br>iii. Presence of Adverse Childhood Experiences<br>iv. Social deprivation |

| | |
|---|---|
| | v. Whether the violent act(s) occurred prior to or after the HI |
| Statistical methods | Appropriate statistical methods and analyses are used to determine association between HI and violence. Statistical analyses are appropriately reported. |
| Conflict of interest | Conflicts of interest are declared. |

# Results

**Risk of Bias Assessment**

Four studies were considered as having a high risk of bias (2,3,5,7) and four as low risk (1,4,6,8). No study was rated as low risk of bias across all domains. High risk was predominantly found for three domains: 'design-specific sources of bias', 'method for assessing HI', and 'methods to control for confounding'. In terms of design-specific bias, studies tended not to corroborate their sources of HI measurement and either relied on self-report (which may be affected by recall bias) or relied on official hospital records (which may have not captured HIs that did not require hospital attention). Half of the studies assessed HI using an internationally recognised classification (1,2,3,6) and only two of these (2,3) used a standardised screening measure in the form of the Brain Injury Screening Questionnaire (Dams-O'Connor et al., 2014). Confounding factors were not controlled for in the design or analyses of five studies (1,2,3,5,8). One study controlled for age, gender, ethnicity, attending school in 6 months prior to current incarceration, and having a place in care prior to 16 years of age (6) and the other controlled for alcohol use, conduct disorder and cultural background (7). The inclusion/exclusion criteria for recruiting participants were not reported in three studies (2,3,7). Two studies relied on self-report to measure violent offending (1,5). Two studies did not clearly present the results from their analyses (2,3). Two studies did not report any conflicts of interest (5,7). The summary of risk of bias ratings are contained in table 1.2.

**Study Characteristics**

Studies were published between 2007 and 2019. Three studies were conducted in Australia, two in the United States of America, two in the United Kingdom, and one in Canada. All were cross-sectional studies, except study 4 which employed a prospective longitudinal design. Although study 4 was a longitudinal study, they gathered information for a number of variables unrelated to HI. They measured HI prospectively, however only measured associations between juvenile offending and HI at one timepoint. A total of 6678 participants were recruited across all studies; however only 5443 participants had HI data linked to juvenile offending and only these were included in study analyses. Most participants were male (83%–100%) and participant age ranged from 10–22 years. Participants were recruited from a range of young offender institutes, detention centres, correctional facilities, justice centres, youth offending teams, special needs schools, and from those on supervised community orders. Four studies (2,3,5,7) examined the cause of HI within their samples, and all of these studies found assaults, fights, or HI related to their offences to be the most frequently reported (table 1.3).

Table 1.2: Risk of bias ratings

| | **Method for selecting study participants** | **Design-specific sources of bias** | **Methods for assessing HI** | **Methods for assessing violence** | **Methods to control confounding** | **Statistical methods** | **Conflict of interest** | **Overall Rating** |
|---|---|---|---|---|---|---|---|---|
| 1. Davies et al. (2012) | Low | High | Low | High | High | Low | Low | 3/7 Low Risk |
| 2. Gordon et al. (2017) Study A | High | High | Low | Low | High | High | Low | 4/7 High Risk |
| 3. Gordon et al. (2017) Study B | High | High | Low | Low | High | High | Low | 4/7 High Risk |
| 4. Guberman et al. (2019) | Low | High | High | Low | Low | Low | Low | 2/7 Low Risk |
| 5. Williams et al. (2010) | Low | High | High | High | High | Low | High | 5/7 High Risk |
| 6. Moore et al. (2014) | Low | High | Low | Low | Low | Low | Low | 1/7 Low Risk |
| 7. Kenny & Lennings (2007) | High | High | High | Low | Low | Low | High | 4/7 High Risk |
| 8. Schofield et al. (2019) | Low | High | High | Low | High | Low | Low | 3/7 Low Risk |

Table 1.3: Summary of included papers

| Author & Country | Study Design & Setting | Sample | HI Measure | Violence Measure | Prevalence of HI & violence | Findings |
|---|---|---|---|---|---|---|
| 1.<br><br>Davies, Williams, Hinder, Burgess, & Mounce (2012)<br><br>United Kingdom | Cross-sectional<br><br>Young offender institutes | N = 61<br>Gender = 100% male<br>Age range = 16-18<br>Mean age = 16.87 | Self-report<br><br>Mild = LOC < 10 minutes; complicated mild = LOC 10-30, moderate-severe = 30-60, very severe = LOC > 60<br><br>HI Frequency = 0 to > 4 | Self-report<br><br>Created an IVO = sum of severity ratings for all violent convictions divided by total number of violent convictions | HI at some point in their lives = 72%, LOC in worst injury = 41%<br><br>Serving sentences of violent convictions = 59%<br><br>At least 1 prior conviction for a violent offence = 89% | No significant main effect of severity of HI (LOC of worst injury) on violent offending ($F_{4,57}$= 0.86, $p$= NS, OP= 0.256)<br><br>No significant main effect of the frequency of HI on violent offending ($F_{3,57}$= 1.05, $p$= NS, OP= 0.271) |
| 2.<br><br>Gordon, Spielman, Hahn-Ketter, & Therese (2017)<br><br>Study A<br><br>United States | Cross-sectional<br><br>State juvenile correctional facilities | N = 3346 (offending data only available for 3101)<br>Gender = 91% male<br>Age range = 10-22<br>Mean age = 15.8<br>Ethnicity = 47% Hispanic | Brain Injury Screening Questionnaire (BISQ)<br><br>Mild = LOC<30 minutes, moderate-severe = LOC>30 minutes | Official offending records from state correctional facilities<br><br>Classified as violent/non-violent | Met criteria for TBI = 22% (56% mild, 44% moderate-severe)<br><br>Serving sentences for violent crimes = 54%<br><br>Of those with no TBI 55% had committed violent crimes, for mild TBI 52% and moderate-severe 55% | No significant difference between violent/non-violent offences and TBI severity ($X^2$, p= .55)<br><br>TBI prior to first offence was associated with violent offences if compared to TBI sustained in same year or after ($X^2$= 11.48, $p$< .01)<br><br>TBI sustained at a younger age in violent than in non-violent offenders ($t_{,678}$= 3.90, $p$< .001) |

| Author & Country | Study Design & Setting | Sample | HI Measure | Violence Measure | Prevalence of HI & violence | Findings |
|---|---|---|---|---|---|---|
| 3.<br><br>Gordon, Spielman, Hahn-Ketter, & Therese (2017)<br><br>Study B<br><br>United States | Cross-sectional<br><br>County juvenile correctional facilities | N = 970 (offending data only available for 732)<br>Gender = 83% male<br>Age range = 10-22<br>Mean age = 15.2<br>Ethnicity = 72% Hispanic, Latino or Latina | Brain Injury Screening Questionnaire (BISQ)<br><br>Mild = LOC<30 minutes, moderate-severe = LOC>30 minutes | Official offending records from county database<br><br>Classified as violent/non-violent | Met criteria for TBI = 41% (82% mild, 19% moderate-severe)<br><br>No data on prevalence of violence in sample reported | No significant difference between violent/non-violent offences and TBI severity (no statistical details reported) |
| 4.<br><br>Guberman, Robitaille, Larm, Ptito, Vitaro, Tramblay, & Hodgins (2019)<br><br>Canada | Prospective longitudinal (although HI and juvenile offending was only measured at one timepoint)<br><br>Recruited when they entered elementary school and followed to age 24 | N = 724 (80 had a conviction for juvenile violence)<br>Gender = 100% male<br>Age = data extracted here from age 12-17 only | TBI information extracted from health files using ICD-9 codes<br><br>All TBI diagnoses recorded in medical files within 30 days of each other were counted as one TBI | Official offending records<br><br>Violent offending defined according to the Correctional Services of Canada classifications<br><br>Juvenile offending defined as between ages 12-17 | 12% of all participants had a juvenile conviction for violence (N = 80)<br><br>Of violent juvenile offenders, 8% (N = 6) had sustained one or more TBIs | Sustaining a TBI by age 12 was not associated with a juvenile conviction for violent crime<br><br>No TBI vs 1 ($X^2$= 0.54, $p$= 0.464)<br>No TBI vs 2 ($X^2$= 2.09, $p$ = 0.183)<br>No TBI vs 3 or more ($X^2$= 0.38, $p$= 1.000)<br>1 TBI vs 2 ($X^2$= 2.85, $p$= 0.149)<br>1 TBI vs 3 or more ($X^2$= 0.25, $p$= 1.000)<br>2 TBIs vs 3 ($X^2$= 1.07, $p$= 1.000) |

| Author & Country | Study Design & Setting | Sample | HI Measure | Violence Measure | Prevalence of HI & violence | Findings |
|---|---|---|---|---|---|---|
| 5.<br><br>Williams, Cordan, Mewse, Tonks, & Burgess (2010)<br><br>United Kingdom | Cross-sectional<br><br>Young offender institute, city-based Youth Offending Team & special needs school. | N = 186<br>Gender = 100% male<br>Age range = 11-19<br>Mean age = 16.67 | Self- report<br><br>Mild = LOC < 10 minutes, complicated mild = LOC 10-30, moderate-severe = 30-60, very severe = LOC > 60<br><br>Frequency = 0 injuries to > 4 | Self-report<br><br>Created IVO = combined sum of frequency score with score of severity of most severe violent offence | History of TBI = 65% (19% classed as possible TBI due to no LOC)<br><br>46% reported LOC (30% mild, 17% moderate-severe)<br><br>32% reported repeated injury with LOC<br><br>No data on prevalence of violence in sample reported | Significant main effect between TBI and increased severity of violent offending ($F_{5,180}$= 3.364, $p$= .006).<br><br>Significant difference between 2 or fewer TBIs vs 3 or more and IVO score ($F_{1,180}$= 12.268, $p$= .001) |
| 6.<br><br>Moore, Indig, & Haysom (2014)<br><br>Australia | Cross-sectional<br><br>Juvenile justice centres and a juvenile correction centre | N = 361<br>Gender = 88% male<br>Age range = 13-21<br>Mean age = 17.0<br>Ethnicity = 42% Aboriginal Australian | Self-report<br><br>Enquired about most severe TBI<br><br>LOC (mild = <30 mins, moderate/severe = >30)<br><br>Frequency of HI with LOC | Official offending records from the Juvenile Justice database<br><br>Most serious offence was categorised as violent/non-violent | 32% reported history of TBI<br><br>13% reported 2 or more TBIs<br><br>92% of most serious TBIs were mild<br><br>80% had their most serious current offence for violence | No significant difference between any TBI severity vs no TBI and violence, adjusted OR= 0.87 (95% CI= 0.46, 1.65)<br><br>No significant difference between 1 TBI vs no TBI and violence, adjusted OR= 0.66 (95% CI= 0.33, 1.35)<br><br>No significant difference between 2 or more TBIs vs no TBI and violence, adjusted OR= 1.59 (95% CI= 0.56,4.50) |

| Author & Country | Study Design & Setting | Sample | HI Measure | Violence Measure | Prevalence of HI & violence | Findings |
|---|---|---|---|---|---|---|
| 7.<br><br>Kenny & Lennings (2007)<br><br>Australia | Cross-sectional<br><br>Juvenile detention centres | N =242<br>Gender = 92% male<br>Age range = 14-21<br>Mean age = 17.17 (male), 16.92 (female)<br>Ethnicity = 42% Indigenous Australian | Self-report<br><br>Worst 3 HI reported<br><br>Severity determined by a range of factors including LOC and number of injuries<br><br>Classified as no HI, mild, moderate or severe | Official offending records from Department of Juvenile Justice and participant survey<br><br>Classified violent by standardised severity of violence codes (Kenny & Press, 2006)<br><br>Violent offending rated as absent, low, moderate or high | At least 1 HI with LOC = 35%<br><br>11% reported 2 injuries, 6% reported 3 injuries, and 4% reported three injuries with LOC<br><br>13% non-violent, 31% low, 44% moderate and 13% severe violence | No significant difference between HI (absent/present) and non-violent/mild, moderate or severe violence ($X^2$, $p$= 0.95)<br><br>Significant difference between HI (absent/present) and severe vs none/mild/moderate violence ($p$= 0.04).<br><br>Severe violent crime and HI, unadjusted OR= 2.37 (95% CI= 1.12, 4.93) and severe violent crime with LOC, unadjusted OR = 2.82 (95% CI= 1.33, 5.92)<br><br>HI vs no HI predicted more severe violence, unadjusted OR= 2.52, $p$= 0.027 (95% CI= 1.11, 5.72) |
| 8.<br><br>Schofield, Mason, Nelson, Kenny, & Butler (2019)<br><br>Australia | Cross-sectional<br><br>Juvenile offenders on a supervised community order | N = 788 (offending data available for 680)<br>Gender = 85% male<br>Age Range = 12-21<br>Mean age = 16.6 | Self-report<br><br>Enquired about frequency of HI, LOC, worst 3 injuries, cause and residual effects | Official offending records<br><br>Created IVO (Kenny & Press, 2006)<br><br>Classified violence as low (minimal and low) or high (moderate and severe) | 61% no TBI, 38% at least 1 and 15% 2 or more.<br><br>61% were rated as low violent offenders and 40% were rated high | No significant difference between no TBIs, 1 TBI, or multiple TBIs and more severe violent offending ($X^2$= .66, $p$= 0.72) |

TBI = Traumatic Brain Injury, LOC = Loss of Consciousness, BISQ = Brain Injury Screening Questionnaire, IVO = Index of Offending, OR = Odds Ratio, OP = Observed Power

**Research Questions**

*Is violent offending more prevalent in juveniles with a HI compared to those without a HI?*

No low risk of bias studies found differences between those with HI and those without. Two studies with low risk of bias across most domains (Guberman et al., 2019; Moore et al., 2014) had design-sources of bias due to lack of corroboration for HI. Guberman and colleagues (2019) were also rated as high risk of bias on their method of assessing HI as it relied on hospital records only and those HI that did not require treatment could have been missed. No significant difference was found between those with and without HI and number of HIs sustained (Guberman et al., 2019; Moore et al., 2014).

One high risk of bias study found a significant association between presence of HI and violent offending (Kenny & Lennings, 2007). Their categorisation of HI was not internationally recognised, only took account of the worst three HIs, and did not assess HI using a standardised measure. They were also scored as high risk of bias for their method for selecting study participants due to unclear inclusion/exclusion criteria, design-specific sources of bias, and for not declaring conflicts of interest. They found that having a HI was significantly associated with more severe violence (compared to non/mild/moderate violence) (OR= 2.37). They also found that HI (compared with no HI) predicted more severe violent offending (unadjusted OR= 2.52; 95% CI= 1.11, 5.72).

*Is more severe HI associated with a higher prevalence of violent offending?*

Four studies examined associations between duration of LOC (severity) and prevalence of violent offending. Only one was rated as having an overall low risk of bias and found no significant difference between severity of HI (LOC of worst injury) and violent offending (Davies et al., 2012).

Two studies with a high risk of bias (Gordon et al., 2017A,B) used the BISQ and an internationally recognised definition to assess HI but did not have clear inclusion/exclusion criteria for their recruitment. They also had design-specific sources of bias, did not control for confounding, and their analyses were not clearly reported. They found no significant association between severity of HI (as measured by LOC) and violent offending (yes/no) in either their state incarcerated or community samples.

As stated earlier, one study with a high risk of bias (Kenny & Lennings, 2007) examined associations between history of HI (absent versus present) and offenders who had committed severe violent offences versus those who had committed none/mild or moderate offences. Having found a significantly higher proportion of severely violent offenders who had HI (OR=2.37), they then compared HI (none versus 1 unconscious episode versus 2 or more unconscious episodes) with violence (severe versus none/mild/moderate) and found that the odds ratio for severe violent offending increased from 2.37 (HI versus no HI only) to 2.82 when LOC was accounted for (95% CI= 1.33, 5.92). As previously mentioned, this study had several methodological limitations.

*Is the number of HIs sustained associated with prevalence of violent offending?*

Four studies examined associations between the number of HIs sustained and violent offending. Three of these were rated as low risk of bias across the domains of selecting study participants, methods for assessing violence, appropriate statistical methods, and reporting conflicts of interest (Davies et al., 2012; Guberman et al., 2019; Schofield et al., 2019). Davies et al. (2012) and found no significant difference between 4 groups (those without HI versus 1 versus 2-4 versus more than 4) and violent offending. However, they did observe a "near significant" effect ($p$= .088) with those with more than 4 HIs tending to be at greater risk of violent

offending than those with fewer HIs. Their study appears to have been underpowered (Observed Power= .041) and given a total N of 61, our calculations indicate a medium effect size (*d*= .59). Guberman et al. (2019) found no association between the number of HI sustained before age 12 and violent juvenile convictions. Similarly, Schofield and colleagues (2019) found no statistically significant association between number of HIs (0 versus 1 versus multiple) and severity of violent juvenile offending (low versus high).

One high risk of bias study using a similar methodology to Davies et al. (2012) did find a that greater severity of violence was associated with having sustained more HIs (Williams et al., 2010). This study had several methodological issues, including not reporting conflicts of interest, using self-report measures, not corroborating self-report, and not controlling for confounding variables. They compared those without HI to those with 1, 2, 3, 4 or 5 or more HIs, finding a significant difference (*p*= .006). Post-hoc contrast analyses found that the difference between 2 or fewer HIs and 3 or more was significant (*p*= .001), indicating that the presence of 3 or more HIs was associated with greater violent offending. The effect size was not reported in the study but by our calculations it suggests a medium-large effect size (*d*= .64).

# Discussion

## Main Findings

This systematic review indicates that evidence for an association between HI and violence in juvenile offenders is weak. Six of the eight studies reviewed found no association between violence and the presence of HI or LOC duration or the number of HIs sustained. These six studies, with a total sample size of 5015 participants, included all four rated as low risk of bias. These low risk of bias studies consistently had appropriate methods of recruitment, explicitly

stated their inclusion/exclusion criteria, stated conflicts of interest, used appropriate methods of analysis, and reported their results clearly. Conversely, two high risk of bias studies found significant associations between HI and violent offending, which might point to a need for more robust studies in this area.

**Quality of the Evidence**

Overall, the quality of the evidence examining associations between HI and violent offending was mixed. Half of the studies were rated as having an overall high risk of bias. Notably, no study scored as low bias across all seven domains. Each study had its own methodological weaknesses that, to a lesser or greater extent, may have introduced bias.

Confounding variables were not accounted for in most studies. Only two studies, included in the same paper, considered when the HI occurred temporally in relation to the violent offending (Gordon et al., 2017, A, B). They found in their state sample study (A) that HI which occurred prior to the first offence was more often associated with violent offending than if occurring in the same year or after the offence. They also reported that the first HI was sustained at a younger age in violent offenders compared with non-violent offenders. Furthermore, several studies described the most reported cause of HI in juvenile offenders to be from assaults, fights and other activity that was related to offending behaviour (Gordon et al., 2017 A,B; Kenny & Lennings, 2007; Williams et al., 2010). Violence may therefore be a cause of HI rather than a consequence. Consequently, the timing of the HI, as well as the age at which it occurred, could be important covariates to consider when investigating the association between HI and violent offending.

The age range of the samples reviewed here varied between 10-22 due to differences in how studies defined a juvenile population. Brain development is thought to continue into an individual's mid-20s (Johnson et al., 2009), and it may be that age-related differences in the impact of HI on behaviour exist. This was only considered in two studies, one of which adjusted for age in their analyses (Moore et al., 2014) and the other finding that there was no significant difference between HI and age, or HI and severity of violence, in their sample (Kenny & Lennings, 2007). Five studies were mixed gender and previous literature shows gender differences in aggression and violence (Staniloiu & Markowitsch, 2012). Gordon et al. (2017 A,B) and Schofield et al. (2019) did not take gender differences into account in their analyses. Moore et al., 2014 adjusted for gender in their analyses, while Kenny and Lennings (2007) conducted subgroup comparisons, finding no significant difference for gender.

Half of the studies did not use an internationally recognised definition of HI and only two used a screening measure (Gordon et al., 2017 A,B). No study corroborated HI self-report with hospital records. Considering the age of participants and the potential for significant HI to have occurred at a very young age (and therefore not be recalled in memory), hospital records could reduce any bias. Guberman and colleagues (2019) used hospital records rather than self-report, however they recorded HI occurring within 30 days of each other as one episode of HI. This method may have missed the impact of multiple HI occurring during the process of recovery.

Variation also existed in how violence was measured. An 'index of offending' was used in several studies (Davies et al., 2012; Schofield et al., 2019; Williams et al., 2010), but this was not a standardised measurement and varied across studies. Furthermore, legislature in the studies country of origin, and what constituted differing severities of violence, also varied. These factors make it difficult to compare findings across studies.

## Relationship to Other Research

Farrer et al. (2013) in their systematic review and meta-analysis found approximately 30% of offending youth to have sustained a HI. This systematic review concurs with the evidence that juvenile offenders have a high prevalence rate of HI, with 72% being the highest prevalence rate reported across studies. Fazel et al. (2011) found a relationship between HI and violent offending (OR= 3.3) in their large population-based study comparing 22,914 adults with HI to 229,118 population controls. They also found an increased likelihood of violent convictions for those with HI (OR= 2.0) compared to unaffected sibling controls. The current review did not find these relationships in juveniles. Fazel et al. (2011) found that violent offending in adulthood was more likely if the offender was diagnosed with HI after the age of 16, which opposes the notion that the brain of juveniles is more at risk of the effects of HI at an early age. This may explain the difference in associations between HI and violent offending in the current study (the average mean age reported across studies in the current review was 15-17) compared to the findings in adult samples. The systematic review by O'Sullivan et al (2015) found that three out of six studies on adult female offenders report an association between HI and greater violence, but all studies were of low quality with significant methodological limitations. These findings are similar to the current review, suggesting that more robust studies are needed in this area.

## Limitations

Strengths of this review include the use of a second screener and rater of studies which reduces overall bias. The review was also registered with PROSPERO and had a clear protocol. Regarding limitations, studies included in the review were limited to the English language. Therefore, studies written in non-English languages that may have contributed relevant knowledge for this review, have been missed. However, none are cited in other reviews or in

included papers. All studies were conducted in Western developed nations. Differences in legal systems between countries with respect to definitions of violent offending (e.g., what constituted a "juvenile" offender) may have limited comparisons between studies. No search of grey literature was conducted which could increase the risk of studies missed through publication bias. Studies that may have been relevant to HI/violence associations but examined aggressive/violent delinquency rather than offending, per se, were excluded from this review to enable better comparisons across studies.

**Recommendations for Future Research**

This review highlights that the most frequent reported cause of HI in juvenile offenders is from assaults, fights, and other activity that was related to violent offending behaviour. Violence is a cause of HI as well as a consequence of it and longitudinal research may be of benefit in understanding the order of occurrence between HI and violence. Corroboration between self-reported HI and hospital records, as well as between self-reported violent offending and criminal justice records, would reduce bias in future studies. A standardised screening measure should be employed in future studies, using an internationally recognised definition of HI. This would increase study validity. Clear definitions of what constitutes violence offending should be reported. The gender of participants needs to be considered in recruitment or analyses in future studies as violent offending for male and female juveniles differs and could be a confounder. Age should also be considered as a covariate. These suggestions would make any future evidence base more homogenous and findings could be compared across studies with a potential meta-analysis being conducted.

## Conclusion

There is currently no clear evidence for an association between HI and violent offending in juvenile offenders. Studies of high quality consistently report no significant association between presence, severity, or frequency of HI, and violent offending. There is some evidence to suggest an association between LOC, a greater number of HI, and more severe violent offences but these findings are from studies of low quality and need to be replicated in more methodologically sound conditions. Main methodological weaknesses were non corroboration of measures of HI or violence, lack of controlling for confounding variables, and risk of recall bias from self-report. Further high-quality research is needed in this area to make any firm conclusions and inform youth justice services of the potential needs of juvenile offenders.

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# Chapter Two: Major Research Project

## Protective Factors and Desistance in a Juvenile Forensic Community Mental Health Service: A Secondary Data Study

Prepared in accordance with the author requirements for the Journal of Youth Violence and Juvenile Justice, appendix 2.1 (pp. 81-82)

# Plain English Summary

**Title**

Protective Factors and Desistance in a Juvenile Forensic Community Mental Health Service: A Secondary Data Study.

**Background**

Risk assessment of juvenile offenders is important to identify and manage risk of future offending. Often risk assessment will focus on 'risk factors' which have been found to increase the likelihood of offending. Some risk assessments include 'protective factors' which are thought to promote pro-social behaviours or buffer against risks of reoffending (e.g., having strong commitment to school). One of these risk assessments is the Structured Assessment of Violence Risk in Youth (SAVRY) (Borum et al., 2006). The SAVRY uses a Protective Scale and three Risk Scales to assess the future risk of offending for juveniles. There is some evidence to suggest that protective factors on the SAVRY are associated with reduced offending in juvenile offenders (Lodewijks et al., 2010). There is little evidence about the utility of protective factors in reducing crime in juvenile offenders who also have mental health difficulties.

**Aims and Questions**

This research examines whether protective factors predict desistance. Desistance is defined as a period when someone refrains from crime. In this study, desistance from any type of offending and from violence were of interest. The primary research question asked whether having at least one protective factor increased the likelihood of desistance in juvenile offenders who attended a forensic community mental health service. Further research questions asked if a greater number of protective factors were associated with desistance, if the Protective Scale

predicted desistance when combined with the Risk Scales, if protective factors were associated with desistance for low- and high-risk groups, and whether specific protective factors predicted desistance.

**Methods**

Secondary data from 82 service users in the Forensic Child and Adolescent Mental Health Service (FCAMHS) in Glasgow between March 2015 and January 2020 were analysed. All service users had offending histories. Participants were 12–18-years-old and all had been assessed using the SAVRY. FCAMHS obtained data on offending for the 6-month period after their risk assessment from the Social Work Intensive Support and Monitoring Service (ISMS).

**Main Findings and Conclusions**

Neither having at least one protective factor nor the total number of protective factors were associated with desistance. The Protective Scale and specific protective factors did not predict desistance. Interestingly, a greater number of protective factors increased the likelihood of desistance in low-risk offenders but increased the risk of *not* desisting for high-risk offenders. This study had a modest sample size and few desistors. More research is needed to explore the effects of protective factors in juvenile offenders who have mental health difficulties.

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# Abstract

**Background**

Evidence suggests that desistance from offending is more likely for those who possess protective factors. Determining the presence or absence of protective factors is therefore valuable when assessing the criminogenic risk of juvenile offenders.

**Aim**

This research examines relationships between protective factors and desistance in juvenile offenders who also have mental health difficulties. There is a paucity of research examining the role of protective factors in clinical, community samples. Findings are hoped to inform clinical practice in terms of understanding protective factors in risk assessment and associated risk management approaches.

**Methods**

An observational, retrospective longitudinal design was employed using secondary data. Data included risk and protective factor scores on the Structured Assessment of Violence Risk in Youth (SAVRY) from 82 juvenile offenders with mental health needs. Participants were aged 12-18 and had attended a community based Forensic Mental Health Service for an assessment at some point between March 2015 and January 2020. Outcome data were desistance from any type of offending and desistance from violent offending at 6-months post their SAVRY being conducted. Chi-square analyses explored associations between protective factors and desistance. Mann-Whitney U analyses investigated any differences between desistors/non-desistors and the number of protective factors present. Binary logistic regression and ROC analyses examined the predictive validity of protective factors in determining desistance.

**Results**

Neither the presence of at least one protective factor nor the total number of protective factors were associated with desistance. The SAVRY Protective Domain did not predict desistance or add incremental value to risk scales. In predicting desistance by the number of protective factors held, a significant interaction was observed between juveniles considered low-risk and high-risk of reoffending.

**Conclusions**

Protective factors were not associated with desistance in a sample of juvenile offenders with additional mental health needs. The odds of desisting for juveniles considered low-risk of reoffending were increased when the number of protective factors were greater, although the opposite was observed for juveniles considered high-risk. Methodological limitations are considered.

**Keywords**

Risk Assessment, Protective Factors, Juveniles, Offending, Mental Health, Desistance

# Introduction

## Risk Assessment

Risk assessment of juvenile offenders is crucial in determining criminogenic factors and informing associated risk management or intervention as a means of reducing their likelihood of recidivism (Lehmann et al., 2016). Risk assessment has historically relied on the identification of factors that may increase likelihood of reoffending, otherwise known as risk factors. These factors can be static (i.e., factors that increase risk but cannot be changed such as a prior history of violence) or dynamic (i.e., factors that are amenable to change and intervention such as current substance use) (Ortega-Campos et al., 2020). There is an established direct association between presence of risk factors in juvenile offenders and the increased likelihood of future offending (Cottle et al., 2001).

## Protective Factors in Risk Assessment

Identification of factors that protect against risk of offending in juveniles has become a recent focus in risk identification and management (Cording & Beggs Christofferson, 2017). Protective factors may promote prosocial behaviour or reduce the likelihood of recidivism by buffering the negative effects of risk factors (Farrington et al., 2016; Jessor & Turbin, 2014). For example, a longitudinal study found that juveniles at age 15 who had a number of protective factors (e.g., good parental management, commitment to school) had a lower probability of violence at age 18 compared to those without protective factors, even when they were exposed to the same level of risk factors (Herrenkohl et al., 2003). Identifying strengths of offenders, rather than solely focusing on their vulnerabilities may provide a more balanced approach to risk assessment (De Ruiter & Nicholls, 2011). This approach also fits well with the Good Lives Model; a strengths-based rehabilitation approach used in forensic settings where protective factors are identified and built upon (Ward & Brown, 2004).

Method of Risk Assessment

The Structured Professional Judgment (SPJ) approach to risk assessment and management is routine practice in forensic settings. This approach involves the use of structured tools to assess static or dynamic risk and protective factors that may be present for the juvenile, whilst holding an additional aspect of clinical judgement when interpreting the tools and making final conclusions about the risk of reoffending (Guy et al., 2012). SPJ approaches are qualitative in nature rather than giving quantitative ratings or scores to risk criteria. It requires the clinician to gather information from multiple sources and a psychological formulation of the juvenile's level of risk is then developed with the guidance of the structured tool. This method contrasts with other types of risk assessment such as actuarial methods which rely on statistical algorithms to predict an individual's future risk of violence (Lehmann et al., 2016) or unstructured clinical judgment approaches that rely on clinician opinion alone to assess future risk (Mori et al., 2017). Several SPJ tools have been developed for use with juvenile offenders which include additional protective factor or strength components. These include the Structured Assessment of Violence Risk in Youth (SAVRY; Borum et al., 2006), the Short-Term Assessment of Risk and Treatability (START; Webster et al., 2004) and the Structured Assessment of Protective Factors for Violence Risk-Youth Version (SAPROF-YV; de Vries Robbe et al., 2015). Due to the scope of this study, only the SAVRY will now be discussed in more detail. The SAVRY organises items under four domains (three risk and one protective). The items are informed by research in offending risk in young people and are rated as low/moderate/high risk (for risk items) or absent/present (for protective items) on this basis.

Evidence for a Role for Protective Factors using the SAVRY

Several studies have examined protective factors in the risk assessment of juvenile offenders. Lodewijks et al. (2010) found that the presence of protective factors on the SAVRY reduced

reoffending for both high and low-risk juvenile offenders. The Protective Domain accounted for unique variance that predicted recidivism when entered into a regression model with the dynamic risk domains. In contrast, Soderstrom et al. (2020) found that the Protective Domain was not a significant predictor of recidivism when combined with the risk domains but did find that specific protective items were associated with reduced offending (e.g., a positive attitude toward intervention and authority and having resilient personality traits).

Rennie and Dolan (2010) found that the Protective Domain of the SAVRY predicted desistance, with the presence of at least one protective factor being sufficient to reduce the risk of recidivism in juvenile offenders. The Protective Domain item of having resilient personality traits tended to be present when one protective factor was associated with desistance. Shepherd et al. (2016) found that juvenile offenders with three or more SAVRY protective factors took longer to reoffend upon release, however this effect was only found for low-risk offenders.

### Desistance

It is important to understand how juvenile offenders can navigate out of a life of criminal activities and the role protective factors may have in the desistance process. There is no consensus in the literature of how the term desistance should be defined. However, it can be thought of as either a distinct period where the offender is not committing offences (primary desistance) or a notion of a change in self-identity where the offender no longer identifies as such due to a period of non-offending (secondary desistance) (Maruna and Farrall, 2004; McNeill, 2006).

### Protective Factors and Juveniles with Mental Health Difficulties

Most studies examine protective factors with incarcerated juveniles or forensic psychiatric

inpatient samples (Dickens & O'Shea, 2018). The latter is of interest as it is estimated that approximately one third of juvenile offenders have an additional mental health need (Chitsabesan et al., 2006). Lodewijks et al. (2008) found that the presence of protective factors on the SAVRY were predictive of reduced incidences of inpatient violence in a sample of adolescent males receiving psychiatric care. There is a paucity of research examining community-based samples of juvenile offenders with mental health difficulties. It is unknown if protective factors provide the same effects within a sample of this kind. As a result, further research is needed to help inform forensic community mental health services about the role of protective factors for desistance in juveniles who offend. Additionally, this would inform services of what risk management strategies may be of benefit.

## Aim and Research Questions

### Aim

To explore associations between protective factors on the Structured Assessment of Violence Risk for Youth (SAVRY) and desistance, and to examine the ability of protective factors to predict desistance from offending.

### Research Questions

Desistance in this study adopts the definition of 'primary desistance' which is *"the achievement of an offence free period"* (McNeill, 2006, pp.47). The period for which desistance is measured in this study is 6 months following the juvenile's SAVRY risk assessment being conducted. All research questions refer to desistance from any type of offending and desistance from violent offending for juvenile offenders attending a Forensic Community Mental Health Service:

i. Is the presence of at least one protective factor on the SAVRY associated with the likelihood of desistance for juveniles in the 6-month period following their risk assessment being conducted?

ii. Do juveniles who desist have a greater number of protective factors than those who do not, and do the number of protective factors predict their desistance? Furthermore, are the number of offences committed in the 6-month period associated with the number of protective factors?

iii. Do the number of protective factors on the SAVRY predict desistance for juveniles with a low number of risk factors as well as those with a high number of risk factors?

iv. Does the Protective Domain add incremental value to the prediction of desistance when combined with the risk domains on the SAVRY?

v. Do specific protective factors in the Protective Domain on the SAVRY predict juvenile desistance better than others?

# Methods

**Design**

The study employed an observational, retrospective longitudinal design using secondary quantitative data to explore associations between protective factors and desistance from any type of offending and violent offending. It was estimated that data from approximately 88 participants would be available for analyses. Secondary Data Source and Research Procedures Participant data were obtained from the NHS Greater Glasgow and Clyde Forensic Child and Adolescent Mental Health Service (FCAMHS). This service provides psychological assessment, formulation and intervention for young people aged 12-18 who have engaged in offending behaviour and have mental health needs. Data were extracted by FCAMHS from

their existing databases within the service. Participant's data were already established within the service for the purpose of risk management and audit and new data were not sought. Consent was provided by the participant upon their contact with the service for their data to be used for future research purposes. Quantitative secondary data were collected from retrospective records. Data were for patients who had a SAVRY risk assessment conducted between March 2015 and January 2020. Data on offending behaviour in the 6-month period after risk assessment were provided to FCAMHS by the Intensive Support Monitoring Service (ISMS). This is an intensive social work service that is an alternative to secure care or custody for juveniles who are a risk to themselves or others. Details of offences were not included in the data set. Data from FCAMHS and ISMS were combined into a single dataset by a FCAMHS clinical psychologist. Participants were excluded if risk assessment or offending data were not available for analyses. Data were anonymised and transferred by secure email to the principal researcher for analyses.

**Research Approvals**

NHS Caldicott approval was granted to FCAMHS to collate data from patient records and for the researcher to gain access to anonymised NHS data for the purpose of the study. Glasgow City Health and Social Care Partnership (HSCP) approved access to anonymised offence data from ISMS. The study was approved by NHS Research and Innovation (appendices 2.2 – 2.4, pp.83-86).

**Variables for Inclusion**

*Risk & Protective Factors*

Data included risk assessment information from the SAVRY. This is the Structured Professional Judgement (SPJ) risk assessment that each young person underwent following

their referral to the FCAMHS service. It is a clinician rated assessment of risk and all assessors were qualified clinical psychologists who had been trained to use the tool. The SAVRY comprises 3 risk domains (Historical, Social/Contextual and Individual/Clinical), with 24 items pertaining to risk which are rated on a three-point domain of low, moderate, or high. The Historical Domain comprises static risk factors (e.g., history of violence, exposure to violence in the home, parent/caregiver criminality), while the Social/Contextual and Individual/Clinical Domains comprise dynamic risk factors (e.g., peer delinquency, lack of personal/social support, risk taking/impulsivity, substance-use difficulties). The SAVRY comprises 6 items pertaining to protective factors (the Protective Domain) which are rated as absent or present. These include prosocial involvement, strong social support, strong attachments and bonds, positive attitude towards intervention and authority, strong commitment to school, and resilient personality traits. From integration of the SAVRY domains, an overall summary judgement is made about the juvenile's risk of violence/harm to others and is rated as either low, moderate, or high. The qualitative ratings gathered from the SAVRY risk assessments were converted into corresponding quantitative information for the purpose of statistical analyses in this study. The SAVRY has good predictive validity, with a meta-analysis finding that the tool predicted violent recidivism with a median AUC (area under the curve) of .71 (Singh et al., 2011). AUC values are typically reported in risk assessment literature and refer to how well the instrument can classify and distinguish between offenders and non-offenders. An AUC value of 1 indicates a perfect classification and a value of 0.5 indicates a classification no better than chance (Szmukler et al., 2012).

*Desistance*

Offence data were obtained from social work reports in the 6-month period after the SAVRY was carried out. Reports were generated for any offending behaviour, including police concern

reports, residential care setting reports, and police charges or convictions. Data included whether there was desistance from any type of offending (yes/no), desistance from violence (yes/no), and the total number of offences within the 6-month period. No breakdown of charges or convictions were included in the data set, and for anonymity purposes, no details of the nature or severity of offending was provided. Offences were categorised as violent or non-violent by social work staff at ISMS. Violent offending was operationalised using the definition in the SAVRY Professional Manual (Borum et al., 2006): *"(a) an act of battery or physical violence that is sufficiently severe to cause injury to another person or persons (e.g., cuts, bruises, broken bones, death), regardless of whether injury actually occurs; (b) any forceable act of sexual assault; or (c) a threat made with a weapon in hand. In general, these acts should be of sufficient severity that criminal charges either do, or could, result"* (pp 14). Due to limitations regarding the availability of details of offences in the data set, desistance was operationalised as an offence free period (i.e., 6 months). This therefore means that those who were defined as desisting from violence in this study, may not have committed a violent offence in the past. However, all participants had committed a prior offence of some kind.

**Sample Size**

On the basis of the FCAMHS database 88 participants were anticipated. A study on desistance with juvenile offenders using the SAVRY, found that 30% desisted (Rennie & Dolan 2010). Based on this, it was expected that 26/88 FCAMHS participants would desist from offending. There is little published information on the proportions of re-offending, split by the presence of any protective factors. However, Rennie and Dolan (2010) reported a SAVRY mean protective total 2.59 for those that desisted and 1.22 for those that did not, and if taking a conservative common standard deviation of 1.9, the present study would have more than 85% power to detect an effect using a two-sided t-test and significance of $p<0.05$ (NQuery v8.6.1.0).

**Statistical Methods**

Data were analysed using SPSS Version 27 (IBM Corp.). Desistance was coded as occurring or not occurring. SAVRY items within the risk domains were scored as low, moderate, or high. Although the SAVRY risk domains are not assigned numerical scores and totalled in clinical practice, this method is routinely adopted in research (Dickens & O'Shea, 2018) and was here as follows; low = 0, moderate = 1, and high = 2. The highest total risk score that could be achieved was 48, with a maximum score of 20 on the Historical Domain; 12 on the Social/Contextual Domain; and 16 on the Individual/Clinical Domain. Protective factors were scored as absent or present, with a maximum Protective Domain score of 6.

All analyses were conducted for desistance from any type of offending and repeated for desistance from violence. The first research question was the primary interest, and all other analyses were exploratory. Therefore, no adjustment was made for multiple comparisons. Yate's Continuity Correction was used for 2x2 Chi-square Test of Independence. Where any test violated the assumption of minimum expected cell frequency equal to five in a 2x2 test, Fisher's Exact Test (2-tailed) was carried out. Confidence intervals were reported at 95%. Data was assessed for normality and for meeting the assumptions of each statistical test.

*Research Question (i)*

Chi-squared was used to examine associations between the presence of one or more protective factor (yes/no) and desistance (yes/no). Binary logistic regression was conducted with the outcome as desistance and having at least one protective factor as the predictor.

*Research Question (ii)*

Data were skewed and therefore Mann-Whitney U was used to investigate significant

differences between those who desisted and those who did not, and the number of protective factors present. The Protective Domain (i.e., number of protective factors) was entered into a binary logistic regression to assess its ability to predict desistance. The distribution for the number of offences was positively skewed and therefore Spearman's Rho correlation was conducted to explore any association between the number of protective factors and the number of offences.

*Research Question (iii)*

Participants were divided into low- or high-risk groups by median split of their total risk score. Mann-Whitney U examined any significant differences between low- and high-risk groups and number of protective factors each group held. Building on the regression analyses in research questions 1 and 2, any effect of risk group on desistance was examined. Firstly, binary logistic regression examined risk group as a predictor of desistance. Then the interaction between risk group and the presence of at least one protective factor, and then separately the interaction between risk group and the number of protective factors, were investigated by adding the interaction term to the main effect models.

*Research Question (iv)*

Receiver operator characteristic (ROC) analyses examined the ability of each SAVRY domain to correctly classify those who desisted from those who did not. For risk domains, ROC analyses were adjusted so that smaller test results indicated greater desistance. This resulted in AUC values for each domain. The Protective Domain was then entered into a hierarchical logistic regression model with significant risk domain predictors to assess whether it added incremental value.

*Research Question (v)*

ROC analyses examined the ability of each protective factor to correctly classify those who desisted from those who did not. A stepwise logistic regression using the backwards likelihood-ratio method examined the predictive ability of individual items on the Protective Domain with desistance as the outcome variable.

# Results

## Demographic Information

There were 83 service users in the FCAMHS database for the study period. Outcome data for one was missing and they were excluded, leaving a final sample of 82. Seventy-nine (96%) participants were male. The mean age was 14.96 (SD= 1.22) and range 12-17 years. The Scottish Index of Multiple Deprivation (SIMD; Scottish Government, 2020) indicated that 54 (66%) participants came from the most deprived quintile in Scotland. Data pertaining to ethnicity or mental health diagnosis were not available (table 2.1).

Table 2.1: Demographics for total sample and by group

| | **Total Sample (N=82)** | **Desist Yes (n=14)** | **Desist No (n=68)** | **Desist Violence Yes (n=22)** | **Desist Violence No (n=60)** |
|---|---|---|---|---|---|
| *Mean Age (SD)* | 14.96 (1.22) | 14.93 (1.21) | 14.97 (1.23) | 15.00 (1.20) | 14.95 (1.24) |
| *Sex, N Male (%)* | 79 (96) | 14 (100) | 65 (96) | 21 (96) | 58 (97) |
| *Scottish Index of Multiple Deprivation (SIMD) N (%)* | | | | | |
| 1 Highest Level | 54 (66) | 7 (50) | 47 (69) | 13 (60) | 41 (68) |
| 2 | 2 (2) | 0 | 2 (3) | 0 | 2 (3) |
| 3 | 15 (18) | 3 (21) | 12 (18) | 4 (18) | 11 (18) |
| 4 | 6 (7) | 2 (14) | 4 (6) | 2 (9) | 4 (7) |
| 5 Lowest Level | 1 (1) | 0 | 5 (2) | 0 | 1 (2) |

*Note:* 4 SIMD values missing.

Fourteen participants (17%) desisted from all types of offending and 22 (27%) desisted from violent offending. The number of offences in the 6-month period ranged from 0-76 (M= 10.23, SD= 14.39). The most frequent protective factor in the overall sample was a 'positive attitude towards intervention and authority' and the least frequent was a 'strong commitment to school' (table 2.2).

Independent samples t-test analyses indicated no significant difference in age between those who did or did not desist from any type of offending ($t(80)= .116$, p= .908) or between those who did or did not desist from violence ($t(80)= -.163$, p= .871). Chi-square analyses found no significant association between sex and desistance from any type of offending (Fisher's Exact Test, $p= 1.000$) or desistance from violence (Fisher's Exact Test, $p= 1.000$). Chi-square analyses suggested that those from the most deprived area of Scotland (SIMD 1st quintile) were not less likely to desist from any type of offending compared to those from other quintiles (Fisher's Exact Test, $p= .498$) or desist from violence compared to other quintiles ($\chi^2 (1)= .000$, $p= 1.000$).

Table 2.2: Descriptive statistics for SAVRY domain scores, number of protective factors, and specific protective factors present

| | **Total Sample (N=82)** | **Desist Yes (n=14)** | **Desist No (n=68)** | **Desist Violence Yes (n=22)** | **Desist Violence No (n=60)** |
|---|---|---|---|---|---|
| *SAVRY Scores, M (SD, range)* | | | | | |
| Historical | 11.79 (4.01, 2-18) | 9.14 (5.02, 2-18) | 12.34 (3.57, 5-18) | 10.05 (4.84, 2-18) | 12.43 (3.49, 5-18) |
| Social/Contextual | 7.72 (2.20, 2-12) | 7.07 (1.94, 4-11) | 7.85 (2.23, 2-12) | 7.73 (2.05, 4-12) | 7.72 (2.26, 2-12) |
| Individual/Clinical | 9.63 (3.29, 1-16) | 7.93 (3.95, 1-14) | 9.99 (3.06, 2-16) | 9.09 (3.89, 1-15) | 9.83 (3.06, 2-16) |
| Total risk score | 29.15 (7.48, 8-44) | 24.14 (9.30, 8-38) | 30.18 (6.68, 15-44) | 26.86 (9.42, 8-43) | 29.98 (6.53, 15-44) |
| Protective | 1.99 (1.54, 0-6) | 2.71 (1.94, 0-6) | 1.84 (1.42, 0-6) | 2.36 (1.71, 0-6) | 1.85 (1.47, 0-6) |
| | | | | | |
| *No of Protective Factors, N (%)* | | | | | |
| No factors | 13 (16) | 2 (14) | 11 (16) | 3 (14) | 10 (17) |
| One factor | 23 (28) | 3 (21) | 20 (29) | 5 (23) | 18 (30) |
| Two factors | 21 (26) | 1 (7) | 20 (29) | 4 (18) | 17 (28) |
| Three factors | 12 (15) | 3 (21) | 9 (13) | 5 (23) | 7 (12) |
| Four factors | 5 (6) | 2 (14) | 3 (4) | 2 (9) | 3 (5) |
| Five factors | 6 (7) | 2 (14) | 4 (6) | 2 (9) | 4 (7) |
| Six factors | 2 (2) | 1 (7) | 1 (2) | 1 (5) | 1 (2) |
| | | | | | |
| *Protective Factor Present, N (%)* | | | | | |
| Prosocial involvement | 25 (31) | 6 (43) | 19 (28) | 7 (32) | 18 (30) |
| Strong social support | 30 (37) | 7 (50) | 23 (34) | 10 (46) | 20 (33) |
| Strong attachments and bonds | 30 (37) | 8 (57) | 22 (32) | 9 (41) | 21 (35) |
| Positive attitude towards intervention and authority | 41 (50) | 7 (50) | 34 (50) | 13 (59) | 28 (47) |
| Strong commitment to school | 18 (22) | 5 (36) | 13 (19) | 7 (32) | 11 (18) |
| Resilient personality traits | 19 (23) | 5 (36) | 14 (21) | 6 (27) | 13 (22) |

**Desistance and the Presence of at Least One Protective Factor**

Sixty-nine (84%) participants had at least one protective factor. Chi-square analyses indicated no significant association between desistance from any type of offence and the presence of at least one protective factor (Fisher's Exact Test, *p*= 1.000). Furthermore, the relationship between desistance from violent offending and the presence of at least one protective factor was also statistically non-significant (Fisher's Exact Test, *p*= 1.000) (table 2.3).

Table 2.3: Desistance and presence of one or more protective factor, *N (%)*

| At least one protective factor | Desist | | Desist violence | |
|---|---|---|---|---|
| | No | Yes | No | Yes |
| **No** | 11 (16.2) | 2 (14.3) | 10 (16.7) | 3 (13.6) |
| **Yes** | 57 (83.8) | 12 (85.7) | 50 (83.3) | 19 (86.4) |

Binary logistic regression analyses indicated that the presence of at least one protective factor did not predict desistance from any type of offending (Wald= .013, *df*= 1, *p*= .860, Exp *(B)*= .1.158, CI= .227 – 5.911) or desistance from violence (Wald= .110, *df*= 1, *p*= .740, Exp *(B)*= .789, CI= .314 – 5.107).

**Desistance and Number of Protective Factors**

Mann-Whitney U analyses found no significant difference in the number of protective factors for those who desisted any type of offending (Md= 3, inter-quartile range 1,4.25) and those who did not (Md= 2, inter-quartile range 1,2.75; *U*= 602, *z*= 1.59, *p*= .112) or between those who desisted from violent offending (Md= 2, inter-quartile range 1,3.25) and those who did not (Md= 2, inter-quartile range 1,2.75; *U*= 779, *z*= 1.28, *p*= .202). See figures 2.1 and 2.2.

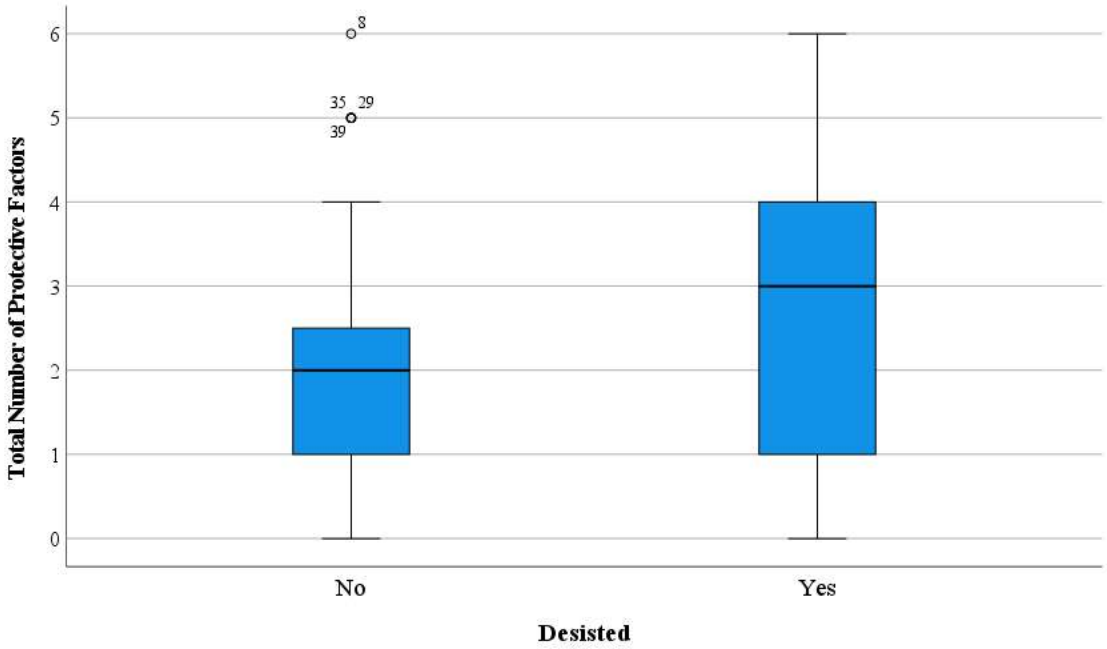


Figure 2.1: Box plot of the number of protective factors by desistance from any type of offending

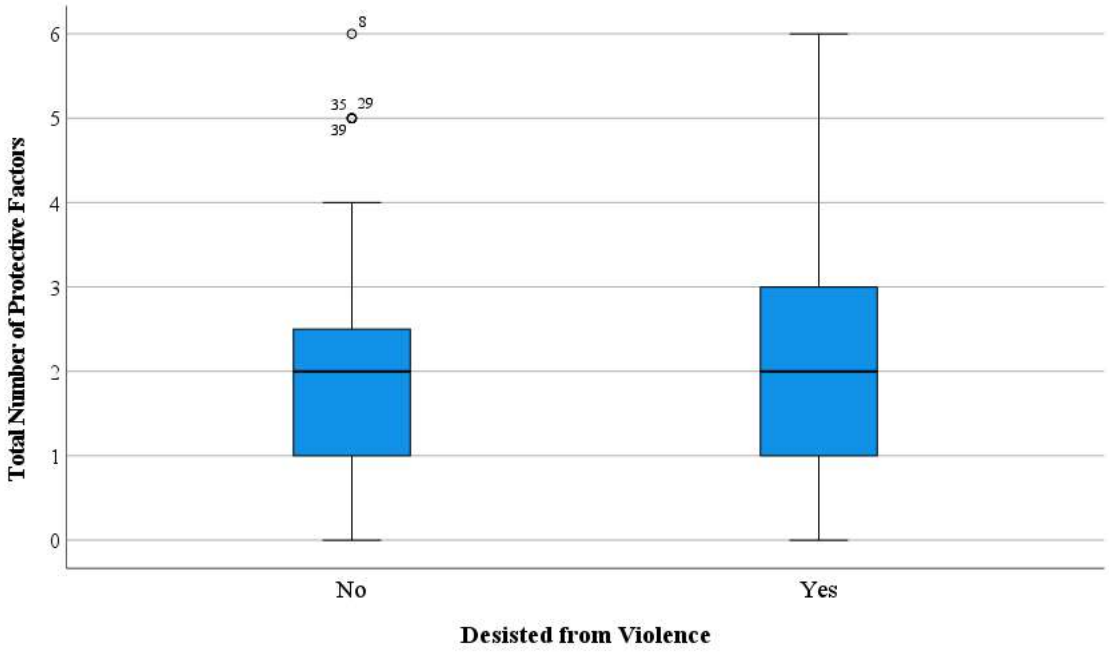


Figure 2.2: Box plot of the number of protective factors by desistance from violence

The Mann-Whiney U box plots highlighted outliers, where 4 participants who did not desist had a higher number of protective factors compared to the rest of the sample. These outliers were examined for any common characteristics. From viewing the data there was no common variable that these outliers shared which would explain their increased number of protective factors. They were all male, however males made up 96% of the sample. Their overall risk judgements on the SAVRY varied and therefore level of risk was not a common factor. The data available within the study was limited, however, and they may have shared a common factor that was not captured by the data for this study.

Binary logistic regression analyses indicated that the Protective Domain did not predict desistance from any type of offending (Wald= 3.557, *df*= 1, *p*= .059, Exp *(B)*= .1.413, CI= .987 – 2.2025) or desistance from violence (Wald= 1.761, *df*= 1, *p*= .185, Exp *(B)*= 1.235, CI= .904 – 1.687). Spearman Rho correlation analyses also found no significant relationship between the number of protective factors and the number of offences within the 6-month follow-up period (*r*= –.209, *p*= .060).

**Protective Factors and Desistance in Low and High-Risk of Offending Groups**

Forty-four (54%) participants were considered low-risk and thirty-eight (46%) considered high-risk for reoffending. Mann-Whitney U analyses indicated that the low-risk group had significantly more protective factors (Md= 2, inter-quartile range 1,4) than the high-risk group (Md= 1, inter-quartile range 1,2; *U*= 526.0, *z*= -2.952, *p*= .003; *r*= .33) (medium effect size). Binary logistic regression analysis found that risk group did not significantly predict desistance from any type of offending (Wald= 3.818, *df*= 1, *p*= .051, Exp *(B)*= 3.889, CI= .996 – 15.187) or desistance from violence (Wald= 1.190, *df*= 1, *p*= .275, Exp *(B)*= 1.750, CI= .640 – 4.782). Binary logistic regression analyses indicated that the interaction between risk group and the

Protective Domain (i.e., number of protective factors per case) significantly predicted desistance from any type of offending (table 2.4).

Table 2.4: *P* value for interactions between risk group and protective factors

| | ***p*** |
|---|---|
| **Desistance from any type of offending** | |
| Risk group * having at least one protective factor | .999 |
| Risk group * Protective Domain | .040 |
| | |
| **Desistance from violence** | |
| Risk group * having at least one protective factor | .325 |
| Risk group * Protective Domain | .595 |

Post-hoc binary logistic regression analyses were conducted to examine this interaction. With desistance from any type of offending as the outcome and the Protective Domain as the predictor, analyses were conducted for low- and high-risk groups separately. For the low-risk group, the Protective Domain was not a significant predictor of desistance (Wald= 3.400, *df*= 1, *p*= .065, Exp *(B)*= 1.487, CI= .975 - 2.267). Similarly, for the high-risk group, the Protective Domain was not a significant predictor of desistance (Wald= 3.042, *df*= 1, *p*= .081, Exp *(B)*= .135, CI= .014 – 1.281). Although each analysis was not significant alone, the odds of desisting for the low-risk group increased when their number of protective factors on the Protective Domain was greater (OR=1.487), whereas the opposite effect was found for the high-risk group (OR=.135 with a negative coefficient), and this explains the significant interaction.

**Predictive Power of SAVRY Domains**

ROC analyses revealed that only the Historical Domain significantly discriminated between those who desisted and those who did not both for any type of offending (AUC= .69) and for violence (AUC= .65) (table 2.5). All other domains were non-significant.

Table 2.5: ROC analyses for SAVRY domains

| | Desisted (any type) | | Desisted violence | |
|---|---|---|---|---|
| **SAVRY Domain** | **AUC (SE)** | **95% CI** | **AUC (SE)** | **95% CI** |
| Protective | .63 (.09) | .45, .82 | .60 (.07) | .45, .74 |
| Historical | .69 (.09) * | .52, .86 | .65 (.08) * | .50, .80 |
| Social/Contextual | .61 (.08) | .45, .76 | .50 (.07) | .37, .64 |
| Individual/Clinical | .66 (.09) | .49, .84 | .55 (.08) | .39, .71 |

*Note:* AUC = area under the curve; SE = standard error; CI = confidence interval; *$p < .05$.

As the Historical Domain was the only significant classifier, the Protective Domain was added into a regression model with the Historical Domain to ascertain if it added predictive value. With the Historical Domain entered in step 1, hierarchical logistic regression showed that the model was significant (Wald= 6.625, *df*= 1, Exp (*B)*= .814, *p*= .01, CI= .696 - .952), correctly identifying 86.6% of cases. The Protective Domain added no incremental value in step 2, predicting 84.1% of cases and reducing the significance of the model (table 2.6).

Table 2.6: Logistic regression predicting likelihood of desistance from any type of offending with the protective domain added into the model

| | ***B*** | **S.E.** | **Wald** | ***df*** | ***p*** | **Odds Ratio** | **95.0% C.I for Odds Ratio** | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Lower** | **Upper** |
| Historical Domain | -.178 | .085 | 4.381 | 1 | .036 | .837 | .709 | .989 |
| Protective Domain | .183 | .200 | .837 | 1 | .360 | 1.201 | .811 | 1.779 |

The analysis was repeated for desistance from violent offending. The model was significant when the Historical Domain was entered in hierarchical logistic regression in step 1 (Wald= 5.382, *df*= 1, Exp (*B)*= .857, *p*= .020, CI= .753 - .976), identifying 76.8% of cases. Addition of the Protective Domain in step 2 identified 78% of cases but reduced the significance of the model (table 2.7).

Table 2.7: Logistic regression predicting likelihood of desistance from violence with the protective domain added into the model

| | *B* | S.E. | Wald | *df* | *p* | Odds Ratio | 95.0% C.I for Odds Ratio | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| Historical Domain | -.142 | .071 | 3.997 | 1 | .046 | .867 | .754 | .997 |
| Protective Domain | .074 | .174 | .182 | 1 | .670 | 1.077 | .765 | 1.516 |

**Desistance and Specific Protective Factors**

ROC analyses indicated that no single protective factor significantly distinguished between those who desisted and those that did not (table 2.8).

Table 2.8: ROC analyses for each item of the protective domain and desistance outcome

| | Desisted (any type) | | Desisted violence | |
|---|---|---|---|---|
| **Protective Factor** | **AUC (SE)** | **95% CI** | **AUC (SE)** | **95% CI** |
| Pro-social involvement | .58 (.09) | .41, .74 | .51 (.07) | .37, .65 |
| Strong social support | .58 (.09) | .41, .75 | .56 (.07) | .42, .70 |
| Strong attachments and bonds | .62 (.08) | .46, .79 | .53 (.07) | .39, .67 |
| Positive attitude toward intervention and authority | .50 (.09) | .33, .67 | .56 (.07) | .42, .70 |
| Strong commitment to school | .58 (.09) | .41, .76 | .57 (.07) | .42, .71 |
| Resilient personality traits | .58 (.09) | .40, .75 | .53 (.07) | .39, .67 |

*Note*: AUC = area under the curve; SE = standard error; CI = confidence interval; no analysis was significant.

Stepwise logistic regression using the individual protective factors as predictors of desistance revealed no significant model for any type of offending or violent offending (appendix 2.5, pp 87-88).

# Discussion

## Main Findings

This study examined the role of protective factors in desistance in juvenile offenders attending a community mental health service. Very few participants desisted offending of any type which was unexpected. A greater number of participants desisted violence which was more in line with the expected number in the study power calculation. The majority of the sample had two or fewer protective factors, which is consistent with findings of studies with juvenile offender samples (Lodewijks et al., 2010; Rennie & Dolan, 2010, Shepherd et al., 2016).

With regards to the primary research question, the presence of one protective factor was not associated with desistance from any type of offending or violent offending. This finding contradicts that of Rennie and Dolan (2010) who found that one protective factor was optimum for buffering reoffending in a sample of incarcerated juveniles. Additionally, the number of protective factors was not statistically different for those who desisted versus those who did not. The Protective Domain did not predict desistance, although it neared significance for those who desisted from any type of offending. Very few participants desisted from overall offending (17%) and perhaps with a larger sample size, and therefore greater power, this may have reached significance. Nevertheless, when compared with the risk domains, the Protective Domain was not a good predictor of desistance. Similarly, the Social/Contextual and Individual/Clinical Domains did not predict desistance. Only the Historical Domain predicted desistance (from any type of offending and desistance from violence), and the Protective Domain showed no significant incremental value when added with this domain in a regression model. Historical risk factors, such as past offending, are thought to be the best predictors of future offending (Bonta et al., 1998), which could explain the current findings. Dynamic and protective factors were of little utility in predicting future offending for juveniles with mental

health difficulties in this study. This is concerning considering these are the factors amenable to change and are therefore targeted during intervention.

The individual protective items on the Protective Domain also did not predict desistance. The poor predictive ability of the Protective Domain observed in this study contradicts the findings of several studies that have found the Protective Domain or specific protective items to be good predictors of desistance (Lodewijks et al., 2010; Lodewijks et al., 2008; Rennie & Dolan, 2010, Shepherd et al., 2016; Soderstrom et al, 2020). The juveniles in this current study were attending a specialist service for complex needs and risk, and protective factors for mental health overlap with those for offending. The findings here may indicate that protective factors have less of a role in desistance for juvenile offenders who attend outpatient mental health services. Although protective factors have been seen to predict reduced aggression in inpatient settings (Lodewijks et al., 2008), juvenile offenders attending outpatient services do not have the same support and management from a clinical team. They may also have increased opportunity for engaging with anti-social peers and therefore the likelihood of offending could increase.

Based on the total number of risk factors, participants were split into groups of low- and high-risk of reoffending. The low-risk group had significantly more protective factors than those the high-risk group. Interestingly, those in the low-risk group had higher odds of desisting from any type of offending as their number of protective factors increased. The opposite was true for those in the high-risk group – their odds of *not* desisting grew greater as their number of protective factors increased. This finding supports those of Shepherd et al. (2016) where a higher number of protective factors were found to increase time to reoffend for low-risk offenders but no effect was found for high-risk offenders. Although, it contradicts the findings

of Lodewijks et al. (2010) where protective factors had a buffering effect for both low- and high-risk offenders. In the current study, the finding only existed for those who desisted from any type of offending and not for those desisting from violence. This highlights that entrenched patterns of offending may be less amenable to the mitigating effect of protective factors, and that this may include violent behaviour. High-risk offenders have higher levels of childhood adversity, behavioural disorders, and school failure compared to low-risk offenders (Baglivio & Epps, 2016; Basanta et al., 2018). As a result, protective factors are not only less likely to be present for high-risk offenders, but they also may not have the same buffering effects as those considered low-risk due to their increased level of psychological and criminogenic needs.

**Limitations**

The data on offending in the current study not only included offences reported to the police, but also behaviour recorded by social work departments that could have led to an offence if it were reported. This was likely to capture less serious offences and could have led to a sample where very few desisted overall compared to previous research in this field. The measurement of desistance of overall offending, in conjunction with the small sample size, may have limited the power of the analyses. Nevertheless, the proportion of those who desisted from violence (27%) was in line with previous research, therefore these analyses may be more valid. Secondly, the median split between those with a lower and higher amount of risk factors may not be a true representation of offenders considered low- or high-risk of reoffending. The split was taken from the total risk score as opposed to the overall SAVRY risk judgement as protective factors are included in the latter, therefore these results should be interpreted with caution. Yet, this method has been used in prior research (Lodewijks et al., 2010) and was therefore felt to be appropriate. Lastly, as this study used secondary data, it was limited in its scope. No details of mental health diagnoses were available and therefore could not be

considered. There could have been variations in the interventions that the juveniles were offered by FCAMHS within the 6-month period studied. Any intervention could have acted as an additional protective factor and data for this was not available. Consequently, mental health and intervention variables could have been an important influencing factor. In addition, the sample did not include a breakdown of ethnicity or offence detail, and the juveniles were mostly male and from the most deprived areas of Glasgow. These factors may reduce study generalisability and limit any conclusion made.

**Implications**

From the present findings it appears that protective factors in the current sample are not as strongly associated with desistance as the literature would suggest. However, as far as the author is aware, no study has examined protective factors in an outpatient sample of this kind. The complexities and interactions that may arise from mental health difficulties could be a significant moderator of how protective factors buffer against risk. Nevertheless, those with fewer risk factors had a greater number of protective factors which could increase their likelihood of desisting. This has implications for clinical practice in forensic mental health services as interventions such as the Good Lives Model (Ward & Brown, 2004) approach or any other strengths-based therapy may be of more benefit to those considered low-risk. Their protective factors could be built upon and promoted within their individual and social contexts. In contrast, findings suggest that those considered at high-risk of reoffending may benefit more from interventions targeted towards addressing their criminogenic needs and reducing risk factors, as protective factors provided no predictive value when considering their desistance from offending.

## Directions for Future Research

Research with a more robust sample size and measures of potential moderating mental health variables is needed. This study was limited due to the nature of the data available. Future studies should take into account any interventions received throughout the period of desistance and consider varying mental health needs of the juveniles. Due to the paucity of research in this area, replication is crucial to assess the validity or reliability of any conclusions made here.

## Conclusion

No significant associations were found between desistance and the presence of one protective factor or the total number of protective factors. The Protective Domain did not predict desistance or add predictive value to the risk domain. No specific protective factor was associated with desistance. Nevertheless, protective factors may have more of a role for desistance in juvenile offenders who have fewer risk factors for reoffending and a lower level of criminogenic need. Future research in this area should continue to inform clinical practice.

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# Appendices

## Appendix 1.1: Author Guidelines for the Journal of Aggression and Violent Behavior

Submission to this journal proceeds totally online and you will be guided stepwise through the creation and uploading of your files. The system automatically converts your files to a single PDF file, which is used in the peer-review process.

As part of the Your Paper Your Way service, you may choose to submit your manuscript as a single file to be used in the refereeing process. This can be a PDF file or a Word document, in any format or lay-out that can be used by referees to evaluate your manuscript. It should contain high enough quality figures for refereeing. If you prefer to do so, you may still provide all or some of the source files at the initial submission. Please note that individual figure files larger than 10 MB must be uploaded separately.

***References***
There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct.

***Formatting requirements***
There are no strict formatting requirements but all manuscripts must contain the essential elements needed to convey your manuscript, for example Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, Artwork and Tables with Captions.
If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes.
Divide the article into clearly defined sections.

Please ensure the text of your paper is double-spaced—this is an essential peer review requirement.

***Figures and tables embedded in text***
Please ensure the figures and the tables included in the single file are placed next to the relevant text in the manuscript, rather than at the bottom or the top of the file. The corresponding caption should be placed directly below the figure or table.

***Use of word processing software***
Regardless of the file format of the original submission, at revision you must provide us with an editable file of the entire article. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also

the Guide to Publishing with Elsevier). See also the section on Electronic artwork.
To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

**Article structure**

***Subdivision - numbered sections***
Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text'. Any subsection may be given a brief heading. Each heading should appear on its own separate line.

***Introduction***
State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

***Material and methods***
Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized, and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.

***Theory/calculation***
A Theory section should extend, not repeat, the background to the article already dealt with in the Introduction and lay the foundation for further work. In contrast, a Calculation section represents a practical development from a theoretical basis.

***Results***
Results should be clear and concise.

***Discussion***
This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

***Conclusions***
The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

***Appendices***
If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

***Essential title page information***
• ***Title.*** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
• ***Author names and affiliations.*** Where the family name may be ambiguous (e.g., a double

name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name, and, if available, the e-mail address of each author. **The title page is to be the first page of the manuscript; the second page is the abstract with key words.**

• ***Corresponding author.*** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. **Ensure that telephone and fax numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address.**

• ***Present/permanent address.*** If an author has moved since the work described in the article was done, or was visiting at the time, a "Present address" (or "Permanent address") may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

**Abstract**
A concise (no more than 200 words) and factual abstract is required. This should be on a separate page following the title page and should not contain reference citations.

***Graphical abstract***
Although a graphical abstract is optional, its use is encouraged as it draws more attention to the online article. The graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 531 × 1328 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. You can view Example Graphical Abstracts on our information site.
Authors can make use of Elsevier's Illustration Services to ensure the best presentation of their images and in accordance with all technical requirements.

**Keywords**
Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

***Abbreviations***
Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

***Acknowledgements***
Collate acknowledgements in a separate section at the end of the article before the references

and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

***Formatting of funding sources***
List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, please include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

***Math formulae***
Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

***Footnotes***
Footnotes should be used sparingly. Number them consecutively throughout the article. Many word processors build footnotes into the text, and this feature may be used. Should this not be the case, indicate the position of footnotes in the text and present the footnotes themselves separately at the end of the article.

***Figure captions***
Ensure that each illustration has a caption. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

**Tables**

Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

**References**

***Citation in text***
Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

***Web references***
As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

***Data references***
This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

***References in a special issue***
Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

***Reference management software***
Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support Citation Style Language styles, such as Mendeley. Using citation plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide. If you use reference management software, please ensure that you remove all field codes before submitting the electronic manuscript. More information on how to remove field codes from different reference management software.

Users of Mendeley Desktop can easily install the reference style for this journal by clicking the following link:
http://open.mendeley.com/use-citation-style/aggression-and-violent-behavior
When preparing your manuscript, you will then be able to select this style using the Mendeley plug-ins for Microsoft Word or LibreOffice.

***Reference formatting***
There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by

Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct. If you do wish to format the references yourself they should be arranged according to the following examples:

***Reference style***

*Text:* Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the Publication Manual of the American Psychological Association, Seventh Edition, ISBN 978-1-4338-3215-4, copies of which may be ordered online.

# Appendix 1.2: Search Terms for Database Searches

| | |
|---|---|
| EBSCOHOST<br>CINAHL | 1. TI (TBI or "brain injur*" or "brain trauma*" OR AB (TBI or "brain injur*" or "brain trauma*)<br>2. (MH "Brain Injuries" OR (MH "Head Injuries")<br>3. S1 OR S2<br>4. TI (offen* or crimin* or crime* or prison* or imprison* or inmate* or incarcerat* or penitentiar* or delinquen* or perpetrat* or jail* or detain* or forensic) OR AB (offen* or crimin* or crime* or prison* or imprison* or inmate* or incarcerat* or penitentiar* or delinquen* or perpetrat* or jail* or detain* or forensic)<br>5. (MH "Juvenile Offenders+")<br>6. S4 OR S5<br>7. TI (violen* or aggress*) OR AB (violen* or aggress*)<br>8. (MH "Violence+") OR (MH "Aggression+")<br>9. S7 OR S8<br>10. TI (child* or young* or juvenile* or youth* or adolescen* or teen*) OR AB (child* or young* or juvenile* or youth* or adolescen* or teen*)<br>11. (MH "Adolescence+")<br>12. S10 OR S11<br>13. S3 AND S6 AND S9 AND S12 |
| OVID<br>EMBASE | 1. ((brain or head) adj4 (injur* or trauma*)).ti,ab.<br>2. traumatic brain injury/ or brain injury/<br>3. 1 or 2<br>4. (offen* or crimin* or crime* or prison* or imprison* or inmate* or incarcerat* or penitentiar* or delinquen* or perpetrat* or jail* or detain* or forensic).ti,ab.<br>5. exp offender/<br>6. 4 or 5<br>7. (violen* or aggress*).ti,ab.<br>8. violence/<br>9. 7 or 8<br>10. (child* or young* or juvenile* or youth* or adolescen* or teen*).ti,ab.<br>11. adolescence/ or adolescent/ or juvenile/<br>12. 10 or 11<br>13. 3 and 6 and 9 and 12 |

| | |
|---|---|
| OVID<br>MEDLINE | 1. ((brain or head) adj4 (injur* or trauma*)).ti,ab.<br>2. Brain Injuries, Traumatic/<br>3. 1 or 2<br>4. (offen* or crimin* or crime* or prison* or imprison* or inmate* or incarcerat* or penitentiar* or delinquen* or perpetrat* or jail* or detain* or forensic).ti,ab.<br>5. Criminals/<br>6. 4 or 5<br>7. (violen* or aggress*).ti,ab.<br>8. Violence/<br>9. 7 or 8<br>10. (child* or young* or juvenile* or youth* or adolescen* or teen*).ti,ab.<br>11. Adolescent/ or Juvenile Delinquency/<br>12. 10 or 11<br>13. 3 and 6 and 9 and 12 |
| OVID<br>PSYCHINFO | 1. ((brain or head) adj4 (injur* or trauma*)).ti,ab.<br>2. exp Traumatic Brain Injury/ or exp Head Injuries/<br>3. 1 or 2<br>4. (offen* or crimin* or crime* or prison* or imprison* or inmate* or incarcerat* or penitentiar* or delinquen* or perpetrat* or jail* or detain* or forensic).ti,ab.<br>5. exp Criminal Offenders/<br>6. 4 or 5<br>7. (violen* or aggress*).ti,ab.<br>8. exp Violence/<br>9. 7 or 8<br>10. (child* or young* or juvenile* or youth* or adolescen* or teen*).ti,ab.<br>11. exp Juvenile Delinquency/<br>12. 10 or 11<br>13. 3 and 6 and 9 and 12 |

## Appendix 1.3: Risk of Bias Ratings for Second-Rater

| | Method for selecting study participants | Design-specific sources of bias | Methods for assessing HI | Methods for assessing violence | Methods to control confounding | Statistical methods | Conflict of interest |
|---|---|---|---|---|---|---|---|
| 1. Davies et al. (2012) | Low | High | Low | High | High | Low | Low |
| 2. Gordon et al. (2017) Study A | High | High | Low | Low | High | High | Low |
| 3. Gordon et al. (2017) Study B | High | High | Low | Low | High | High | Low |
| 4. Guberman et al. (2019) | Low | High | High | Low | Low | Low | Low |
| 5. Williams et al. (2010) | Low | High | High | High | High | Low | High |
| 6. Moore et al. (2014) | Low | High | Low | Low | Low | Low | Low |
| 7. Kenny & Lennings (2007) | High | High | High | Low | Low | Low | High |
| 8. Schofield et al. (2019) | Low | High | High | Low | High | Low | Low |

NB. Initial conflicts in ratings are highlighted in red. Second-rater re-evaluated their ratings following a minor change in rating criteria (i.e., moving the concordance of measures criteria from the 'measure of HI' domain to the 'design-specific sources of bias' domain).

# Appendix 2.1: Author Guidelines for the Journal of Youth Violence and Juvenile Justice

**Manuscript Submission to *Youth Violence and Juvenile Justice* (*YVJJ*)**

All new manuscripts to *YVJJ* must be submitted using the SAGE track manuscript submission website. Please read below for instructions on submitting manuscripts to *YVJJ*.

Log onto the SAGE track manuscript submission website at http://mc.manuscriptcentral.com/yvjj and click on "**Create Account: New users click here.**"

Follow the instructions and make sure to enter your current and correct email address. Once you have finished creating a user account, your User ID and Password will be sent via email.

**Submission of a New Manuscript**

Log onto the manuscript central website and select "Author Center." Once at the Author Center, select the link "Click here to Submit a New Manuscript." Follow the instructions on each page. Once finished with a page, click on the "Save and Continue" option at the end of each page. Continue to follow the instructions for loading a new manuscript and/or other files at the appropriate stages (e.g., abstract, title page, etc.). When loading the manuscript file, make sure to use the "Browse" function and locate the correct file on your computer drive. Make sure to "Upload Files" when you are finished selecting the manuscript file you wish to upload. NOTE: All text files must be in word format and de-identified (please also remove any identifying information from the manuscript's properties before you upload the manuscript). The system will convert the submission to a PDF file.

After uploading your manuscript, review your submission in one of the provided formats (e.g., PDF). Once you have reviewed your submission, click on the "Submit" button. You should receive a submission confirmation screen and an email confirming submission. You can revisit the website at any time to review the status of your submission.

**Submission of a Revised Manuscript**

To submit a revised manuscript to *YVJJ*, log onto the SAGE track manuscript submission website at http://mc.manuscriptcentral.com/yvjj. Once at your **Author Dashboard**, view your "Manuscripts with Decisions" and select the option to "Create a Revision." Continue to follow the directions to upload your revised manuscript. Make sure to upload a de-identified version of your revision as with the initial submission. Also provide comments regarding changes that were made to your revised manuscript. These comments will be provided to reviewers.

Submission of a manuscript implies commitment to publish in the journal; simultaneous submissions are not acceptable.

All copy should be typed, double-spaced, and should follow the style of the *Publication Manual of the American Psychological Association* (7th ed.). Notes and references should appear at the end of the manuscript. Each manuscript should include a brief abstract of 100-

150 words describing the subject, general approach, intended purpose of the article, and findings; include 4-5 keywords for indexing and online searching. Also, please supply a 2-3 line (within 50-75 words) bio for each author. Ordinarily, articles should be less than 35 pages in length. However, research notes should not exceed 15 pages.

Referees will evaluate submitted manuscripts anonymously. Therefore, potential contributors should send two electronic copies of the manuscript via e-mail, one copy that includes a cover page giving the title, author(s), and author(s) affiliation and complete contact information, and a second electronic copy in which only the title of the paper is included as a means of identification.

# Appendix 2.2: Data Access Approval from Glasgow City HSCP

**From:** Callan, Tina (Social Work) [mailto:Tina.Callan@glasgow.gov.uk]
**Sent:** 14 January 2021 11:28
**To:** Love, Leighanne; 'Laura Kerr (PGR)'
**Subject:** RE: External Research Application (OFFICIAL)

**OFFICIAL**

Hi Laura/Leighanne
That's Mike Burns got back to say he is approving your research application so you can start any time subject to NHS R&D approval of course.

We send a standard email out with all approvals as follows:

The approval is based on the understanding of the project in its current form. Should any significant changes be made to the research aims or methodology, Glasgow City HSCP reserves the right to withdraw consent. This consent is also subject to the understanding that Glasgow City HSCP will be given a copy of your research report prior to publication. Please forward a copy to me when you have completed it, as well as sharing this with Leighanne of course.

I look forward to seeing the outcome of this research,
Thanks
Tina

Tina Callan
Senior Officer
Performance Team
Business Development
Glasgow City Health and Social Care Partnership
Commonwealth House
32 Albion Street
Glasgow
G1 1LH

Phone 0141 287 8310
Email tina.callan@glasgow.gov.uk

www.glasgowcity.hscp.scot
www.glasgow.gov.uk
www.nhsggc.org.uk

Work pattern Mon – Fri 9.30am to 2.00pm

# Appendix 2.3: NHS Caldicott Approval

Laura Kerr

Data Protection Officer
Information Governance Department
NHS Greater Glasgow & Clyde
2nd Floor, 1 Smithhills Street
Paisley PA1 1EB

Date: 11/12/2020

Enquiries to: Isobel Brown
Tel: 0141 355 2020
Email: Isobel.Brown@ggc.scot.nhs.uk

Dear Laura,

**Re: Investigating an association between protective factors and desistance in a forensic child and adolescent mental health service: A secondary data analysis**

Thank you for your updated Caldicott application received on 11/12/2020 regarding your proposed Research Project.

I have reviewed this application and can confirm that I am happy to approve this application on behalf of the Caldicott Guardian.

Please note that this approval only covers access to NHSGGC patients and is subject to the appropriate ethical and research and development approval being obtained.

Please find attached a signed copy of your application for your records.

Yours sincerely

Isobel Brown
Data Protection Officer
Information Governance

Appendix 2.4: Research and Innovation Management Approval Letter

Senior Research Administrator: Kayleigh McKenna
Telephone Number: 0141 314 4000
E-Mail: Kayleigh.McKenna@ggc.scot.nhs.uk
Website: https://www.nhsggc.org.uk/about-us/professional-support-sites/research-innovation

Research & Innovation
Dykebar Hospital, Ward 11
Grahamston Road
Paisley, PA2 7DE
Scotland, UK

21/01/2021

Dr Leighanne Love
NHS Greater Glasgow & Clyde
Garthavel Royal Hospital
1055 Great Western Rd
Glasgow

## NHS GG&C Board Approval

Dear Dr Love,

| | |
|---|---|
| **Study Title:** | Investigating an association between protective factors and desistence in a forensic child and adolescent mental health service: A secondary data analysis |
| **Principal Investigator:** | Dr Leighanne Love |
| **GG&C HB site** | Community Mental Health |
| **Sponsor** | NHS Greater Glasgow and Clyde |
| **R&I reference:** | GN20MH588 |
| **REC reference:** | n/a |
| **Protocol no: (including version and date)** | V1.8 11.12.20 |

I am pleased to confirm that Greater Glasgow & Clyde Health Board is now able to grant **Approval** for the above study.

**Conditions of Approval**

1. **For Clinical Trials** as defined by the Medicines for Human Use Clinical Trial Regulations, 2004
   a. During the life span of the study GGHB requires the following information relating to this site
      i. Notification of any potential serious breaches.
      ii. Notification of any regulatory inspections.

It is your responsibility to ensure that all staff involved in the study at this site have the appropriate GCP training according to the GGHB GCP policy (www.nhsggc.org.uk/content/default.asp?page=s1411), evidence of such training to be filed in the site file. Researchers must follow NHS GG&C local policies, including incident reporting.

2. **For all studies** the following information is required during their lifespan.
   a. First study participant should be recruited within 30 days of approval date.
   b. Recruitment Numbers on a monthly basis
   c. Any change to local research team staff should be notified to R&I team

d. Any amendments – Substantial or Non Substantial
e. Notification of Trial/study end including final recruitment figures
f. Final Report & Copies of Publications/Abstracts
g. You must work in accordance with the current NHS GG&C COVID19 guidelines and principles.

**Please add this approval to your study file as this letter may be subject to audit and monitoring.**

Your personal information will be held on a secure national web-based NHS database.

I wish you every success with this research study

Yours sincerely,

**Kayleigh McKenna**
**Senior Research Administrator**

**CC: Prof T.McMillan (CI); Ms L.Kerr (researcher)**

# Appendix 2.5: Stepwise Logistic Regression Analyses

**Key**

P1 = Pro-social involvement
P2 = Strong social support
P3 = Strong attachments and bonds
P4 = Positive attitude toward intervention and authority
P5 = Strong commitment to school
P6 = Resilient personality traits

**Desistance from any type of offending**

| | | *p* | Odds Ratio | 95.0% C.I for Odds Ratio | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| **Step 1** | **P1** | .793 | .825 | .197 | 3.460 |
| | **P2** | .487 | .634 | .176 | 2.286 |
| | **P3** | .282 | .496 | .138 | 1.781 |
| | **P4** | .609 | 1.427 | .364 | 5.589 |
| | **P5** | .364 | .504 | .115 | 2.210 |
| | **P6** | .556 | .670 | .176 | 2.544 |
| **Step 2** | **P2** | .406 | .599 | .179 | 2.005 |
| | **P3** | .265 | .486 | .137 | 1.727 |
| | **P4** | .646 | 1.360 | .366 | 5.060 |
| | **P5** | .338 | .489 | .114 | 2.110 |
| | **P6** | .533 | .656 | .174 | 2.471 |
| **Step 3** | **P2** | .404 | .598 | .178 | 2.003 |
| | **P3** | .269 | .488 | .137 | 1.742 |
| | **P5** | .393 | .560 | .148 | 2.122 |
| | **P6** | .524 | .650 | .173 | 2.442 |
| **Step 4** | **P2** | .368 | .576 | .174 | 1.914 |
| | **P3** | .205 | .449 | .130 | 1.549 |
| | **P5** | .362 | .541 | .144 | 2.027 |
| **Step 5** | **P3** | .155 | .431 | .122 | 1.398 |
| | **P5** | .374 | .551 | .149 | 2.047 |
| **Step 6** | **P3** | .087 | .359 | .111 | 1.160 |

**Desistance from violence**

| | | *p* | Odds Ratio | 95.0% C.I for Odds Ratio | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| **Step 1** | **P1** | .473 | 1.595 | .446 | 5.707 |
| | **P2** | .245 | .518 | .171 | 1.568 |
| | **P3** | .942 | .958 | .307 | 2.989 |
| | **P4** | .425 | .636 | .209 | 1.932 |
| | **P5** | .329 | .533 | .151 | 1.887 |
| | **P6** | .726 | .806 | .243 | 2.681 |
| **Step 2** | **P1** | .473 | 1.581 | .452 | 5.528 |
| | **P2** | .241 | .516 | .171 | 1.558 |
| | **P4** | .426 | .638 | .211 | 1.931 |
| | **P5** | .308 | .527 | .154 | 1.806 |
| | **P6** | .708 | .799 | .247 | 2.585 |
| **Step 3** | **P1** | .502 | 1.530 | .442 | 5.293 |
| | **P2** | .231 | .509 | .169 | 1.536 |
| | **P4** | .439 | .646 | .214 | 1.953 |
| | **P5** | .293 | .517 | .151 | 1.766 |
| **Step 4** | **P2** | .307 | .590 | .214 | 1.625 |
| | **P4** | .518 | .701 | .239 | 2.058 |
| | **P5** | .346 | .561 | .169 | 1.867 |
| **Step 5** | **P2** | .326 | .604 | .221 | 1.653 |
| | **P5** | .203 | .484 | .158 | 1.480 |
| **Step 6** | **P5** | .196 | .481 | .159 | 1.460 |

# Appendix 3.1: Major Research Project Proposal

**Laura Kerr**

**University Supervisor:** Professor Tom McMillan

**Local Lead Investigator:** Dr Leighanne Love, FCAMHS

**Version:** 1.8

**Date:** 11th December 2020

**IRAS Project ID:** 288295

**Word Count:** 3073

## Major Research Project Proposal

## Investigating an association between protective factors and desistance in a forensic child and adolescent mental health service: A secondary data analysis.

# Abstract

**Background**

Evidence suggests that determining the presence or absence of protective factors adds value to the risk assessment of juvenile offenders. Protective factors have been found to buffer the effects of re-offending and recidivism rates have been found to be higher for those juvenile offenders who have fewer protective factors.

**Aims**

This study aims to examine the association between the presence of protective factors and desistance in a clinical, community sample, as well as exploring the predictive validity of protective factors in determining desistance.

**Methods**

Secondary data from an NHS Forensic Child and Adolescent Mental Health Service will be analysed. Data includes risk and protective factor scores on the Structured Assessment of Violence Risk in Youth (SAVRY) and general/violent offence data at 6 months after the SAVRY was conducted. Associations between the presence of protective factors and desistance will be explored using appropriate tests depending on the distribution of the data. Binary logistic regression and receiver operating characteristic analyses will be conducted to explore power of protective factors in predicting desistance from offending.

**Applications**

The study will contribute to understanding of protective factors that may promote desistance and will inform forensic child and adolescent mental health services, as well as social work services that assess the risk of young offenders. This study also has implications for risk management and intervention.

# Introduction

Risk assessment of juvenile offenders is crucial in determining criminogenic needs and informing associated risk management or intervention as a means of reducing their likelihood of recidivism. In Scotland, those under the age of 20 are more likely to reoffend compared to any other age group which highlights the need for appropriate intervention at this age and stage of life (Scottish Sentencing Council, 2019).

Risk assessment has historically relied on the identification of factors that may increase likelihood of re-offending, otherwise known as risk factors. These factors can be static (i.e. factors that increase risk but cannot be changed such as a prior history of violence) or dynamic (i.e. factors that are amenable to change and intervention such as current substance use) (Ortega-Campos et al., 2020). There is an established direct association between presence of risk factors in juvenile offenders and the increased likelihood of future offending (Cottle, Lee & Heilbrun, 2001).

Emerging risk assessment literature highlights that factors that protect against risk in juveniles could be additionally important in risk identification and management (Lodewijks et al., 2008; Rennie & Dolan, 2010; Shepherd, Luebbers & Ogloff, 2014). Protective factors, such as prosocial peers or good engagement in school, are factors that can reduce the likelihood of recidivism or buffer the negative effects of risk factors (Dickens & O'Shea, 2018).

The Structured Professional Judgment (SPJ) approach to risk assessment and management is routine practice in forensic settings. This approach involves the use of standardised tools to assess static or dynamic risk and protective factors that may be present for the juvenile, whilst holding an additional aspect of clinical judgement when interpreting the tools and making final risk judgements (Guy, Packer & Warnken, 2012). Several SPJ tools have been developed for use with juvenile offenders which include additional protective factor or strength components.

These include the Structured Assessment of Violence Risk in Youth (SAVRY; Borum, Bartel & Forth, 2006), the Short-Term Assessment of Risk and Treatability (START; Webster, Martin, Brink, Nicholls & Middleton, 2004) and the SAPROF-YV (de Vries Robbe, Geers, Stapel, Hilterman & de Vogel, 2015).

It is important to understand how juvenile offenders navigate their way out of a life of criminal activities and the role protective factors may have in this process. Using the SAVRY, Lodewijks et al. (2008) examined the role of protective factors in three samples: juveniles at pre-trial, those incarcerated in a juvenile detention facility, and those following release. They found that the presence of protective factors buffered the effect of reoffending for both high- and low-risk juvenile offenders. The protective domain was found to account for unique variance in predicting recidivism when entered into a regression model with the dynamic risk domain. They further established that strong social support and strong attachments to prosocial adults were significant protective factors in predicting desistance.

Similarly, Rennie and Dolan (2010) found that total scores on the protective domain predicted desistance and that just one protective factor was sufficient to buffer against recidivism in juvenile offenders. They found the protective factor of having resilient personality traits tended to be present when one factor provided a buffering effect.

Shepherd et al. (2016) examined associations between protective factors and time spent desisting from offending. They found that juvenile offenders who had three or more protective factors took longer to reoffend. However, they found a difference between number of protective factors and time to re-offend between low- and high-risk groups, where high-risk offenders' time to reoffend was unaffected by the number of protective factors they held. This study also found that pro-social involvement, having a strong commitment to school and having a positive attitude toward intervention and authority were strong predictors of desistance.

These findings indicate that protective factors may have a significant role in promoting desistance from criminal behaviours. However, most studies include samples who were incarcerated and do not have additional mental health needs. It is estimated that approximately one third of juvenile offenders have an additional mental health need (Chitsabesan et al., 2006). The presence of protective factors may be reduced for those with both criminogenic and mental health needs and it is unknown whether protective factors provide the same buffering effects within a clinical sample. The paucity of research examining the role of protective factors in desistance within a clinical, community-based samples of juveniles who offend indicates a need for research in this area.

## Aims

This study aims to explore the effects of protective factors in the Structured Assessment of Violence Risk for Youth (SAVRY) on desistance and their means of predicting desistance from reoffending in a Forensic Child and Adolescent Mental Health Service (FCAMHS).

**Research Questions**

i. Is the presence of at least one protective factor associated with the likelihood of desistance for juveniles in a Forensic Child and Adolescent Mental Health Service?
ii. Is the number of protective factors associated with the likelihood of desistance?
iii. Do protective factors buffer against re-offending in both high and low risk groups?
iv. Is the protective domain a significant predictor of desistance and does it add predictive value when combined with the static and dynamic risk domains?
v. Do specific protective factors predict desistance better than others?

# Plan of Investigation

## Participant Data

Participant data will be gathered from NHS Greater Glasgow and Clyde's Forensic Child and Adolescent Mental Health Service. Participants will not actively participate in the study, but their data is already established within the service for the purpose of risk management and audit. An anonymous data set with no identifiable personal data will be provided by FCAMHS for the purpose of this research. Participant data will include males and females aged 12-18 who have been involved in offending behaviour, are case managed within the community and have a mental health need.

## Inclusion and Exclusion Criteria

Participants will only be excluded if their risk assessment or offending behaviour data is not available for analyses.

## Variables for Inclusion

Quantitative secondary data will be collected from retrospective records from 2015 - 2020.

### *Demographic Data*

Participants age, gender, Scottish Index of Multiple Deprivation scores, and age of referral to the service will be included in the data set.

### *Measure of Risk*

The SAVRY (is a Structured Professional Judgement (SPJ) Risk Assessment that has been conducted for each participant following their referral to the FCAMHS service. It is a clinician rated assessments of risk and all assessors are qualified clinical psychologists who have been

trained to use the tool. The SAVRY (Borum, Bartel & Forth, 2006) comprises 24 items pertaining to risk factors (historical, social/contextual, and individual) which are rated on a three-point domain of high, moderate, or low. The historical items make up the static risk domain and the social/contextual and individual domains are combined to make up the dynamic risk domain. The tool comprises 6 protective factor items which are rated as absent or present. These include prosocial involvement, strong social support, attachments and bonds, positive attitudes towards intervention and authority, strong commitment to school, and resilient personality traits. From integration of these factors, an overall judgement score of risk of violence/harm to others is rated as high, moderate, or low. The SAVRY has good predictive validity, with a meta-analysis finding that the tool achieved a median AUC (Area Under the Curve) value of .71 in predicting violent recidivism (Singh, Grann & Fazel, 2011).

*Measure of desistance*

Offending behaviour will be obtained from the Intensive Support Monitoring Service (ISMS). This is an intensive social work service considered an alternative to secure care, or custody, for juveniles who are at risk to themselves or others. Offence data will be gathered from social work reports in the 6-month period after their SAVRY risk assessment was conducted. The offence data from ISMS is also intended to be used by FCAMHS/ISMS as part of an audit within their service. Data will include the number of general offences and violent offences. There will be no qualitative information about the offence committed within the data set.

**Design**

This is a retrospective longitudinal design using secondary quantitative data to compare factors associated with desistance from general/violent offending.

**Research Procedures**

Data to be included in the study will be extracted by a Clinical Psychologist within FCAMHS from their existing databases within the service. NHS clinical data will be combined with ISMS offence data by the Clinical Psychologist. FCAMHS will transfer the data in an anonymised form to the principal researcher and it will be analysed for the purposes of this research.

**Data Analysis**

Descriptive statistics will include sample characteristics, the rates of overall desistance and for general and violent recidivism, and whether each protective factor is present.

Table 1 below outlines the data included in the data set.

*Table 1. Variables for analysis*

| |
|---|
| Age |
| Age at referral |
| Gender |
| Scottish Index of Multiple Deprivation score |
| Historical Risk Factors - total score out of 20 (high=2, mod=1, low=0) |
| Social/Contextual Factors - total score out of 12 (high=2, mod=1, low=0) |
| Individual Risk Factors - total score out of 16 (high=2, mod=1, low=0) |
| Total Risk Score - total score out of 48 (median split will determine low and high-risk groups) |
| Protective Factors - total score out of 6 (absent/present) |
| Summary Risk Rating - total out of 2 (high=2, mod=1, low=0) |
| Number of general offences at 6 months post SAVRY |
| Number of violent offences at 6 months post SAVRY |

To answer research question (i), a chi-square test will examine any association between protective factors (absent/present) and desistance (yes/no). This will also be analysed as a binary logistic regression with the outcome variable as desistance (yes/no) and exploratory

variable as protective factors (absent/present). These analyses will be run for both general offending and violent offending only.

For research question (ii), Further chi-square analysis will be conducted to examine groups where the number of protective factors is either low (0); moderate (1-2) or high (3+) and outcome is desisted (yes/no) for both general and violent only offending. These categories are provisional as they are dependent on the spread of the data. Correlational analyses will be conducted to explore any association between the number of protective factors and the number of offences included in social work reports at 6 months post risk assessment.

For research question (iii), the binary logistic regression noted for research question (i) will be expanded on to explore any comparisons between high-risk and low-risk groups. Risk group will be determined by a median split of total risk score.

For research question (iv), further binary logistic regressions will be conducted to investigate the predictive power of the protective domain and the static and dynamic risk domains (total scores) on the outcome variable of desistance (yes/no). Receiving operator characteristics (ROC) analysis will be conducted to examine the predictive power of these domains for both violent and general offending.

To answer research question (v), a stepwise logistic regression will be conducted with the desistance (yes/no) as the outcome variable and the individual items on the protective domain being entered as explanatory variables. A ROC analysis will also be conducted.

The first research question is the primary interest, and all other analyses are exploratory. Therefore, there will be no adjustment made for multiple comparisons.

**Justification of Sample Size**

A sample size of 88 will be used as this is the maximum data available from the FCAHMS database. With our expected number of 88, and assuming a similar proportion as observed by Rennie and Dolan (2010). will re-offend at least once (70%), we expect 62 to re-offend, and the remaining 26 will not re-offend. There is little published information on the proportions re-offending split by the presence of any protective factors. However, given an observed mean SAVRY protective total of 1.22 and 2.59 by Rennie and Dolan (2010) respectively, with a conservative common standard deviation of 1.9, we will have in excess of 85% power with a two-sided test and significance level of 5%. This sample size calculation is provided using NQuery v8.6.1.0 in consultation with a statistician.

**Settings and Equipment**

A password protected University of Glasgow encrypted laptop will be used to access the data. The data will be stored on the university secure server. SPSS Version 26 will be utilised for the purpose of data analysis.

## Ethical Issues

Participants have consented to their anonymised information being used for research purposes upon engagement with FCAMHS and the service has Caldicott approval granted to access and collate historical FCAMHS patient data. Further Caldicott approval has been granted for the principal researcher to access the data in an anonymised form from FCAMHS. NHS Research

Ethics and the University's Medical, Veterinary and Life Sciences (MVLS) Ethics Committees have confirmed that ethical approval is not required due to the anonymised nature of the secondary data. Approval is being sought from Glasgow City Health & Social Care Partnership (HSCP) for ISMS anonymised data to be transferred from FCAMHS to the researchers. NHS R&I approval will be then sought for the research.

## Data Management

The anonymised data will be processed and stored in accordance with the Data Protection Act 2018. Data will be transferred by Dr Leighanne Love at FCAMHS to the University of Glasgow to be stored on the university's server. The data held on the sever will be accessed through a password protected university laptop. Data will be held in an Excel spreadsheet and transferred to an SPSS file so that it can be analysed. The data will be kept for 10 years following completion of the study and destroyed thereafter by deletion of the electronic files. The principal and chief investigators will have access to the data.

## Dissemination

The research will part of a thesis submitted to the University of Glasgow as partial fulfilment of a Clinical Psychology Doctoral qualification. It will be uploaded on the University of Glasgow's 'Enlighten Thesis' webpage for access by the public. The resulting paper will also be submitted for scientific publication and may be presented at conference presentations. The completed research will be disseminated to both FCAMHS and ISMS to inform their services of the findings. The findings may also be disseminated at the youth justice conference.

## Financial Issues

The study will have no associated costs due to the availability of existing data and lack of recruitment processes.

## Proposed Timetable

| | |
|---|---|
| Final proposal | October 2020 |
| Caldicott approval | November 2020 |
| Data analysis | January 2021 |
| Write-up | January – February 2021 |
| Final submission | 26th February 2021 |

## Practical Applications

The study will contribute to understanding of factors that may promote desistance from violent reoffending and inform forensic child and adolescent mental health services, as well as other services that assess risk of young offenders. It therefore has implications for risk assessment, risk management, and intervention for young people who offend and have additional mental health needs.

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Appendix 3.2: Major Research Project Proposal (abandoned due to Covid-19)

**Laura Kerr:**

**University Supervisor:** Professor Tom McMillan

**Field Supervisor:** Dr Leighanne Love

**Version:** 2.5

**Date of Submission:** 17th December 2019

**Word Count:** 3587

# Major Research Project Proposal

# Head injury in juveniles in the community who offend: Relationships with disability, offending behaviour and co-morbidity.

# Abstract

**Background**

Research has shown associations between head injury (HI) and offending behaviour in juveniles. However, less is known about persisting disability related to HI in juvenile offenders. Furthermore, this population tend to experience co-morbid difficulties such as mental health problems, cognitive dysfunction, substance use and trauma; all of which may result in disability.

**Aims**

To investigate the prevalence of HI in juveniles in the community who offend and its relationship with disability and offending behaviour. Secondary aims are to explore associations between HI and the aforementioned co-morbid variables; and whether HI is associated with disability independently of these factors.

**Methods**

This is a between groups, cross-sectional study. Participants are juveniles, aged 12-18, who are involved in the youth justice system but are not in custody. Participants will undergo measures of HI severity, disability, offending behaviour, cognitive functioning, anxiety, depression, trauma, and substance use. Associations between these variables will be examined using between group and correlational analyses.

**Applications**

The study will contribute to the initiatives of the National Prisoner Healthcare Network. It will inform forensic child and adolescent mental health (F-CAMHS) and social work services with respect to rehabilitation, intervention, and service development.

# Introduction

Head injury (HI) is consistently found to be more prevalent in offending populations compared to the general population (Farrer & Hedges, 2011; McMillan et al 2019). Approximately 30% of offending youth are estimated to have a HI and their odds of having a HI is 3.38 times higher than the non-offending youth population A meta-analysis found that 30% of juvenile offenders had sustained a HI and that they are more likely to have a HI compared to those who do not offend (Farrer, Frost & Hedges, 2013). There is growing international interest in this area, with a seminal review highlighting the relationship between HI and earlier, more violent offending, as well as increased recidivism in both adult and juvenile samples (Williams, 2018). A recent Scottish Government report by the National Prisoner Healthcare Network (NPHN) has emphasised the need for further research and improvement in identification of HI in offenders (McMillan et al., 2016).

It is suggested that HI could be related to the epidemiology of criminal behaviour. HI is associated with cognitive and behavioural sequelae that may increase offending behaviours, such as impulsivity, aggression, and poor decision making (Wood & Worthington, 2017). Children and adolescents are particularly vulnerable to HI. It is the leading cause of death and disability for this age group (Tagliaferri et al., 2006) and this time in life is pivotal for neurodevelopment (Ciccia, Meulenbroek & Turkstra, 2009). Indeed, HI has been associated with earlier onset and more violent criminal behaviour in adolescents (Perron & Howard, 2008; Gordon, et al. 2017) and multiple HIs compared to a single HI in juvenile offenders was found to be associated with increased number of convictions (Williams et al., 2010).

Although HI is highly prevalent in juveniles who offend and appears to correlate with offending characteristics, there is a paucity of research on associated disability in offenders (Moynan &

McMillan, 2018). Prior HI may, or may not, lead to disability and determining this is crucial for rehabilitation and reducing the risk of recidivism. Studies involving adults have found that approximately one third of male prisoners with moderate-severe HI have associated disability (Walker, 2017) and 10% of prisoners with HI have persisting disability that is likely to require intervention (McGinley et al., 2019). A recent unpublished study investigating disability in juvenile prisoners found that multiple HI was associated with increased disability (McVean, 2019). Considering these findings, there is a need to investigate associated disability in juveniles who offend but are not in custody.

Cognitive deficits in attention, memory and processing speed are associated with HI and may result in associated disability. Cognitive performance on neuropsychological tests relating to intelligence and executive functioning in offenders has been found to be poorer in those that have sustained a HI compared to offenders that have not (Pitman et al., 2015). Furthermore, those who offend often have co-morbid difficulties which, in addition to HI, may be associated with disability. In a prospective cohort study, HI was associated with the development of psychiatric disorders such as depression, post-traumatic stress disorder and anxiety disorders (Bryant et al., 2010). In juvenile offenders with HI, there is evidence to suggest a higher prevalence of alcohol and substance misuse and of trauma backgrounds than in those without a history of HI (Kennedy, Heron & Munafo, 2017; Moore, Indig & Haysom, 2014; Schofield et al., 2019; McVean, 2019). These variables may also be risk factors for offending and/or disability. Therefore, it is unclear whether HI is a significant contributor independently of these factors.

## Aims

1. To investigate the prevalence of HI in juveniles in the community who offend.
2. To explore associations between HI, disability and offending behaviour.
3. To explore associations between HI and cognitive impairment, mental health problems, substance use and trauma.
4. To explore whether HI is associated with disability independently of the factors in (3).

### Hypotheses

$H_1$: Those with multiple HI and/or moderate-severe HI will have greater disability compared to those with no/single mild HI.

$H_2$: Those with multiple HI and/or moderate-severe HI will have a greater number of convictions, violent offences and referrals to the court or children's reporter compared to those with no/single mild HI.

$H_3$: Those with multiple HI and/or moderate-severe HI will have worse cognitive ability, poorer mental health, increased substance misuse, and elevated trauma histories/symptoms compared to those with no/single mild HI.

$H_4$: Multiple HI and/or moderate-severe HI will be associated with increased disability independently of the variables in $H_3$.

## Plan of Investigation

### Participants

Participants are individuals involved with the Glasgow Youth Justice Service due to their offending but are not in secure care or custody. This includes juveniles who have attended the

children's reporter or courts for offending behaviour and those that attend the Intensive Support and Monitoring Service (ISMS). ISMS is an intensive social work service considered an alternative to secure care, or custody, for juveniles who are at risk to themselves or others.

**Inclusion and Exclusion Criteria**

Juveniles aged 12-18 will be invited to take part. Those attending ISMS for any reason other than offending will be excluded. Other exclusion criteria are: not fluent in English; not having basic literacy; posing a risk of harm to the researcher; and having capacity or communication difficulties, or a neurodevelopmental disability at birth, that would impact on their ability to participate or provide informed consent.

**Recruitment Procedures**

Participants will be recruited from three Social Work Services in Glasgow (North East, North West and South) and ISMS. Approximately 250-300 juveniles are open to social work, with an additional 40 open to ISMS for offending behaviour. Information posters about the study will be distributed to sites and a presentation will be given to staff. Social workers will be asked to introduce the study to those under their caseload. If possible, participants will be offered a research appointment at a time when they would ordinarily be attending the social work sites in order to increase recruitment uptake. A social worker from F-CAMHS will aid recruitment and file reviews.

**Measures**

<u>Demographics</u>

Demographic data include age, gender, and education. A measure of social deprivation will be obtained using the Scottish Index of Multiple Deprivation (Scottish Government, 2016).

Maternal substance misuse during pregnancy and methadone use by the participant in recent months will also be ascertained.

Head injury

The Ohio State University Traumatic Brain Injury Identification Tool (OSU TBI-ID) will be used to assess the occurrence and severity of HI. It screens for lifetime history of injury to the head or neck. It has good test–retest reliability in offending populations (Bogner & Corrigan, 2009). Although this measure has only been validated with adults, it has been found to be an appropriate measure of HI in studies with juveniles (McVean 2019). It essentially formats an interview where clarifications can be given if questions are not understood, and uses simple language.

*Primary Outcome Measures*

Disability

The Glasgow Outcome Scale-Extended Paediatric Version (GOS-E Peds; Beers et al., 2012) will measure disability. It is intended for use for those living in the community and can be used with children and adolescents of varying developmental stage. It has good criterion-related and discriminant validity.

Forensic History

Information related to offending will be sought through self-report and will be corroborated by official reports where possible. Data includes: the age of first offence, number of convictions, number of times they have been referred to the children's reporter/courts and whether offences are violent.

*Secondary Outcome Measures*

Cognitive functioning

The Trail Making Test (TMT) will assess visual attention and task switching (DKEFS subtest; Delis, Kaplan & Kramer, 2001). Participants connect numbers in consecutive order (part A) and then connect numbers and letters in alternating consecutive order (part B). The DKEFS version was selected due to the availability of normative data for the participant age range; this also applies for the next test.

The Verbal Fluency Test (VFT) will assess phonetic & semantic verbal fluency (DKEFS subtest). Participants generate as many words as they can beginning with 'F', 'A' and 'S' and then in a designated category within a specified time frame.

The Symbol Digit Modalities Test (SDMT; Smith, 1982) will assess processing speed. Participants pair coded numbers with geometric figures within a specified timeframe. It is sensitive to detecting the presence of brain damage and has normative data across the age range.

The Rey Auditory Verbal Learning Test (RAVLT; Schmidt, 1996) will assess learning and verbal memory. Participants learn a list of 15 words over 5 trials then recall the list following an interference list. Normative data is available for the age range of participants.

The Word Memory Test (WMT) will assess effort. This has been found to be a suitable test of performance in children and adolescents who have a least a grade 3 reading level (Green & Flaro, 2010).

Mental health

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) will measure mental health. It has adequate test-retest reliability and can discriminate between adolescents with and without diagnoses of depression or anxiety (White et al., 1999).

Substance misuse

The CRAFFT Screening Interview (CRAFFT; Knight et al., 1999) will assess substance use and high-risk alcohol/drug-use behaviours. It has good sensitivity and high test-retest reliability (Dhalla, Zumbo & Poole, 2011).

Trauma

The Child and Adolescent Trauma Screen (CATS) will assess trauma. It comprises items relating to past traumatic events and symptoms of post-traumatic stress disorder. It has good to excellent reliability (Sachser et al., 2017). The Adverse Childhood Experience Questionnaire (ACE-Q) Teen Self-Report (Centre for Youth Wellness, 2015) will assess adverse experiences in childhood which have been linked to difficulties in both mental and physical health.

**Design**

This is a between groups, cross-sectional design exploring associations between several psychological and behavioural variables of those with and without a history of significant HI.

**Research Procedures**

Participants will be provided with a study information sheet. This will be discussed with them and their understanding checked by the researcher. Written informed consent will be required from the participant and assent will be sought from their legal guardian if they are under 16.

Participants will complete all measures in one sitting, lasting approximately 60-80 minutes. All measures will be administered by the primary researcher who will attend a site one day per week during the data collection phase.

**Data Analysis**

Descriptive statistics for prevalence of HI, demographic variables, co-morbid variables and disability will be reported. For inferential data analyses, variables have been outlined in Table 1.

Table 1. Variables for analyses

| Variable | Description | Scale | Minutes to Administer |
|---|---|---|---|
| **Head Injury** | OSU-TBI: no/single mild; multiple; moderate-severe | Categorical | 5 |
| **Disability** | GOS-E Peds: disabled or good recovery | Categorical | 5 |
| **Offending Behaviour** | Number of convictions<br>Number of violent offences<br>Number of times reported to the courts and/or children's reporter | Categorical or continuous | 5 |
| **Cognitive Ability** | Combined z score for all tests (TMT, VFT, SDMT, RAVLT) | Continuous | 25 |
| **Effort** | WMT: pass/fail | Categorical | 15 |
| **Mental Health** | HADS: score for depression & anxiety | Categorical | 5 |
| **Substance Use** | CRAFFT | Categorical | 5 |
| **Trauma** | CATS and ACE score | Categorical | 5 |

$H_1$: Chi-square tests of independence will explore associations between HI severity and disability. Analyses will distinguish between HI related disability and disability from any other cause.

$H_2$: ANOVAs or chi-squares (depending on level of measurement) will compare HI group and offending characteristics.

$H_3$: Individual univariate analyses (ANOVA or chi-squares depending on level of measurement) will compare HI group with anxiety, depression, trauma, cognitive ability, and substance use as outcome variables. Additional analyses will determine whether effort was associated with performance on the cognitive tests or was associated with HI severity.

$H_4$: Multivariate logistic regression with HI and those significant variables as highlighted by univariate analyses entered as predictor variables and disability entered as the outcome variable.

Age, gender, education level, maternal substance use and social deprivation may be entered as covariates in multivariate analyses.

**Justification of Sample Size**

Studying 78 juvenile prisoners, McVean (2019) found medium to large effect sizes between HI severity and multiple variables (anxiety, depression, post traumatic symptoms, ACES, and alcohol and drug use). Additionally, a medium effect size ($r^2$=.117) between HI severity and disability was found in a study with 81 adult prisoners (Walker, 2017). G-Power estimates that 85 participants will be needed to achieve a medium effect size ($r^2$=.15), with power set at .80

and significance set at .05 in a regression analyses with 4 predictor variables. Therefore, this study will aim to recruit 85 participants.

### Settings and Equipment

Research will be conducted within social work sites. Equipment comprises of a laptop, questionnaires, and cognitive tests.

## Health and Safety Issues

### Researcher Safety Issues

Social workers will advise on researcher safety. Internal risk management protocols will be followed, for example, a social worker may need to be present during the interview with the young person. The researcher will undergo any site-specific safety training that is required.

### Participant Safety Issues

Any participant distress during the interview will be responded to with reassurance and support. Re-traumatisation has not been an issue in previous studies with juvenile offenders that have used simple categorical questionnaires. However, research will cease if the participant does not wish to carry on. If a severe HI with associated disability is identified or any other significant concern regarding the health or wellbeing of the participant is highlighted, then this will be brought to the attention of their social worker. If fatigue is evident then breaks will be offered. However, similar studies involving juvenile prisoners have found that breaks are rarely required.

## Ethical Issues

Ethical approval will be sought from the NHS as well as Glasgow City Council Social Care Research and Ethics Board. Not all participants will be under the care of parents and may be under the care of the local authority. In this case, if under 16, consent from the local authority will be sought. A parental consent opt-in letter will be provided to participants who need additional consent from their guardian. Age-appropriate language and/or images will be used in research posters and leaflets to aid understanding of the research and make it accessible for participants. Participants will be advised of their right to withdraw from the study at any time. They will be informed of the limits to confidentiality prior to commencing the study and who will be told if any confidentiality issues arise. Participant data will be processed and stored in accordance with the Data Protection Act 2018. Participants will be given a unique identifier to maintain anonymity. Data will be stored securely in a locked filing cabinet, encrypted password protected laptop, and university server. Data will be destroyed 10 years following the study's completion.

## Financial Issues

Expenses comprise of costs for photocopying materials and neuropsychological tests that need to be bought into the department. Full costs are outlined in the 'Research Equipment, Consumables & Expenses' form.

## Timetable

| | |
|---|---|
| Ethics application | January – March 2020 |
| Recruitment & data collection | April – October 2020 |
| Data analysis & write-up | November 2020 – February 2021 |
| Final submission | 28th February 2021 |

## Practical Applications

The research will contribute to the initiatives of the National Prisoner Healthcare Network. It will inform forensic child and adolescent mental health and social work services with respect to rehabilitation, intervention, and service development.

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