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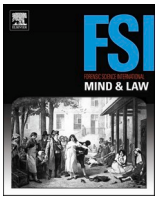

Opening Editorial

An exploratory study on the role of criminogenic risk factors and informant-rated everyday executive functioning in predicting the age of offending onset in young people with FASD

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ABSTRACT

Fetal Alcohol Spectrum Disorder (FASD) is characterised by a range of neurodevelopmental deficits that may increase risks of justice system involvement. Improving our understanding of criminogenic risk factors and particularly the role of informant-rated executive functioning (EF) in predicting the age of offending onset in this clinical population may reduce recidivism and help inform targeted interventions. Participants' file records (N = 100) were retrospectively reviewed to gather information on criminogenic factors (i.e., out-of-home care, adverse childhood experiences, school disengagement, negative peer association, age of substance use onset), and informant ratings from the Behaviour Rating Inventory of Executive Function - 2nd edition (BRIEF2). Scores on the BRIEF2 measure were available for 38 participants upon file review. Across the total sample (N = 100), most participants were male (82%) and of Aboriginal descent (88%). Mean age at the time of assessment was 15.60 years (range = 10–24). After controlling for demographic factors, individual regression analyses showed out-of-home care ($B = -0.93$, $p = .031$), negative peer association ($B = -0.96$, $p = .024$), and age of substance use onset ($B = 0.29$, $p = .032$) predicted the age of offending onset. When all criminogenic factors were entered into the model, only age of substance use onset remained a significant predictor of age of offending onset ($B = 0.29$, $p = .032$). Specifically, early substance use initiation resulted in earlier contact with the justice system. Additionally, those with more informant-rated EF difficulties in working memory ($B = 0.07$, $p = .024$), task shifting ($B = 0.08$, $p = .011$), plan/organise ($B = 0.08$, $p = .014$) and inhibition ($B = 0.05$, $p = .048$) had a later onset of offending behaviour. Our preliminary findings provide evidence for the vulnerability to justice system involvement in young people with FASD and identified risk factors that can guide prevention and intervention programs.

1. Introduction

Fetal Alcohol Spectrum Disorder (FASD) is a condition caused by prenatal alcohol exposure (PAE) that is characterised by a range of physical and/or neurodevelopmental deficits (Bower et al., 2017). International studies have demonstrated disproportionately high rates of FASD among youth and adults in the justice system (Flannigan et al., 2018; McLachlan et al., 2019; Popova et al., 2011). The only prevalence study among young people in an Australian detention centre reported the rate of FASD at 36%, with 47% of those with FASD being Australian First Nations peoples (Bower et al., 2018). Notably, Australian First Nations peoples are sixteen times more likely than non-Indigenous people to be incarcerated (Tubex et al., 2020). This may be partly due to the detrimental effects of colonisation, such as intergenerational trauma, systemic racism and economic marginalisation, which are also observed in other First Nations communities around the world (Blagg et al., 2020; MacDonald & Steenbeek, 2015). Similarly, a Canadian systematic review showed high rates of FASD (between 19.0% and 35.6%) in First Nations youth in custody (Hughes et al., 2016). However, it is evident that all youth with FASD are vulnerable to becoming involved with the justice system regardless of their cultural background. Improving our understanding of the underlying reasons for this are essential to reduce incarceration, recidivism and inform targeted interventions.

The literature has established that individuals with FASD experience a range of unfavourable circumstances and psychosocial vulnerabilities across their lifespan that overlap with known criminogenic factors (McLachlan et al., 2018). In Australia, research by Tan et al. (2022) showed high rates of adverse childhood experiences (ACEs) (e.g., victims of abuse/neglect, exposure to domestic violence, parental substance misuse) and child protection system involvement in young people with FASD. Similarly, Kambeitz et al. (2019) in the United States found that ACEs and placement in foster/residential care are common in those with FASD. Importantly, it was argued that children with FASD who are raised in an unstable home environment often lack family support that is protective against entry into the justice system (Pei et al., 2016). Furthermore, a systematic review by Flannigan et al. (2018) suggested that early life exposure to ACEs can result in mental health and/or social problems, putting young people with FASD at greater risk of engaging in offending behaviour. Many studies have also highlighted the high rates of illicit substance misuse in individuals with FASD than those without the condition (Pei et al., 2011; Streissguth et al., 2004). Notably,

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challenges with substance use in this clinical population are linked to contact with the justice system (Popova et al., 2021). Difficulties with school engagement characterised by expulsions and drop-outs are also common in children with FASD (Burd et al., 2004; Streissguth et al., 2004). Streissguth et al. (2004) suggested that staying in school and the absence of substance misuse were protective against justice system involvement. Overall, research evidence indicates a link between various experiences of life adversity/psychosocial vulnerabilities and offending behaviour in this clinical population.

To date, only a small number of published studies have directly investigated the criminogenic risk factors for individuals with FASD. In a Canadian sample of individuals with FASD and PAE, Harker (2014) found home stability was protective against future offending behaviour. Additionally, current substance use and involvement in foster care were significantly associated with a higher number of criminal charges in their study. Corrado and McCuish (2015) investigated the development of early-onset, chronic onset and versatile offending (i.e., committing a diverse range of offences) in a sample of incarcerated serious/violent offenders with and without FASD. Criminogenic risk factors such as placement in foster care and early onset of alcohol use mediated the relationship between FASD and early onset of offending. Pei et al. (2016) interviewed offenders with FASD to better understand their experiences within the Canadian correctional system. Participants of the study reported risk factors such as poor decision-making abilities, mental health problems, victimisation and limited social support that increase the risk of re-offending. More recently, McLachlan et al. (2018) found that youth with and without FASD did not differ on risks (e.g., education/employment, peer relations, substance abuse) for violence and general recidivism when assessed using a youth risk assessment inventory. However, the sampling characteristics (i.e., Canadian justice-involved individuals with FASD) of these studies could limit generalisability to the justice population in Australia.

In addition to the adverse outcomes discussed above, the direct neurological insult associated with PAE can result in a variety of neurocognitive difficulties, affecting intelligence, language, learning, memory, attention and importantly executive functioning (EF) in individuals with FASD (Connor et al., 2020; Mattson et al., 2011). EF refers to a broad range of higher-order cognitive processes such as decision-making, planning, working memory, inhibition and emotional regulation (Blakemore & Choudhury, 2006). Deficits in inhibition are well-established in individuals with FASD. For example, past research using neuropsychological tests found children with FASD had significant difficulties inhibiting prepotent responses (Rasmussen & Bisanz, 2009). Tan et al. (2022) highlighted that young people with FASD were more likely than those from the general offence population to be charged with property damage, and this may be partly due to impairments in inhibition. Additionally, results from psychometric testing revealed significant impairments in working memory in individuals with FASD (Mattson et al., 2011). A combination of working memory and language deficits may impact those with FASD to comprehend and follow court processes (Reid et al., 2020). Furthermore, due to impaired decision-making and poor social choices, children with FASD can be more easily influenced by negative peers with their desire to be accepted, thus increasing their susceptibility to offending behaviour and victimisation (Fast & Conry, 2009).

While numerous studies (Lange et al., 2017) have examined the EF profiles in individuals with FASD, there is scant research that systematically investigated the relationship between EF impairments and criminality (e.g., number of charges/convictions, the onset of offending) in this clinical population. For example, Corrado and McCuish (2015) found that low self-control in violent youth offenders with FASD was associated with an earlier onset of offending behaviour. In contrast, Harker (2014) showed performance on psychometric testing of EF was not associated with the types of charges in a sample of justice-involved individuals with FASD and PAE. The author argued it is possible that the neuropsychological measures used in the study lacked ecological validity and thus did not accurately capture the variable of interest. Indeed, while neuropsychological tests measure the distinct components of EF in a standardised testing environment, questionnaires such as the Behaviour Rating Scale of Executive Function (BRIEF-2) provide a more ecologically valid measure of everyday EF in a natural context (Bernes et al., 2021).

Improved understanding of the relationship between the most commonly reported criminogenic factors in individuals with FASD and the onset of offending behaviour in this clinical population will advance the potential for prevention and rehabilitation programs. Gaining more knowledge regarding the role of everyday EF in predicting the age of offending onset can also be useful for clinicians to implement more targeted interventions to ameliorate EF difficulties, which in turn may reduce offending behaviour in young people with FASD. To address limitations from prior research (Harker, 2014), the current study utilised an ecologically valid measure (i.e., Behaviour Rating Inventory of Executive Function) in assessing EF. Age of offending onset was selected as an outcome measure because research has consistently established that youths who begin offending from early to mid-adolescence have a more dangerous and chronic course of criminality than those whose age of crime onset is in late adolescence or early adulthood (Piquero & Chung, 2001).

The primary aim of this study was to explore the individual contribution of criminogenic risk factors (i.e., out-of-home care, ACEs, school disengagement, negative peer association, age at first illicit substance use) and their contribution altogether in predicting the age of offending onset. Using a smaller subset of the sample, a secondary aim was to explore the role of each informant-reported everyday EF impairment in predicting the age of offending onset. No specific hypotheses regarding the aims were formulated given the exploratory nature of this study. The data reported in this paper were collected from the same participants described in Tan et al.'s study (2022).

2. Methods

2.1. Sampling procedures

The current study employed a retrospective cohort study design. All participants were seen at the Patches multidisciplinary FASD diagnostic clinics in Western Australia (WA) between 2017 and 2019. The referrals came from various government agencies (e.g., justice system, child protection services), general practitioners, education service providers and caseworkers. A paediatrician and a neuropsychologist were always part of the FASD diagnostic team while the involvement of other health professionals (e.g., speech pathologist, occupational therapist) was evaluated on a case-by-case basis. As part of the assessment, participants' performances across nine neurodevelopmental domains (i.e., cognition, memory, attention, executive functioning, adaptive functioning, language, motor functioning, academic achievement, affect regulation), psychosocial functioning, general physical health and facial features were evaluated in accordance with the Australian FASD diagnostic guidelines (Bower & Elliott, 2016). Of 462 individuals who attended the multidisciplinary clinic during between January 2017 and December 2019, 219 met the Australian FASD diagnostic criteria and the remaining were not diagnosed with FASD. Participants were included in the current study if they had a confirmed diagnosis of FASD and had a known history of justice system involvement in WA, thus resulting in a total of 100 participants. There were no other inclusion or exclusion criteria.

2.2. Data collection

All participants (or their legal guardians) provided their consent/assent for their data to be used in research. Participants' file records were retrospectively reviewed to obtain information regarding demographic factors, FASD diagnosis, criminogenic risk factors, offending

outcome and informant-rated everyday EF.

2.2.1. Criminogenic risk factors and age of offending onset

Clinicians on the Patches multidisciplinary team routinely collected information on several adverse outcomes related to FASD to be included in the diagnostic reports. ACEs such as early life adversities (e.g., abuse, neglect) and household dysfunctions (e.g., exposure to substance misuse, domestic violence) were obtained during the clinical interview and from allied health reports. This information was coded by the researcher against the 10-item ACEs measure developed by (Felitti et al., 1998). No missing information, apart from participants' parental marital status were noted during retrospective coding of these data. Therefore, a maximum score of nine (range 0–9) was attainable. A score offour or more was considered to be at increased risk of negative health outcomes following established guidelines (Felitti et al., 1998). FASD diagnostic reports were reviewed retrospectively to determine whether participants had been placed in out-of-home care (OOHC). Information on school engagement was collected from school reports. Specifically, those with a low attendance rate (50% or less) or had dropped out of school were considered to have poor school engagement. Data on negative peer influence (e.g., reported involvement with antisocial group) and substance use (i.e., age first started using illicit substances, types of substances) were gathered during the clinical interview and from allied health reports. Age of offending onset was based on the age when the participants first came into contact with the justice system as gathered from the diagnostic/allied health reports.

2.2.2. Behaviour Rating Inventory of Executive Function, second edition (BRIEF-2)

The BRIEF-2 is a rating scale designed to capture everyday EF difficulties in individuals aged between 5 and 18 years (Gioia et al., 2015). The BRIEF-2 Parent form has good internal consistency reliability (0.76–0.97), test-retest reliability (0.79) and content validity (0.77) (Hendrickson & McCrimmon, 2019). The normative sample (n = 1400) for the Parent form consisted of 49.1% male, 56.1% Caucasians, 14.1% African Americans, 18.9% Hispanics and 10.9% other (Gioia et al., 2015). In this study, the informant (e.g., biological parent, family members, carer, caseworker) completed the BRIEF-2 Parent measure at the time of assessment. The questionnaire was administered and scored by clinicians on the Patches diagnostic team, who used a culturally secure approach when administering the BRIEF2 questionnaire to participants of Aboriginal descent. Specifically, items on the measure were read out to the informants, questions were paraphrased if required, concepts were explained in plain language, informants' understanding was checked from time to time and informants were given the option to discontinue if they deemed the questions were culturally irrelevant/inappropriate for the young person. Furthermore, the measure was only administered if the participant had a suitable informant who had a good understanding (i.e., most recent and extensive contact with the child across different settings) of their everyday EF over the past six months and was able to complete the questionnaire.

The BRIEF-2 Parent form consists of 63 items and takes approximately 10 min to complete. It has nine clinical scales (Inhibit, Self-Monitor, Shift, Emotional Control, Initiate, Working Memory, Plan/Organise, Task-Monitor and Organisation of Materials) and yields T-scores which have a mean of 50 and a standard deviation of 10. Elevated T-scores suggest a higher degree of impairment. Specifically, clinically significant concerns are indicated by T-scores of 65 or greater (Gioia et al., 2015). The *Inhibit* scale measures inhibition of motor activity, verbalisation, impulses and overall behaviour. The *Self-Monitor* scale assesses awareness of the impact of one's own behaviour on others. The *Shift* scale captures an individual's ability to move freely from one situation/activity or aspect of a problem to another as the situation demands. The *Emotional Control* scale assesses emotional control related to fluctuations in mood, outbursts and overreactions to small events. The *Initiate* scale includes items related to task initiation and independently generating ideas/problem-solving strategies. The *Working Memory* scale measures the capacity to hold information in mind for the purpose of completing a task. The *Plan/Organise* Scale assesses one's ability to manage current and future task demands through employment of planning and organisation skills. The *Task Monitor* scale measures difficulty noticing errors (e.g., missing spelling errors, not paying attention to detail) in work output. Finally, the *Organisation of Materials* scale assesses orderliness of work, play and storage spaces (e.g., school desk).

2.3. Ethics and partnership with relevant stakeholders

Ethics approval was obtained from the Human Ethics Committee at the University of Western Australia and the Western Australian Aboriginal Health Ethics Committee. A letter of support from a local Aboriginal community organisation was also acquired as part of the ethics application. An Aboriginal community reference group was formed before commencement with the assistance of the Kulunga Aboriginal Unit (a unit at Telethon Kids Institute that supports researchers conducting Aboriginal health research). As this project was not specifically targeted at one Aboriginal or Torres Strait Islander group, members of the group were selected to represent a spread of geographical areas. Meetings were conducted quarterly with members reimbursed for parking and travel costs. The group assisted with developing the research protocols according to the National Health and Medical Research Council (2018) ethical guidelines for research with Aboriginal and Torres Strait Islander. They also helped identify research aims that meet the needs of Australian First Nations peoples and ensured the results of this study were interpreted in a culturally safe and appropriate manner. A member also reviewed the final manuscript to ensure that the group's views were represented accurately.

3. Data analysis

Statistical analyses were conducted using IBM SPSS-22. An alpha level of 0.05 was used for all tests. Descriptives were calculated for demographic characteristics, criminogenic risk factors and BRIEF-2 scores. A series of hierarchical multiple regressions were conducted to examine the relationship between each potential criminogenic factor individually and the age of offending onset (continuous) after controlling for demographic variables. Demographic factors (i.e., sex (categorical), cultural background (categorical)) were entered at Block 1 and criminogenic risk factors (i.e., total ACEs scores (continuous), OOHC (categorical yes/no), poor school engagement (categorical yes/no), negative peer association (categorical yes/no), age first started using illicit substances (continuous)) were entered individually at Block 2. Next, while controlling for demographic factors, a hierarchical multiple regression was conducted to determine the relative importance of the criminogenic risk factors by adding them simultaneously. Similarly, demographic factors were entered at Block 1 and all the criminogenic risk factors were entered at Block 2. To investigate the role of each informant-reported EF difficulty in predicting the age of offending onset, we performed a series of hierarchical multiple regressions Specifically, demographic factors were entered at Block 1 and each scale (i.e., Inhibit, Self-Monitor, Shift, Emotional Control, Initiate, Working Memory, Plan/Organise, Task-Monitor and Organisation of Materials) was entered (one at a time) at Block 2.

Visual inspection of QQ plots and values of both skewness (−0.24 to 0.75) and kurtosis (0.03–0.45) (Byrne, 2013) collectively indicated that total ACEs scores, age first started using illicit substances and age of offending onset were normally distributed. All assumptions for the regression analyses were checked and met for all models. The assumption of normally distributed residuals was satisfied. Specifically, the value of Cook's distance was less than 1 and there were no outlying standardised residuals. Additionally, the assumption of independence of errors was met, with the Durbin-Watson statistics falling in the acceptable range of 1.50–2.50 (Field, 2013). To evaluate the generalisability of

the model, the assumption of homoscedasticity was tested statistically. The correlation between the standardised predicted values and the absolute standardised residuals was non-significant. The absence of a statistically significant correlation suggests that the homoscedasticity assumption was met. Finally, there was no evidence of multicollinearity, with both tolerance and variation inflation factor falling in the acceptable range (i.e., tolerance >0.10 and variation inflation factor <10) (Field, 2013).

3.1. Missing data

Data on substance use were available for 87 participants and missing for the remaining 13 participants. Of those with available data on substance use, 68 (78%) had substance use challenges and 19 (22%) had no history of substance use. While the BRIEF-2 (Parent form) was administered to 44 carers/parents, scores were only available for 38 participants upon file review. The BRIEF-2 (Parent form) for the remaining 6 participants were not reported in any documents. The remaining 56 individuals who did not complete the BRIEF-2 measure (Parent form) were given either the BRIEF-2 screening measure (due to time constraint or literacy issues) or the adult BRIEF measure. Scores from the BRIEF-2 screening measure and adult form of the BRIEF were not captured in our dataset.

4. Results

4.1. Sample characteristics

Across the total sample (N = 100), 82% were males, 88% identified as Australian Aboriginal peoples and 12% as Caucasian. The mean age of the sample at the time of assessment was 15.60 years (SD = 3.01, range = 10–24 years). More than half of the sample 59% (n = 59) came from metropolitan/regional areas of WA and 41% (n = 41) from remote parts of WA.

4.2. Criminogenic risk factors and age of offending onset

The mean age of offending onset in the total sample was 13.24 years (*SD* = 2.12, range = 10–20). The most common criminogenic risk factor across the total sample was poor school engagement (84%), followed by both exposure to negative peer influence (60%) and placement in OOHC (60%). Of those who had a period of OOHC (n = 60), 38.3% (n = 23) currently resided with extended family members, 23.3% (n = 14) in group homes/residential placement, 21.7% (n = 13) with a foster family, 15.0% (n = 9) with their biological parent and 1.7% (n = 1) with an adoptive family. The median of the total ACEs score was 3.00 and the mean was 3.17 (SD = 1.63). The total ACEs scores ranged from 0 to 8.

Table 1
Hierarchal Multiple Regressions Predicting the Age of Offending Onset from each Criminogenic Factor Individually.

	B	95% CI for B		*SE B*	β	*t*	*p*	R^2	ΔR^2
		LL	UL						
Model 1 (N = 100)									
Block 1								.05	.05
Sex	−1.18	−2.28	−0.08	0.55	−.22	−2.14	.035*		
Cultural background	−0.35	−1.64	0.95	0.65	−.05	−0.53	.596		
Block 2								.09*	.05*
Sex	−1.05	−2.13	0.03	0.55	−.19	−1.92	.058		
Cultural background	−0.22	−1.49	1.06	0.64	−.03	−0.33	.739		
Out-of-home care	−0.93	−1.77	−0.09	0.42	−.22	−2.19	.031*		
Model 2 (N = 100)									
Block 1								.05	.05
Sex	−1.18	−2.28	−0.08	0.55	−.22	−2.14	.035*		
Cultural background	−0.35	−1.64	0.95	0.65	−.05	−0.53	.596		
Block 2								.10*	.05*
Sex	−1.21	−2.28	−0.13	0.54	−.22	−2.23	.028*		
Cultural background	−0.43	−1.70	0.85	0.64	−.07	−0.66	.508		
Negative peer association	−0.96	−1.79	−0.13	0.42	−.22	−2.29	.024*		
Model 3 (n = 68)[#]									
Block 1								.07	.07
Sex	−1.43	−2.79	−0.07	0.68	−.25	−2.09	.040*		
Cultural background	−0.78	−2.76	1.21	0.99	−.09	−0.78	.438		
Block 2								.13*	.07*
Sex	−1.14	−2.49	0.21	0.67	−.20	−1.69	.097		
Cultural background	−0.63	−2.57	1.30	0.97	−.08	−0.65	.517		
Age at first substance use	0.29	0.03	0.55	0.13	.26	2.20	.032*		
Model 4 (N = 100)									
Block 1								.05	.05
Sex	−1.18	−2.28	−0.08	0.55	−.22	−2.14	.035*		
Cultural background	−0.35	−1.64	0.95	0.65	−.05	−0.53	.596		
Block 2								.05	.00
Sex	−1.18	−2.29	−0.07	0.56	−.21	−2.11	.038*		
Cultural background	−0.35	−1.65	0.96	0.66	−.05	−0.53	.600		
Total ACEs scores	−0.01	−0.27	0.25	0.13	−.01	−0.08	.940		
Model 5 (N = 100)									
Block 1								.05	.05
Sex	−1.18	−2.28	−0.08	0.55	−.22	−2.14	.035*		
Cultural background	−0.35	−1.64	0.95	0.65	−.05	−0.53	.596		
Block 2								.05	.00
Sex	−1.19	−2.30	−0.08	0.56	−.22	−2.13	.036*		
Cultural background	−0.34	−1.65	.097	0.66	−.05	−0.52	.605		
School disengagement	−0.08	−1.23	1.07	0.58	−.01	−0.13	.895		

Note. [#] = Of those with available data on substance use (n = 87), 68 had substance use challenges and 19 had no history of substance use.
Note. *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit; *SE* = standard error. *$p < .05$.

The age of illicit substance use onset ranged from 8 to 17 years, with a mean of 12.71 (SD = 1.98). Of the 68 participants, the most commonly used substances were marijuana (n = 68), followed by volatile substances (n = 17) (e.g., solvents, aerosols, gases) and amphetamine (n = 6). Additionally, 26.5% (n = 18) of those using substances also reporting polysubstance use.

After controlling for demographic factors, individual regression analyses show that placement in OOHC, negative peer association and age of substance use onset were significant predictors of age of offending onset – See Table 1. Specifically, those who had been placed in OOHC were younger when they first came into contact with the justice system. Similarly, those who were exposed to negative peer influence had a younger age of offending onset. Substance use at a younger age also resulted in early contact with the justice system. Conversely, total ACEs scores and poor school engagement were not significant predictors of age of offending onset. When all criminogenic risk factors were entered into the model together, only age at first substance use remained a significant predictor of age of onset of offending in the hierarchical multiple regression analysis (Table 2).

4.3. BRIEF-2 informant measure

Of the 38 available BRIEF-2 questionnaires, 13 (34.2%) were completed by family members, 12 (31.6%) by biological parents, 7 (18.4%) by youth justice/child protection workers and 6 (15.8%) by foster carers. Young people with FASD displayed significant deficits in many aspects of everyday EF and most scores were in the clinical range of 65 and above compared with a normative sample. Specifically, more participants showed deficits in Emotional Control and Working Memory and fewest demonstrated impairments for Initiate and Organisation of Materials (Table 3).

Within the regression models, unstandardised betas showed that those with more difficulties in Working Memory, Shifting, Inhibition and Plan/Organise were more likely to begin offending at an older age – See Table 4. Conversely, Emotional Control, Self-Monitor, Task Monitor, Initiate and Organisation of Materials were not significant predictors of the age of offending onset (Table 4).

5. Discussion

To our knowledge, this exploratory study is the first to investigate the criminogenic risk factors and the role of informant-reported EF difficulties in predicting the age of offending onset in an Australian cohort of justice-involved individuals with FASD. We found a range of criminogenic risk factors and informant-reported everyday EF challenges to be predictive of age of offending onset.

Table 3
Percentage of Young People with BRIEF-2 Scores in the Clinically Significant Range with T-Scores of More Than 65.

BRIEF-2 scales	n = 38/(%)
Emotional control	28 (73.7)
Working memory	27 (71.1)
Shift	26 (68.4)
Inhibit	24 (63.2)
Self-monitor	22 (57.9)
Plan/Organise	14 (36.8)
Task monitor	12 (31.6)
Initiate	10 (26.3)
Organisation of materials	10 (26.3)

5.1. Criminogenic risk factors

5.1.1. Out-of-home care (OOHC)

More than half (60%) of the young people with FASD in our study had been placed in OOHC, rates that are similar to a vulnerable/disadvantaged paediatric population from South Western Sydney (56%) (Wickramasinghe et al., 2019). Importantly, we found OOHC significantly predicted earlier onset of offending behaviour in this sample of young people with FASD. Findings from this study align with a growing body of evidence demonstrating that children with OOHC involvement are younger compared to other justice-involved individuals when they first engaged with the justice system (Australian Institute of Health and Welfare, 2018; Ryan et al., 2013). For example, an Australian study found that children from child protection backgrounds were three times more likely than those from a comparison group to be first sentenced before the age of 14 (Baidawi & Sheehan, 2019). This aligns with the mean age of offending onset of 12.83 years for those with a child protection background in our study.

Several reasons may explain why placement in OOHC precipitated earlier contact with the justice system in our sample. While removing children from dysfunctional families may protect them from further maltreatment, this experience is often traumatic and may lead to disrupted attachment (Doyle Jr, 2008). A seminal paper by Bowlby (1944) demonstrated that home instability (e.g., childhood separation) could lead to emotional deprivation and the disruption of early attachment relationships. For the developing child, this may result in avoidance attachment and thus, they often lack the support system (i.e., secure base) to buffer against life stressors and to protect them from justice system involvement. Notably, this study shows only 15% of children with OOHC background resided with their biological parents. This is particularly concerning given the detrimental effects (e.g., juvenile offending) of disrupted attachment in early childhood. In children with FASD, challenges with forming secure attachments may also be exacerbated by underlying deficits in affect regulation (Temple et al., 2019).

Table 2
Hierarchical Multiple Regression Predicting the Age of Offending Onset from all Criminogenic Factors.

Variables	*B*	95% CI for *B*		*SE B*	β	*t*	*p*	R^2	ΔR^2
		LL	UL						
Block 1								.07	.07
Constant	15.03	12.69	17.36	1.17					
Sex	−1.43*	−2.79	−0.07	0.68	−.25*	−2.09	.040*		
Cultural background	−0.78	−2.76	1.21	0.99	−.09	−0.78	.438		
Block 2								.21*	.14
Constant	11.78	6.96	16.60	2.41					
Sex	−1.01	−2.37	0.35	0.68	−.18	−1.48	.143		
Cultural background	−1.09	−3.06	0.88	0.98	−.13	−1.11	.272		
Age at first substance use	0.29*	0.03	0.56	0.13	.27*	2.22	.030*		
Out-of-home care	−0.48	−1.60	0.64	0.56	−.11	−0.86	.394		
Negative peer association	−1.11	−2.24	0.01	0.56	−.24	−1.98	.052		
Total ACEs scores	0.09	−0.25	0.43	0.17	.07	0.51	.611		
Poor school engagement	0.26	−1.29	1.82	0.78	.04	0.34	.736		

Note. N = 68; *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit; *SE* = standard error. *$p < .05$.

Table 4
Hierarchal Multiple Regressions Predicting the Age of Offending Onset from each BRIEF2 Clinical Scale.

	B	95% CI for B		*SE B*	β	*t*	*p*	R^2	ΔR^2
		LL	UL						
Model 1 (n = 38)									
Block 1[#]								.09	.09
Sex	−1.30	−2.96	0.35	0.84	−.27	−1.60	.118		
Cultural background	−0.93	−2.50	0.64	0.77	−.20	−1.20	.238		
Block 2								.21*	.13*
Sex	−1.41	−2.97	0.15	0.77	−.29	−1.83	.075		
Cultural background	−0.76	−2.25	0.73	0.73	−.16	−1.04	.306		
Working memory	0.07	0.01	0.12	0.03	.36	2.36	.024*		
Model 2 (n = 38)									
Block 2								.25*	.16*
Sex	−1.23	−2.76	0.30	0.75	−.25	−1.64	.111		
Cultural background	−0.25	−1.79	1.28	0.76	−.05	−0.34	.739		
Shifting	0.08	0.02	0.13	0.03	.43	2.70	.011*		
Model 3 (n = 38)									
Block 2								.19	.11*
Sex	−1.02	−2.65	0.62	0.80	−.21	−1.27	.214		
Cultural background	−0.59	−2.15	0.97	0.77	−.13	−0.77	.448		
Inhibition	0.05	0.01	0.10	0.03	.33	2.06	.048*		
Model 4 (n = 38)									
Block 2								.26*	.16*
Sex	−1.37	−3.03	0.28	0.81	−.26	−1.69	.101		
Cultural background	−0.32	−1.93	1.28	0.79	−.07	−0.41	.687		
Plan/Organise	0.08	0.02	0.14	0.03	.41	2.61	.014*		
Model 5 (n = 38)									
Block 2								.15	.07
Sex	−1.31	−2.93	0.30	0.80	−.27	−1.65	.108		
Cultural background	−0.62	−2.21	0.96	0.78	−.13	−0.80	.430		
Emotional control	0.05	−0.01	0.11	0.03	.27	1.65	.108		
Model 6 (n = 38)									
Block 2								.11	.03
Sex	−1.20	−2.87	0.47	0.82	−.25	−1.46	.153		
Cultural background	−0.81	−2.41	0.78	0.78	−.17	−1.04	.307		
Self-monitoring	0.03	−0.03	0.10	0.03	.16	0.98	.335		
Model 7 (n = 38)									
Block 2								.16	.07
Sex	−1.32	−2.94	0.29	0.79	−.27	−1.66	.105		
Cultural background	−0.67	−2.23	0.90	0.77	−.14	−0.87	.391		
Task-monitoring	0.05	−0.01	0.11	0.03	.27	1.70	.099		
Model 8 (n = 38)									
Block 2								.21	.10
Sex	−1.32	−3.03	0.39	0.84	−.25	−1.57	.126		
Cultural background	−0.87	−2.37	0.63	0.74	−.19	−1.18	.248		
Initiation	0.07	0.01	0.14	0.03	.32	2.03	.051		
Model 9 (n = 38)									
Block 2								.10	.02
Sex	−1.19	−2.89	0.52	0.84	−.24	−1.41	.167		
Cultural background	−0.64	−2.41	1.13	0.87	−.13	−0.74	.466		
Organisation of materials	0.03	−0.04	0.10	0.03	.16	0.89	.377		

Note. [#] = Results for Block 1 were the same for all models, so these were not repeated in the table. *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit; *SE* = standard error. *$p < .05$.

Taken together, having a dysfunctional family background and difficulties with forming secure attachments may explain earlier engagement with the justice system in this sample of young people with FASD.

5.1.2. Adverse childhood experiences (ACEs)

High rates of ACEs have also been documented in the FASD clinical population, especially in Aboriginal children (Tan et al., 2022). While the total ACEs scores were not significantly associated with the onset of offending behaviour, this may be because the ACEs tool used in the study is not sensitive to cultural factors, such as not measuring intergenerational trauma. Indeed, members of our Aboriginal reference group suggested that survivors of the Stolen Generation may pass on the impacts of institutionalisation to their future generation, and they may find it challenging to nurture their children as they may experience difficulties with attachment themselves (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, October 5, 2021). Consequently, their children may experience a range of difficulties such as disconnection from culture/families and exposure to high levels of stress from family, which can lead to a variety of adverse outcomes (e.g., poverty, abuse/neglect, criminality). Additionally, Craig et al. (2021) highlighted that intergenerational trauma plays a vital role in predicting the risk of offending in a sample of Indigenous justice-involved youth. For Aboriginal people with FASD, the effects of complex trauma on justice system involvement may be further compounded by other factors such as discrimination, social/economic marginalisation and racism (Blagg et al., 2020).

5.1.3. School disengagement

Similar to past research (Streissguth et al., 2004), we found a large proportion (80%) of young people with FASD disengaged from school. Of these, almost half (40.5%) in our study were from remote/very remote parts of WA. Indeed, Hancock and Zubrick (2015) highlighted that those who experience multiple disadvantages (e.g., those from remote areas, families with limited social/financial capital) are at high risk of school disengagement. However, we found school disengagement was not a significant predictor of age of offending onset, which is at odds with current research (Henry et al., 2012). Our Aboriginal reference group members proposed that school disengagement may not necessarily predict justice system involvement in Aboriginal children as the positive influence of cultural identity and engagement may offer a better protection against life stressors that precipitate offending behaviour (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, October 5, 2021).

5.1.4. Negative peer association

Additionally, we found exposure to negative peer influence resulted in earlier contact with the justice system in young people with FASD. Several different mechanisms (e.g., friendship selection, time spent with peers, social learning) may explain the relationship between negative peer association and juvenile offending (Beier, 2014). For young people with FASD, Brown et al. (2011) proposed that the combination of social immaturity and the high levels of suggestibility resulting from their neurocognitive deficits (e.g., impaired decision making/moral judgement) is responsible for the elevated risks of justice system involvement. Furthermore, with the desire to be accepted by peers, young people with FASD may succumb to peer pressure, thus increasing their susceptibility to offending behaviour and victimisation.

5.1.5. Substance misuse

In our study, a significant proportion (78%) of young people with FASD had substance use challenges, rates that are much higher than a clinical sample of adolescents with PAE (10.6%) (Pfinder et al., 2014). Interestingly, all individuals with FASD who had substance use challenges reported using marijuana. This may be because marijuana is relatively easy to obtain in Australia (Sutherland et al., 2021). The elevated rates of substance use in our sample may be attributed to several factors: the present study was conducted with most participants (88%) who are of Aboriginal descent, a population with known high rates of substance use that occur within the context of historical/intergenerational trauma (Krishnamoorthi, 2019) and individual-level risk factors (e.g., low socioeconomic status, high psychological stress) (Snijder et al., 2021), as well as included a high-risk sample (i.e., involvement with the justice/child protection system) where substance misuse is common (Peters et al., 2015).

The etiological mechanisms underlying substance misuse in individuals with FASD may involve biological and environmental factors such as life adversity and disrupted attachment (O'Connor, 2014). PAE is known to disrupt the brain's stress-response system and this biological vulnerability is believed to influence the propensity towards substance use (Chotro et al., 2007; Hellemans et al., 2010). Furthermore, a systematic review highlighted that prenatal exposure to illicit substances may sensitise offspring to the rewarding effects of substances, and thus increasing the risks of offspring substance misuse even after controlling for demographic factors (Dodge et al., 2019). Indeed, recent literature suggests that mothers of children with FASD may have used other substances (e.g., marijuana, amphetamines) in addition to alcohol during pregnancy (Connor et al., 2020).

Of note, we found only age at first illicit substance use remained a significant predictor of the age of offending onset when all criminogenic factors were entered into the model at Block 2. Specifically, those who were younger when they first started using illicit substances also had earlier contact with the justice system, aligning with previous findings in a sample of juvenile and adult offenders from Canada (Walters & Urban, 2014). In WA, young people who are found to be in possession of a small amount of cannabis for personal use are eligible for a diversionary outcome where no criminal record is made (Misuse of Drugs Act, 1981). This is particularly relevant to participants in this study given retrospective file reviews show that their first contact with the justice system was unrelated to substance-related offences.

It has been documented that early onset of substance use may increase an individual's vulnerability to deficits in EF skills (e.g., inhibition, decision-making), which may predispose them to justice system involvement (Chambers et al., 2003). Notably, Chambers et al. (2003) suggested that substance use during the sensitive developmental period in early adolescence may impair the maturation of neurological networks responsible for the development of EF abilities. Therefore, it is reasonable to postulate that early exposure to substance use during adolescence may worsen existing EF impairments related to PAE. Nevertheless, there is a need for future studies to tease apart the relevant contribution of PAE and subsequent illicit substance exposure on EF difficulties in individuals with FASD given research in this area is lacking.

5.2. Everyday executive functioning difficulties

This study demonstrated that young people with FASD were rated as having significant impairments in everyday EF, which is in keeping with results from past studies (Mohamed et al., 2019; Rasmussen & Bisanz, 2009; Rasmussen et al., 2007). While a large proportion (73.7%) of our FASD cohort had clinically elevated difficulties in emotional control, this was not a significant predictor of the age of offending onset. Instead, we found individuals with FASD with informant-rated difficulties in shifting, working memory and planning/organisation skills significantly predicted a later offending onset.

Developmental studies highlighted that EF abilities start to develop in early childhood and continue into early adulthood (Korzeniowski et al., 2021; Theodoraki et al., 2020). Typically, EF skills do not emerge until around 6 years of age and only become fully developed in early adulthood (Zelazo & Carlson, 2012). However, as children with FASD grow older (14–16 years old), their EF difficulties become more pronounced, and evidence suggests that they lag significantly behind same-aged peers in EF skills (Rasmussen & Bisanz, 2009). Given EF challenges tend to become more severe with age in individuals with FASD, this may explain the later onset of offending behaviour Furthermore, it is possible that individuals with FASD in our sample were raised in a structured/supervised environment when they were younger as part of their formal placement arrangement given their involvement with the child protection system. However, the level of support may be significantly reduced as they grow older and leave care. Accordingly, recent research also emphasises the need to improve access to services for youth with FASD and support them in transitioning to adulthood (Brown et al., 2019). Hence, the lack of support provided to older children with FASD and the worsening of EF with age collectively may explain the later onset of offending behaviour. Moreover, during our consultation with the WA Police Force, it was suggested there is a possibility that police may be less likely to press charges on young people with severe EF challenges (suggestive of FASD), especially if the offences are classified as non-scheduled (i.e., eligible for a diversionary outcome) under the Youth Offender Act 1994 of WA. In such cases, police cautioning may be given and no formal records of the charges are recorded, thus explaining the later onset of offending behaviour.

Additionally, we found individuals with FASD with more informant-reported difficulties in inhibition were significantly more likely to begin offending at an older age, a finding that is inconsistent with past research (Corrado & McCuish, 2015). Specifically, Corrado and McCuish (2015) found low self-control in youth with FASD was associated with an earlier onset of offending behaviour. However, it was unclear what measures were used to form the self-control composite scores in their study and how this construct was defined. Interestingly, it has been

highlighted in past literature that the lack of a consensual definition of impulsivity may lead to different definitions of the term and how it is measured in the study (Kocka & Gagnon, 2014; Meda et al., 2009). The inconsistent findings between studies may also be due to the variability in the types of measures used to assess self-control/impulsivity. Our study employed the BRIEF-2 questionnaire which focuses on everyday executive functioning challenges. It was unclear whether Corrado and McCuish's study (2015) investigated self-control in the context of daily life or self-control tested with laboratory-based measures.

5.3. Interventions and support

It is crucial to ensure that prevention/targeted intervention programs are in place to prevent offending and future engagement with the adult justice system in young people with FASD. This is particularly relevant given the young mean age of offending onset (13.24 years) in our study and FASD was previously found as a risk factor for criminal behaviour (Brintnell et al., 2019). While the neurocognitive deficits associated with FASD are irreversible, interventions can be targeted to address the multiple layers of risks in FASD to reduce justice system involvement. An example of one approach is the Risk-Need-Responsivity model that focuses on comprehensive assessment of risks, understanding of individual needs and recognising barriers/protective factors that may influence intervention outcomes (Brogan et al., 2015). Interventions as such would need to be personalised and implemented before the young people is in contact with the justice system.

A recent report published by the Department of Child Protection and Family Support (2016) highlighted that family dysfunction is the primary reason children come into care. Given placement in OOHC was found to predict earlier contact with the justice system among young people with FASD in this study, support services that target family issues (e.g., parenting/home management skills, support with housing/employment issues, criminal behaviour of family) and the individual's complex needs (e.g., mental health, substance use problems) are essential to enable children to remain at home with family in a safe environment. For Aboriginal families, partnership with Aboriginal service providers may support families in accessing more culturally responsive services that more effectively meet their needs. As emphasised above, children in OOHC often experience disrupted attachment and multiple forms of trauma (Osborn et al., 2008), highlighting the need for trauma-informed approaches to guide the integrity of child protection work.

Additionally, our study showed that negative associations with peers who engage in antisocial behaviour predicted earlier onset of offending behaviour. Thus, interventions must target interpersonal skills development (e.g., peer refusal), a common deficit area in individuals with FASD (Lange et al., 2017). Parental supervision such as active monitoring of the child's whereabouts/behaviour and friendship networks may also be protective against justice system involvement (Walters, 2020). Linking individuals with FASD with a culturally appropriate mentor can also help provide the young person with positive role models and a safe place to express their needs and assist them to take more positive decisions in life. This is especially relevant given young people with FASD face multiple adversities and lack the support system to buffer against life stressors (Tan et al., 2022).

One of the most critical findings in our study is that the onset of substance use had a unique contribution to the age of offending onset. Members of our Aboriginal reference group suggested that early substance use initiation in our sample may be related to exposure to substance use in the community in the context of intergenerational trauma, remote living, disempowerment and overcrowded housing and these were identified as intervention targets (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, October 5, 2021). The group indicated a need for improved access to alcohol and drug treatment/diversion services to support the young person and their family (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, July 6, 2022). This is especially relevant for young people in remote communities, given the widespread and heavy use of illicit substances in rural Australia (Putt & Delahunty, 2006). Members of the group also highlighted the importance of culturally appropriate mental health support from organisations like the Yorgum Healing Services to address the impact of intergenerational trauma (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, July 6, 2022). This is particularly important given there is often a cycle of trauma in the family that may result in substance misuse as a form of coping (Pride et al., 2021). Furthermore, substance use in the family may make it challenging for the young person to stay 'clean' and cope with relapse (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, July 6, 2022). For young people where substance use is rife at home, Aboriginal residential rehabilitation centres (e.g., Miliya Rumurra Aboriginal Residential Centre) play a critical role in providing the young person with a culturally safe environment to become sober (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, July 6, 2022). Additionally, the strengths of Aboriginal cultural traditions can be targeted as a therapeutic capital. For example, the group suggested that cultural activities (e.g., visits to cultural sites, bush walks) can help relieve boredom, a common reason for people to start experimenting with substances in remote communities (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, July 6, 2022). Most importantly, cultural activities can help the young person to connect with their culture, land, and people, all of which are protective against substance use (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, July 6, 2022). Feedback from the group also indicated that linking the young person with someone from the family/cultural group who has been through the journey of sustained recovery from substance use can have a positive impact on the young person's own recovery journey (I. Adams, F, Procter, P. Oatley, & R. Bonney, personal communication, July 6, 2022). This is especially relevant given the kinship system is integral to Aboriginal culture, spirituality and identity (Lohoar et al., 2014).

Interventions for substance use should also be targeted to the levels of deficits in young people with FASD given they often experience a range of cognitive impairments and may find it challenging to understand complex instructions in substance use rehabilitation programs (Burd et al., 2010). Thus, they may benefit from interventions that focus on behavioural modifications. In addition to cognitive deficits, results from our study showed clinically elevated difficulties in daily EF in young people in FASD. Notably, this was found to be associated with the later onset of offending behaviour. As difficulties with EF tend to be more pronounced with age in children with FASD (Nash et al., 2015), this highlights the importance of EF intervention such as the Alert program (Ordenewitz et al., 2021; Wagner et al., 2020) and support/-services for older children with FASD to prevent justice system involvement.

5.4. Strengths, limitations, and future research

A strength of this novel study was the consultation with an Aboriginal community reference group to ensure the research methods and interpretations of findings were culturally appropriate. Research in this area is crucial as findings may help direct prevention programs against justice system involvement, particularly for vulnerable subgroups (e.g., Aboriginal young people with FASD). Nevertheless, several limitations need to be considered when interpreting the findings of the current study. Firstly, given the high proportion of Aboriginal participants in this study, the use of a traditional ACEs questionnaire may not accurately/adequately capture life adversities in this population as it does not consider the effects of colonisation and systemic racism (Joy & Beddoe, 2019). This highlights the importance of working with Aboriginal communities to co-develop a culturally appropriate tool to better capture ACEs in this high-risk population. Using a culturally appropriate measure, it will be crucial for future studies to explore the

relationship between ACEs and the age of onset of offending in young people with FASD. The additional questions on intergenerational trauma and systemic racism could increase multiple points to the final ACEs scores and may lead to a statistically significant finding.

Secondly, age of first substance use was recalled retrospectively by participants/carers and may be subjected to recall bias. However, given most of the participants are relatively young and therefore not very distant from their first experience with substance use, the impact of this bias may be reduced. The age of first substance was also cross-checked between participants and their carers to ensure consistency. We also do not have information about the quantity/dose of substances used. Given dose-related neurocognitive effects of illicit substances have been previously documented (Conrod & Nikolaou, 2016), it will be critical for future research to investigate how this influences the age of offending onset. Furthermore, the small sample size available for the BRIEF-2 measure in this study may limit generalisability, and any significant differences that might exist in the population may not be detected in this sample. Future research with a more robust sample size is warranted to allow more confident conclusions about the relationship between daily EF and the age of onset of offending behaviour.

Additionally, the criminogenic risk factors (i.e., OOHC, negative peer association, age of substance use onset) identified in this study only had a small contribution (5%–14%) to the age of offending onset, suggesting there are other factors in play and thus warrant further investigation. We also did not explore how these criminogenic risk factors would interact with each other and affect offending outcomes as this is outside the scope of the present study. This is an important area for future research given it can help inform the development of more effective interventions to reduce recidivism. The inclusion of a comparison group (i.e., individuals with FASD but without justice system involvement) in future research could also enhance our understanding of whether the risk factors identified in this study are unique to justice-involved individuals with FASD. The importance of identifying protective factors and building on resilience against justice system engagement in young people with FASD is increasingly recognised (Pei et al., 2016). Future research in this area is essential for informing interventions and assisting individuals with FASD to develop their strengths and help maintain a positive self-image (Flannigan et al., 2018).

6. Conclusion

The present study was the first to investigate the criminogenic factors and role of informant-rated everyday EF challenges in predicting the age of onset of offending in an Australian FASD cohort. Criminogenic risk factors such as placement in OOHC, exposure to negative peer influence and age of substance use of onset predicted earlier contact with the justice system in young people with FASD. Of these, the onset of substance use was identified as the most important predictor of the age of offending onset. This suggests substance use prevention and treatments/programs are especially crucial in preventing the onset or worsening of substance use and related harms (e.g., contact with the justice system) in young people with FASD. Other novel findings included the role of informant-rated EF difficulties (i.e., shifting, working memory and planning/organisation, inhibition) in predicting the age of offending onset, where more challenges in these domains resulted in a later offending onset. Given the vulnerability of individuals with FASD, particularly Aboriginal children/adolescents within the justice system, these findings highlight the importance of early diagnosis of FASD, early screening of criminogenic factors and implementing timely interventions to prevent re-offending and pathway into the adult justice system.

Declaration of competing interest

Grace Kuen Y Tan has declared no conflicts of interest

Martyn Symons has declared no conflicts of interest

Donna Cross has declared no conflicts of interest

James Fitzpatrick provided clinical services and is the chief executive officer of Patches Australia.

Isabelle Adams has declared no conflicts of interest.

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