Poor Parental Supervision is Associated with Traumatic Brain Injury and Reactive Aggression in Young Offenders.

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Abstract

Objective. To establish whether poor parental supervision is associated with head injury and self-reported reactive aggression (i.e. aggression in response to perceived provocation or threat) in adolescents in a young offender's institute, by examining correlations between these variables. Understanding this population is important as they are at a key pivotal age for intervention to prevent life-long re-offending.

Method. Ninety-six male participants aged 16-18 were recruited from a UK Young Offender's Institute. Self-report measures of remembered parenting, reactive aggression, and head injury history were administered during individual interviews.

Results. 74% of participants reported having experienced a lifetime TBI, and 46% of participants reported experiencing at least one TBI leading to a loss of consciousness (LOC). We found that poor parental supervision, length of LOC following TBI, and self-reported reactive aggression, were all positively correlated.

Conclusions. Findings show that there are correlational relationships between poor parental supervision, length of LOC following lifetime TBI, and higher levels of self-reported reactive aggression. This suggests there may be pathways resulting from poor parental supervision leading to both TBI with LOC, and reactive aggression. We advocate for future research with longitudinal designs and larger samples to examine the nature of these interactions, and to establish whether poor parental supervision is a prospective risk factor for more TBIs leading to LOC, and reactive aggression. This is key to understanding whether parenting interventions could help to reduce the disabling effects of TBI in adolescents, and help to prevent contact with the law.

Keywords: *Parental Supervision; Traumatic Brain Injury; Reactive Aggression; Violent Crime; Young Offenders*

Poor parental supervision (i.e. poor monitoring of a child's activities) is a risk factor for paediatric and adolescent TBI in the general population. Known leading causes of TBI in paediatric and adolescent populations include falls, road traffic accidents, abuse, and fights [1, 2]. Attentive and responsive parenting practices involve the moderation of these risk situations. Good supervision can help to minimise the risks of falls and accidents during early childhood (under 5) [3]. In the general population, adolescents whose parents are uninvolved and offer poor supervision take more risks. They are twice as likely to be involved in car crashes, more likely to drive when intoxicated, and more likely to use a mobile telephone whilst driving [4].

TBI commonly leads to lasting problems with reactive aggression (aggressive behaviour in response to perceived provocation, threat, or frustration), with often severe consequences for the individual and their family [5, 6]. This link is thought to be due to deficits in executive functioning and emotion regulation following TBI, leading to problems with impulse control, decision-making, and behavioural flexibility [7]. As a result of these deficits, individuals with TBI are often more prone to reacting impulsively to perceived provocation, rather than selecting a reasoned or logical response. TBI is a spectrum disorder, and resultant sequalae vary by severity and chronicity of injury - those with multiple injuries often have poorer outcomes than those with single incidences [8]. TBI is a known correlate of contact with the criminal justice system, and has been identified as a risk factor for earlier, more violent offending [6]. In the general population, TBI is estimated to affect approximately 8% - 12% of people [9, 10], but amongst young offenders in custody incidence of TBI is 4-5 times higher [11, 6]. In longitudinal birth cohort studies where temporal order can be established, the presence of a paediatric TBI has been shown to precede and increase risk of criminality and violent offending behaviour in later life [12, 6]. High velocity rotational injuries (often sustained in road traffic accidents) have been linked to greater anger and irritability in the general population [6,

[13]. Greater disability and more severe deficits following TBI are associated with increased aggressive behaviour post-injury [14].

Parental supervision can modify the risk of poorer outcomes following paediatric TBI. For example, correlational studies have revealed that higher levels of parental supervision and responsiveness to their child's feelings and needs following a moderate, severe, or complicated-mild paediatric TBI can mitigate the resultant symptoms, reducing deficits in theory of mind (the ability to understand that others have separate thoughts, feelings, and experiences from our own) and improving peer relationships, amongst other outcomes [15]. This is a mechanism which has been shown to underpin aggression. Austin, Bondu, and Elsner (2010) performed a longitudinal cross-lagged analysis revealing that lower levels of both cognitive and affective theory of mind are predictive of higher levels of reactive aggression in middle childhood (6-9 year olds) when controlling for age and gender [16]. Temporally, it is interesting to consider whether parental supervision may be a contextual factor that increases chances of TBI and/or behavioural issues post TBI. Root and colleagues (2016) found correlational evidence that poor parental supervision of children aged 8-13 with a moderate, severe, or complicated-mild paediatric TBI led to poorer social outcomes [17]. All these relationships are bidirectional in developmental models; children whose parents who offer poor supervision and less nurturance after paediatric TBI have poorer outcomes in terms of reactive aggression, but children who are more reactively aggressive and externalise anger may be parented more passively as a result.

Pathways to crime are mixed and complex, and are impacted by a myriad of factors including ethnicity, socio-economic status, and mental health [6, 18 - 20], but some pathways appear to originate with poor parental supervision and TBI. We therefore aim to establish whether parental supervision is linked to severity of lifetime TBI and self-reported reactive aggression in 16-18 year olds recruited from a Young Offenders Institute. This is a

population of significant interest in forensic literature, due to this population being at a key dynamic phase for neuromaturation [21], and having high levels of mental health and educational needs, and high rates of re-offending [22 - 24]. Intervention and support for this population could prevent future re-offending. Despite TBI being closely linked to reactive aggression in several studies, the role of parental supervision in this area is not properly understood as yet. This study is a pilot, exploring whether there are associations between parental supervision, TBI, and reactive aggression. This will form the basis of future research exploring the nature of these relationships. The narrow adolescent age band is advantageous when considering retrospectively reported parenting styles, as although there will always be unavoidable issues with the reliability of retrospective self-reporting, proximity to the event can improve consistency of reporting [25]. We hypothesise here that poor parental supervision will be linked to higher severity of lifetime TBI in incarcerated adolescents, and higher levels of self-reported reactive aggression.

Method

Ethical Approval

Appropriate ethical approval was granted by the University of Exeter Department of Psychology research ethics committee, and HMPPS research governance, prior to the commencement of this study.

Participants and Design

This study used a cross-sectional interview design. Participants were recruited using opportunity sampling from a Young Offender's Institute (YOI), during free periods from their educational activities. Participants were included if they were males aged 16 to 18. Participants were excluded from participating if they were experiencing active suicidal ideation, active psychosis, if English was not their first language, if they had severe visual or

hearing impairments which would impact their ability to complete the interview, or if they had a diagnosis of a physical or mental health condition that may affect cognitive functioning (including autism spectrum condition [26], congenital learning disabilities, and epilepsy). A total of 105 participants were asked to participate. Six declined to participate, and one did not meet the inclusion/exclusion criteria. A further two were excluded prior to analysis as they had missing data (data missing at random, representing >5% of the sample, therefore exclusion was the appropriate course of action). The final sample was 96 participants (91.42% of all those approached).

Participants were aged between 16 and 18 (M = 16.86, *SD* = .64). 52 (54.17%) described their ethnicity as White English, 21 (21.88%) described their ethnicity as Black Caribbean, 5 (5.21%) described their ethnicity as Black African, and 18 (18.75%) described their ethnicity as other. Table 1 shows descriptive characteristics of participants.

**** Table 1 about here****

Measures

The following measures were administered to assess the variables of interest in this study, alongside other measures beyond the scope of this study for collaborative research projects.

Poor Parental Supervision

Retrospectively reported parenting practices including poor supervision were measured using a retrospective report version of the short form of the Alabama Parenting Questionnaire (APQ-9) [27]. It assesses parenting practices in three areas: positive parenting, inconsistent discipline, and poor supervision, and three items comprise each subscale. Items are scored on a five-point Likert-type scale ranging from 1 (Never) to 5 (Always). The

wording of items was adapted to be self-report and can apply to parents or primary caregivers. Examples of items include 'I stay out in the evening after the time I was supposed to be home' and 'I go out with friends my parent/guardian(s) don't know'. The scale has been found to have good convergent validity on a three-factor model and acceptable internal consistency between α=0.59-0.79 for mothers and α=0.63-0.84 for fathers [27].

Reactive Aggression

Current self-reported reactive aggression was measured using the reactive aggression subscale of the reactive-proactive aggression questionnaire [28]. This is a brief 26 item measure, and 11 items measure self-reported frequency of reactive aggression. Participants respond on a three-point Likert type scale ranging from 0 (never) to 2 (often). Examples of items include 'How often have you damaged things when mad?' and 'How often have you become angry when provoked?'. This measure has shown good internal reliability for reactive (a=.84) aggression, and convergent and discriminant validity for behaviours measured by the Child Behaviour Checklist in adolescent males [28].

Traumatic Brain Injuries

Presence of historic TBI was established using questions from the head injury section of the comprehensive health assessment tool (CHAT) [29]. These questions include "Have you ever had an injury to the head that caused you to be knocked out and/or dazed and confused for a period of time?". Responses were recorded as 'Yes' or 'No'. Participants were asked how they obtained their head injuries, and were asked to choose from: 'road accident', 'fall when sober', 'fall when under the influence of a substance', 'sports injury', 'fight', 'other criminal activity', or 'other non-criminal activity'. If participants answered yes to having had an injury to the head, they were asked to estimate their total cumulative loss of consciousness (LOC) from the following: 'no loss of consciousness,' 'up to five minutes', '5-10 minutes',

'10-30 minutes', '30-60 minutes' or 'over 60 minutes'. This was used to create a continuous scale of severity of TBI, as this is an appropriate measure of 'dosage' [30]. This self-report method of assessing TBI in incarcerated populations has been found to be generally accurate and reliable when compared to medical records [31]. It is also appropriate for this population, as TBIs obtained during criminal activities are less likely to receive hospital treatment [32].

Procedure

The researchers provided training to staff at the YOI in interview administration and data collection. A pilot period of data collection observation was conducted to ensure the procedure was followed correctly and the data was high-quality. The structured interviews were completed in the same order each time and took approximately 30 minutes. Participants were remunerated with two pounds phone credit.

Results

All analyses were conducted using R statistical software version 3.6.3 [33]. A non-parametric Spearman's rank correlation was used, as data was not normally distributed, and there was excessive heteroscedasticity. The study was underpowered to perform more complex statistical models examining the relationships between correlated variables, so more advanced analyses were not conducted.

71 participants (73.96%) reported having experienced a lifetime TBI, and 44 (45.83%) reported experiencing at least one TBI leading to LOC. Retrospectively reported poor parental supervision was significantly correlated with self-reported current reactive aggression ($r(96) = .242$, $p = .018$) and longer LOC after TBIs ($r(96) = .280$, $p = .006$). Self-reported current reactive aggression was also significantly correlated with longer LOC after TBIs ($r(96) = .242$, $p = .018$). Table 2 shows correlations between all variables.

**** Table 2 about here****

Discussion

73.96% of all participants reported having experienced at least one TBI, and 45.83% reported having sustained a lifetime TBI leading to a LOC. This is consistent with existing literature, which has found evidence for causality and discusses TBI as a 'silent epidemic' amongst incarcerated populations [6]. We found evidence of correlations between poor parental supervision, severity of lifetime TBI, and self-reported reactive aggression. Our results provide preliminary support to the hypothesis that the themes found in the general population showing that there are associations between poor parental supervision, TBI, and reactive aggression are applicable to incarcerated adolescents, where the incidence of TBI is exceptionally high.

We have illustrated that the relationships between poor parental supervision, reactive aggression, and TBI, shown in the general population of adolescents also apply in incarcerated young offenders. This provides support for further research exploring the principles that parenting practices pre- and post- TBI could be important risk factors both for injury leading to TBI, and for poorer outcomes following TBI. This is therefore a group who would benefit from interventions which have been evidenced to improve coping skills and social functioning, and reduce frustration levels following TBI, such as cognitive behavioural therapy [34]. The use of parenting and family interventions following paediatric TBI is also important - and should be incorporated by youth intervention and probation teams working with the families of young offenders affected by TBI. For example, family problem-solving therapies have been found to be effective in improving behavioural problems and family functioning following paediatric TBI in randomised controlled trials [35]. Screening for TBI in offenders is key to understanding the difficult reactive aggressive behaviours that may be displayed by young offenders, and identification of TBI can facilitate therapeutic, informed

frontline working to improve aggression levels and outcomes both within prisons and with integration into the community.

The primary limitation of this study is the cross-sectional nature of the data, which greatly limits the developmental inferences which can be drawn. We did not have a measure of whether parenting practices changed following TBI, or were consistent prior to TBI. We were underpowered to examine more complex relationships, for example whether the presence of TBI leading to LOC mediates the relationship between poor parental supervision and self-reported reactive aggression, and whether length of LOC following lifetime TBI interacts with self-reported reactive aggression. Additionally, the use of self-report measures can be problematic, despite using well-validated measures. Capturing the nuances and variations of parenting styles in a short-form self-report questionnaire is difficult, and future studies should consider the use of semi-structured interviews and longitudinal observation to capture rich, dynamic data about parenting styles, as discussed by Smith (2011)[36]. A theoretical limitation of this study is the complexity of the mechanisms of reactive aggression. Whilst there are compelling arguments for TBI altering neural correlates of reactive aggression, [37, 6], it is also possible that the self-reported reactive aggression captured in our study is a marker of previous psychological trauma [38], or of mental health problems [39, 40]. The impact of multiple or complex TBIs on reactive aggression is difficult to delineate, and TBIs often occur in the presence of psychological trauma (e.g. in abusive home environments, or in accidents), so the impact of psychological trauma should always be considered.

Our preliminary correlational findings indicate more work with larger samples is needed. Future birth cohort and longitudinal studies are crucial to elucidate the temporal order of events increasing risk of aggression and incarceration in adolescents. This will enable some delineation of the relationship between TBI and reactive aggression, and provide

194 further clarification into the mechanisms of reactive aggression in childhood and adolescence.
195 Bidirectional relationships are difficult to detect and separate, but understanding the nature of
196 the relationships can help to inform screening and intervention for adolescents at risk of
197 reactive aggression, and at risk of contact with the criminal justice system, following TBI.
198 Other important correlates of contact with the criminal justice system, including educational
199 level, mental health, and socio-economic status should also be collected in future work, in
200 order to more accurately model pathways into crime, and understand cumulative risk factors
201 for offending behaviour.

202 In sum, we have found that parenting practices were associated with both more severe
203 lifetime TBI, and higher levels of self-reported reactive aggression in a sample of
204 incarcerated adolescents. These findings, particularly if bolstered by future studies exploring
205 the nature of these links, offer insights into how to reduce the occurrence of TBI and improve
206 outcomes following TBI. This contributes to a wider body of literature, aiming to reveal and
207 reduce the impact of TBI in the criminal justice system.

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Table 1

Table 1: *Characteristics of variables including Mean & Standard Deviation.*

Variable	**Mean**	**SD**
Age	16.86	.643
Length Loss of Consciousness	1.67	1.587
Poor Supervision	11.23	2.989
Reactive Aggression	13.55	4.410
Ethnic Group	**N**	**%**
White English	52	54.17
Black Caribbean	21	21.88
Black African	5	5.21
Other Ethnic Group	18	18.75

Note: Age - Range = 16-18. Length Loss of Consciousness - Scored between 0 and 6, where 6 is the highest 'dosage' of injury. Poor Supervision - Scale Range = 0-15. Reactive Aggression - Scale Range = 0-22.

Table 2

Table 2: *Spearman's Rho correlation coefficients for correlations between variables with indications of significance at p = .05 and p = .01.*

Variable	Age	Length LoC	Poor Supervision	Reactive Aggression	Ethnicity
Age	-				
Length LoC	.023	-			
Poor Supervision	-.043	**.280****	α = .611		
Reactive Aggression	-.064	**.242***	**.242***	α = .818	
Ethnicity	-.036	-.108	-.073	-.129	-

Note: * = p is significant at .05, ** = p is significant at .01.
Poor supervision was significantly correlated with reactive aggression (r(96) = .242, p = .018) and longer LOC after TBIs (r(96) = .280, p = .006). Reactive aggression was also significantly correlated with longer LOC after TBIs (r(96) = .242, p = .018).