The risk factors for criminal behaviour in high-functioning autism spectrum disorders (HFASDs): A comparison of childhood adversities between individuals with HFASDs who exhibit criminal behaviour and those with HFASD and no criminal histories.

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ABSTRACT

Most reports of the criminal behaviour of individuals with high-functioning autism spectrum disorder (HFASD) have been case studies, and few have empirically examined the risk factors of criminal behaviour among these individuals. This study examined 175 individuals with HFASD, including 36 individuals who had prior a history of criminal behaviours (the criminal group) and 139 individuals without a criminal history (the control group), with regard to 15 types of childhood adversities (CAs). The age of initial HFASD diagnosis and history of neglect and physical abuse were significantly correlated with an increased risk of criminal behaviour. These findings agreed with previous studies on general populations. The unique characteristics of individuals with HFASD and a history of criminal behaviour are discussed.

Keywords: Criminal behaviour, high-functioning autism spectrum disorder (HFASD), risk factor, childhood adversities (CAs), age of initial diagnosis

1. Introduction

Over the past two decades, an increasing amount of attention has been given to high-functioning autism spectrum disorders (HFASDs). This diagnosis includes high-functioning autism (HFA) and Asperger's syndrome (AS). High-functioning pervasive developmental disorder (HFPDD) is generally defined as a pervasive developmental disorder (PDD) in individuals with normal or above-average intelligence (i.e., either IQ ≦ 70; Howlin, 2003, or IQ ≦ 85; Baron-Cohen, O'Riordan, Ston, Jones, & Plaisted, 1999). In England, the estimated prevalence of PDD in preschool children is 0.626%, and 74.2% of this group do not have intellectual disabilities (IDs; Chakrabarti & Fombonne, 2001). The estimated prevalence of HFASD in the general preschool population is 0.464%. Similarly, Kadesjö, Gillberg, and Hagberg (1999) reported that the estimated prevalence for ASD is 1.2%, and approximately 70% of those with this condition do not have IDs. The prevalence of HFASD is approximately 0.84%.

Although individuals with HFASD often have average or above-average intellectual abilities, they exhibit impairment in social, communication and imagination areas. These impairments often result in difficulties with interpersonal relationships (Frith, 1991; Wing 1996). Moreover, individuals with HFASD often have comorbid psychiatric disorders, such as anxiety disorder and depression, or display problematic behaviours, such as violence and/or other antisocial behaviours (Tantam, 1991). Although research on the violent, antisocial or criminal

behaviours committed by individuals with HFASD was scarce until the 1980s, it has increased since 1990 (Bjorkly, 2009; Newman, & Ghaziuddin, 2008). Bjorkly (2009) conducted a systematic review on violence in people with AS that included 11 published case studies of 22 patients and 29 violent incidents. Many of these patients made threats or committed physical assaults, and others attacked or made threats with weapons such as screwdrivers (Mawson, Grounds, & Tantam, 1985) or knives (Murrie, Warren, Kristiansson, & Dietz, 2002; Raja, & Azzoni, 2001). Other incidents included homicide (Scragg, & Shah, 1994; Schwartz-Watts, 2005), attempted rape (Kohn, Fahum, Ratzoni, & Apter, 1998), and arson (Murrie et al., 2002). Additional studies of individuals with HFASD reported theft (Chen, Chen, Yang, Yeh, Chen, & Lo, 2003; Sugiyama, 2003), vandalism (Simblett, & Wilson, 1993; Tantam, 1988), sexual offence (Silva, Ferrari, & Leong, 2002; Sugiyama, 2003), and arson (Everall, & Lecouteur, 1990; Tantam, 1991).

Based on the definition used in the studies listed above, we define criminal behaviour as an illegal act for which an individual can be punished by law. This definition includes juvenile delinquencies such as running away from home as well as underage drinking or smoking.

Many of the studies on the criminal behaviour of individuals with HFASD are case studies, and empirical studies are scarce. Ghaziuddin, Tsai, and Ghaziuddin (1991) made the first attempt to examine the relationship between HFASD and criminal behaviour. These authors reviewed 21 peer-reviewed articles regarding people with AS that included 132 individuals. Of

this group, only three (2.3%) had a history of violence.

Scragg and Shah (1994) found that the rate of AS among patients hospitalised in a high-security hospital was 1.5%-2.3%. Note that the majority of admissions to this hospital were the result of criminal behaviour. However, some non-criminal patients were transferred because of their unmanageable behaviour at less secure psychiatric facilities. Siponmaa and Wilson (2001) also found that 15% of 126 young (15- to 22-year-old) offenders in Stockholm, Sweden met the diagnostic criteria of PDD, including 12% with PDDNOS and 3% with AS. Therefore, their estimated prevalence of HFASD in the young forensic population was greater than 3%. These findings indicate that, although these studies regarding the rates of criminal behaviour among individuals with HFASD do not necessarily show a strong correlation between HFASD and criminal behaviour, it is apparently higher in individuals with HFASD compared with the general population (i.e., less than 1%; Chakrabarti & Fombonne, 2001; Kadesjö et al., 1999).

Although the estimated prevalence of criminal behaviours among individuals with HFASD is higher than that of the general population, little is known about the risk factors for individuals with ASD, especially those with HFASD. In one of the few empirical studies on the subject, Mouridsen, Bente, Torben, and Niels (2008) investigated the prevalence rate and patterns of criminal behaviour in 313 former child psychiatric inpatients with PDD and compared them with 933 matched controls from the general population. These patients were divided into three

groups: those with childhood autism (*n*=113), those with AS (*n*=114), and those with atypical autism (*n*=86). They found that 9% of 113 individuals with childhood autism exhibited criminal behaviours; furthermore, 8.1% of 86 patients with atypical autism and 18.4% of 114 patients with AS were convicted of crimes. These results indicate that HFASD might be a risk factor of criminal behaviour. Långström, Grann, Ruchkin, Sjostedt, and Fazel (2009) also compared 31 individuals with ASD (including those with autism and AS) who committed violent, non-sexual crimes as well as two sexual offences with those with ASD and no history of violence. These authors reported that the violent offences among those with ASD were predicted by gender (i.e., males), sub-diagnosis (i.e., AS rather than autism), and comorbid psychiatric disorders (i.e., psychotic and substance use disorders). These results matched a previous study reporting the risk factors of criminal behaviour among individuals without ASD (Långström et al., 2009).

An awareness of criminal behaviour in individuals with HFASD is increasing, but how criminal behaviour risk factors interact with one another still remains unclear. Although several criminal behaviour risk factors and psychiatric disorders have been identified in the general population, most studies have examined only one or two factors (Green et al., 2010). However, risk factors are highly clustered with one another and should be examined using a multivariate model.

Based on this notion, a large-scale epidemiological study known as the National Comorbidity Survey Replication (NCS-R) was conducted in the US (Green, et al., 2010). The

NCS-R reported 12 risk factors, named “childhood adversities” (CAs), which were selected through a review of risk factor studies that influenced the development of psychiatric disorders. These CAs included maladaptive family functioning (i.e., parental mental illness, substance use, criminality, family violence, physical and sexual abuse, and neglect) and were significantly related to the initial age of onset of disruptive behaviours (Green et al., 2010). CAs may be risk factors for criminal behaviour in individuals with HFASD. In fact, some individuals with HFASD who exhibit violent behaviour were physically abused as children (Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005).

Other CAs that are related to criminal behaviour include a history of being bullied (Saito, Kobayashi, Tanaka, & Shimizu, 2003; Sugiyama, 2003; Tantam, 2000) and childhood hyperactivity (Biederman, Mick, Faraone, & Burback, 2001). Bullying and hyperactivity are risk factors for criminal behaviour according to community (Connor, 2002) and clinical samples (Barkley, 1998; Sugiyama, 2000). Similar to the general population, individuals with ASD often exhibit hyperactivity and become the target of bullying (Heinrichs, 2003; Wing, 1996).

In addition, three offenders who were victims of bullying received diagnoses of PDD later in life (Schwartz-Watts, 2005). These cases suggest that an early ASD diagnosis and proper intervention is important to decrease the risk of developing criminal behaviours (Schwartz-Watts, 2005; Sugiyama, 2003). In fact, the age at which ASD was first diagnosed often affects early interventions and could thereby influence prognosis (Lord, 1995). Based on

these reports, the timing of the initial ASD diagnosis and appropriate intervention might influence the later development of criminal behaviour in those with HFASD. A delay in the initial ASD diagnosis might be another risk factor of criminal behaviour in individuals with HFASD.

Thus, the purpose of this study was to examine the risk factors of criminal behaviour, including CAs and the age of initial diagnosis, in individuals with HFASD.

2. Methods

2.1. Participants

The participants included 175 individuals (147 males, 28 females) who were diagnosed with HFASD by child psychiatrists based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994). We divided participants into two groups: those who exhibited criminal behaviour (the criminal group) and those without a history of criminal behaviour (the control group). There were 36 participants (30 males, 6 females) in the criminal group, and their mean age was 16.83 years (age range = 7-30 years, *SD* = 5.59). There were 139 participants (117 males, 22 females) in the control group, and their mean age was 14.89 years (age range = 6-28 years, *SD* = 4.24; Table 1). There were no significant between-group differences with regard to gender, age or sub-diagnosis (Table 2).

2.2. Measures

2. 2.1. Data collection procedure

We collected data by reviewing existing clinical records as well as interviewing participants and their parents. Child psychiatrists obtained any information that was missing from the clinical records by interviewing participants and their parents. Clinical psychologists and child psychiatrists with more than 15 years of experience with developmental disorders collected all the data.

2. 2.2. Childhood adversity

We used dichotomous items for CAs (Green et al., 2010), which included two types of CAs: maladaptive family functioning (MFF) CAs and other CAs. MFF CAs included seven items: parental mental illness, parental substance abuse, parental criminality, family violence, physical abuse, sexual abuse, and neglect. Other CAs included five items: parental death, parental divorce, other type of parental loss, life-threatening childhood physical illness, and extreme childhood economic adversity.

In addition to the above-mentioned CAs, the age of the individual at initial diagnosis with HFASD, bullying or being bullied, and propensity for hyperactivity were also included because these items are risk factors for criminal behaviour in individuals with HFASD (e.g., Connor, 2002; Lord, 1995; Wing, 1996).

All items concerning family and parents focused on only biological factors (Green et al., 2010). The MMF parental illness item was assessed by recording family histories of major depression, generalised anxiety disorder and panic disorder. If participants lived in foster homes,

they were rated as experiencing other parental loss. We assessed family economic adversity based on whether the family received welfare, other forms of governmental assistance, or both.

2. 2. 3. Criminal behaviour data

Using clinical records, we collected additional information about the criminal group, such as the types and frequencies of criminal behaviour, the onset of criminal behaviour and the age at which their last criminal behaviour was observed. Regarding the types of criminal behaviour, kleptomania entails the stealing of both material goods and money. Sexual misconduct includes voyeurism, peeping, juvenile prostitution and lingerie theft. The participants checked all the behaviours that applied to them. We also assessed the frequency of criminal behaviours using a 3-point Likert scale: “only once (no recurrence at the time of the assessment)”, “multiple recurrent incidents without a current episode” and “multiple recurrent incidents with a current episode”.

2.4. Data Analyses

First, the types and frequency of criminal behaviours in the criminal group were calculated. Second, the CA prevalence rates for each group were calculated, and the χ^2 test and unadjusted odds ratio (OR) were used to analyse the associations between CAs and the groups. Third, based on Green et al.’s (2010) suggestion, a logistic regression analysis estimated the influence of each CA. Several multivariate models were estimated; each included a CA dummy variable.

The first logistic regression model was additive; it included a separate predictor variable

for each of the CAs without interaction terms. 14 CAs except for the “age of initial HFASD diagnosis” was included. This model also included the “number of the CAs” experienced by participants as an additional predictor for each of the 14 CAs (Green et al., 2010). Following Green et al.’s (2010) suggestion, a cut-off point for the number of the CAs was explored to compare the two groups. We observed significant differences between the two groups in the number of CAs when the number of CAs was divided into groups of “4 or less” and “5 or more,” which indicates that 5 was an appropriate cut-off point for this variable. Hereafter, the number of CAs refers to a dichotomous variable.

The second model included all 15 CAs. We added the variables using the forced entry method in the first and second models. The third model used the stepwise method to explore the best combination of these variables. This method included 15 CAs for the type and number of CAs. Survival coefficients and their standard errors were exponentiated and reported as ORs and 95% confidence intervals (95% CI), respectively. We used the Akaike information criterion (AIC) to select the best multivariate model (Burnham & Anderson, 2002) and evaluated statistical significance using 2-tailed tests ($p < .05$).

3. Results

3. 1. Criminal behaviour features

The most common problem in the criminal group was theft, followed by sexual misconduct, violence, and running away (Table 3). Trouble act was sending spoofed e-mail; one

of male participants was bullied by his female friends, and he spoofed her as a retaliation. Table 3 shows that 47.2% of participants in the criminal group exhibited the problem “only once (no recurrence at assessment)”; the same proportion exhibited the problem “multiple recurrent incidents without a current episode)”. The onset of criminal behaviour ranged from 5 to 21 years old, with a mean (*SD*) age of 11.42 (4.45) years. The age at which the last criminal behaviour occurred ranged from 6 to 24 years old, with a mean (*SD*) age of 14.31 (4.39) years (Table 4). The most common age for the onset of criminal behaviour was 6 years old (19.4%), followed by 8 (11.1%), 14 (11.1%) and 16 (11.1%). The last criminal behaviour was most commonly displayed between age 14 (11.1%) and 18 (11.1%).

3. 2. The prevalence of childhood adversity

The frequency of the presence of each CA is shown in Table 5. Significant differences in MFF CAs were observed between the criminal group and the control group with regard to family violence, physical abuse, sexual abuse and neglect. Specifically, more participants in the criminal group experienced these CAs than those in the control group. With regard to the other CAs, significant differences were observed in parental death, parental divorce and other parental loss: More participants in the criminal group experienced these CAs compared with controls. With regard to the additional CAs, no significant differences were observed in bullying or hyperactivity. The mean age at which HFASD was first diagnosed in the criminal and control groups were 10.25 (*SD* = 4.68, range = 2-22) and 5.94 (*SD* = 3.79, range = 1-17) years,

respectively. The initial HFASD diagnosis occurred at a significantly older age for participants in the criminal group than for those in the control group (t = -5.78, df = 173, p < .001).

Regarding the number of CAs, significantly more participants in the criminal group belonged to the "5 or more group" than those in the control group.

3. 3. CAs and the likelihood that individuals with HFASD will display criminal behaviours

First, each CA variable was examined using a bivariate model that did not control for the influence of each variable. The MFF categories family violence, physical abuse, sexual abuse and neglect had significant ORs (Table 6). Neglect had the largest OR (OR = 15.1). With regard to the other CAs, the significant ORs for parental divorce (OR = 4.5) and other parental loss (OR = 12.5) indicate that the risk for criminal behaviour increases for those who experience these CAs. Concerning the additional CAs, the ORs for bullying and hyperactivity were not significant. Lastly, the OR for the number of CAs was significant, which means that the risk for criminal behaviour increased as individuals experienced more CAs.

Second, we conducted a multivariate logistic regression analysis to control for the influence of each variable (Table 6). The results of this analysis revealed that the ORs for physical abuse and neglect were significant. Sexual abuse was not included in the analysis because none of the participants in the control group reported sexual abuse. The other CAs did not affect the likelihood of criminal behaviour (i.e., the ORs were not significant after controlling for the other variables). With regard to the additional CAs, the OR for the age of

initial HFASD diagnosis was significant. In the multivariate model, the authors examined χ^2 statistics and the AIC in the following models: one in which only the MFF CAs were entered (χ2(5) = 32.6 ($p < .001$), AIC = 153.61); one in which only the other CAs were entered (χ2(5) = 16.2 ($p < .001$), AIC = 171.6); one in which only the additional CAs were entered (χ2(3) = 30.3 ($p < .001$), AIC = 153.6); one in which the MFF CAs and the other CAs were entered (χ2(10) = 36.9 ($p < .001$), AIC = 161.0); and one in which all CAs were entered (χ2(13) = 53.2 ($p < .001$), AIC = 150.7). The latter model provided the best fit for the data.

Finally, the multivariate model that included all the types and numbers of the CAs was examined to control the influences of each variable (Table 6). The model was interactive in that the type and number of CAs were both included in the model (Green et al., 2010). Only the OR for the age of initial HFASD diagnosis was significant in this model ($\chi^2 = 56.7$, $df = 14$, $p < .001$, AIC = 149.2).

3. 4. Determining the best combination of variables to predict the most common criminal behaviours in individuals with HFASD

A logistic regression analysis using the backward selection method determined the variable that most contributed to the risk for criminal behaviour in individuals with HFASD (Table 7). Among all of the variables, the Wald statistic confirmed that the age of initial HFASD diagnosis, neglect, physical abuse, bullying and parental divorce were significant. The model that included these five variables initially provided the best fit in this study ($\chi^2 = 49.5$, $df = 5$, $p < .001$, AIC =

138.4). Of these five variables, only the ORs for the age of initial HFASD diagnosis, neglect and physical abuse were significant. Individuals who experienced childhood neglect or physical abuse were most likely to have criminal behaviours later in life. Criminal behaviour was 6.3 times more likely to occur in those who experienced neglect and 3.1 more likely in those who experienced physical abuse compared with the control group. There was a 1.2-fold increase in criminal behaviours for each year that the psychiatric diagnosis was delayed.

4. Discussion

4. 1. Characteristics of individuals with HFASD who exhibit criminal behaviours

In this study, the most common criminal behaviour was theft (55.6%), followed by sexual misconduct (25.0%), violence (25.0%), and running away (19.4%). Theft is also the most common criminal behaviour in the general Japanese population (Ministry of Justice, Japan, 2008) and in many European countries (e.g., Junger-Tas et al., 2010). The rates of sexual misconduct, violence, and running away in the general Japanese population are not high (Japanese Ministry of Justice, 2008); thus, the relatively high rate of sexual misconduct in this study may by a characteristic of individuals with HFASD. Hellemans, Colson, Verbraeken, Vermeiren, and Deboutte (2007) interviewed 24 adolescents and adults with HFASD regarding their sexuality and reported that approximately one-third required sexual development or behavioural interventions. Indeed, previous case studies have reported that individuals with HFASD and excessive sexual interest engaged in sexual misconduct (e.g., Kohn et al., 1998,

Murrie et al., 2002). Accordingly, a feature of ASD was derived: Restricted and repetitive patterns of behaviour, interests, and activities may take on a sexual aspect, and their unique or intense sexual interests may lead to criminal behaviour (Murrie et al., 2002).

In the present study, 94.4% of participants in the criminal group exhibited “multiple recurrent incidents with a current episode of criminal behaviour” or “multiple recurrent incidents without a current episode;” 5.6% of participants reported only once and no recurrences illicit behaviours at the time of the assessment.” This result corresponds with many previous case studies reporting that individuals with HFASD repeat criminal behaviours (e.g., Baron-Cohen, 1988; Chen et al., 2003; Mawson et al., 1985). As mentioned earlier, restricted and repetitive patterns of behaviour, interests, and activities might contribute to recurrent criminal behaviour. Moreover, a lack of empathy for others (Wing, 1981), which relates to severe and sustained impairments in social interactions, might also be related to recurrent criminal behaviour (Woodbury-smith, Clare, Holland, Kearns, Staufenberg & Watson, 2005).

More importantly, these individuals often repeat criminal behaviours even though they were seeing child psychiatrists and receiving traditional interventions. These findings reflect the difficulty of intervening in cases of criminal behaviour. Preventive approaches should focus on ASD traits.

4. 2. Criminal behaviour risk factors in individuals with HFASD

The results indicated that the age at which HFASD was first diagnosed, physical abuse and

neglect significantly predicted criminal behaviour in individuals with HFASD. This finding corresponds with previous case reports suggesting that a delayed initial diagnosis and appropriate treatment lead to violent behaviours (Mukaddes & Topcu, 2006). Our findings demonstrating that neglect and physical abuse have significant effects are also in agreement with previous results from the general population. For example, childhood neglect and physical abuse significantly predict aggression that results in violent crime arrests in adulthood (Maxfield, & Widom, 1996). Thus, neglect and physical abuse are significant risk factors of criminal behaviour in the HFASD population. Neglect and physical abuse exert a large influence on children's physical and psychological development. For instance, when children experience neglect or physical abuse, their physical growth is stunted, and their mental status is unstable; these children are more likely to have mental disorders such as depression or aggression towards others (Child Welfare Information Gateway, 2008). Such problems exert negative influences on their emotional regulation, friendships and adjustment to school (Sroufe, Egeland, Carlson, & Collins, 2005), which may result in criminal behaviour.

This study is one of the few to assess the relationship between the age of initial HFASD diagnosis and the likelihood of criminal behaviour. The results show that a later diagnosis is correlated with an increased prevalence of criminal behaviour. In general, the presence of HFASD is easily overlooked in young children (De Giacomo & Fombonne, 1998) because speech delays, a common characteristic of ASD, are unlikely to be observed. Later diagnoses

lead to a lack of early medical and educational interventions and perhaps the inability to acquire social skills and adapt to society (e.g., Lord, 1995). It is critical that children with ASD increase their repertoire of appropriate behaviours at an early age (Howlin, 1997; Richman, 2001); thus, late diagnoses might be a significant risk factor of social adaptation failures in individuals with ASD.

Parents of children with ASD typically report higher levels of parenting stress and affective symptoms compared with parents of normally developing children and those of children with other disabilities (e.g., Bristol and Schopler 1984; Dumas et al., 1991). Moreover, Hastings and Johnson (2001) found that parental stress correlated with levels of autism symptoms. From these findings, one might associate a delayed ASD diagnosis with criminal behaviour. A delayed diagnosis leads to a poor prognosis (Lord, 1995) and elevates parental stress; the parents may also become depressed or apathetic, which leads to harsher disciplines that could develop into child abuse (Sullivan & Knutson (2000). Child abuse exacerbates the child's socio-emotional development, which might lead to criminal activity.

The additional CA categories, hyperactivity and being bullied, were not significantly correlated with criminal behaviour; however, researchers have observed that there are significant correlations among these variables in the general population. For example, children who lack control at age three exhibit aggression later in life (Caspi, Henry, McGee, Moffitt, & Silva, 1995). Moreover, alienation from friends was positively correlated with aggression

(Schwartz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1998). One possible explanation for the present study's non-significant results is the high percentages of hyperactivity and bullying in both the criminal and control groups. The lack of a significant between-group difference with regard to hyperactivity and bullying may have masked the relationship between these factors and risk of criminal behaviours. Hyperactivity is often observed in children with ASD (e.g., Wing, 1996), and these children are often ridiculed and become targets of bullying because they fail to comprehend the intentions of others (Heinrichs, 2003; Yoshida & Uchiyama, 2004). Therefore, although hyperactivity and bullying were not significantly correlated with criminal behaviour in individuals with HFASD in the present study, practitioners must still consider these factors when working with this population.

4. 3. Limitations

This study selected several CAs to predict criminal behaviour in individuals with HFPDD. However, many of these CAs are environmental factors; the only individual factors were physical illness and hyperactivity. As a result, other individual factors (e.g., hereditary) were not taken into account. In addition, the interaction between individual factors and environmental factors was not examined. Therefore, future studies are needed to examine the influence of biological and environmental factors on criminal behaviour in individuals with HFASD.

Except for the age of initial HFASD diagnoses, all the CAs were rated as either present or absent, even though the severity of these factors may differ among individuals. Sampson and

Laub (1994) assessed quantitative variables similar to CAs and explained that family poverty interrupted informal social control processes in the family. The lack of informal social control in families increased the risk for delinquency. Thus, insufficient family functioning (e.g., economic adversity, parental criminality and family violence) might postpone the timing and age at which HFASD is first diagnosed. Therefore, studies that rate the presence and level of child abuse or neglect using multilevel rather than dichotomous scales may reveal additional details regarding the relationships among criminal behaviours and these variables. Moreover, prospective studies might provide additional information on this topic.

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Table 1

Demographic charactersitics of participants

	Criminal	Control	Total	X^2 (df)
Sex				
Male	30	117	147	.02 n.s.
Female	6	22	28	(1)
Total	36	139	175	
Diagnosis				
Autism	9	36	45	
Asperger	11	47	58	.22 n.s.
NOS	16	56	72	(2)
Total	36	139	175	

Table 2

Mean (SD) age and IQ of each group

	Criminal (N=36)	Control (N=139)	
	M (SD)	M (SD)	t
Age	16.83 (5.59)	14.89 (4.24)	-1.94 n.s.
IQ	96.86 (18.25)	92.20 (13.46)	-1.43 n.s.

Table 3

The type and frequency of criminal behaviour in the criminal group

	N	(%)
Type[1]		
Theft, kleptomania (things, money)	20	(55.6)
Sexual misconduct (voyeurism, peeping, juvenile prostitution, lingerie theft)	9	(25.0)
Violence	9	(25.0)
Running away	7	(19.4)
Arson	4	(11.1)
Blackmail	2	(5.6)
Trouble act	1	(2.8)
Frequency		
Only once (no recurrence at the time of the assessment	2	(5.6)
Multiple (recurrent incidents without a current episode)	17	(47.2)
Multiple (recurrent incidents with a current episode)	17	(47.2)
total	36	(100)

[1]checked all that apply

Table 4

The information about onset of criminal behaviour
and age at which most recent criminal behaviour

	onset		most recent	
age	*N*	(%)	*N*	(%)
5	1	(2.8)	0	(0.0)
6	7	(19.4)	1	(2.8)
7	2	(5.6)	2	(5.6)
8	4	(11.1)	1	(2.8)
9	1	(2.8)	1	(2.8)
10	0	(0.0)	2	(5.6)
11	2	(5.6)	2	(5.6)
12	2	(5.6)	3	(8.3)
13	3	(8.3)	3	(8.3)
14	4	(11.1)	4	(11.1)
15	2	(5.6)	1	(2.8)
16	4	(11.1)	7	(19.4)
17	1	(2.8)	1	(2.8)
18	2	(5.6)	4	(11.1)
19	0	(0.0)	1	(2.8)
20	0	(0.0)	0	(0.0)
21	1	(2.8)	0	(0.0)
22	0	(0.0)	1	(2.8)
23	0	(0.0)	0	(0.0)
24	0	(0.0)	2	(5.6)
total	36	(100)	36	(100)
M(*SD*)	11.42(*4.45*)		14.31(*4.39*)	

Table 5

Prevalence of childhood adversities (CAs)

	N (%)			X^2(1)
	CD	Control	Total	
Ⅰ. Maladptive Family Functioning CAs				
Parental mental illness	6 (16.7)	15 (10.8)	21 (12.0)	0.9
Parental substance use	1 (2.8)	1 (0.7)	2 (1.1)	1.1
Parental criminality	0 (0.0)	0 (0.0)	0 (0.0)	-
Family violence	2 (11.1)	4 (1.4)	6 (3.4)	8.1 **
Physical abuse	13 (36.1)	10 (7.2)	23 (13.1)	20.9 ***
Sexual abuse	2 (5.6)	0 (0.0)	2 (1.1)	7.8 **
Neglect	9 (25.0)	3 (2.2)	12 (6.9)	23.4 ***
Ⅱ. Other CAs				
Parental death	3 (8.3)	2 (1.4)	5 (2.9)	4.9 *
Parental divorce	10 (27.8)	11 (7.9)	21 (12.0)	10.7 **
Other parental loss	3 (8.3)	1 (0.7)	4 (2.3)	7.4 **
Physical illness	7 (19.4)	24 (17.3)	31 (17.7)	0.1
Economic adversity	5 (13.9)	8 (5.8)	13 (7.4)	2.8
Ⅲ. Additional CAs				
Bullying	23 (63.9)	104 (74.8)	127 (72.6)	1.7
Hyperactivity	21 (58.3)	80 (57.6)	101 (57.7)	0.0
The age of initial HFASD diagnosis	-	-	-	-
No. of CAs				
≧5	9 (25.0)	2 (1.4)	11 (6.3)	26.9 **

* significant at the 0.05 level, two tailed

** significant at the 0.01 level, two tailed

*** significant at the 0.001 level, two tailed

Table 6

Bivariate and multivariate associations (odds ratios) between childhood adversities (CAs) and criminal behaviour

	OR (95% CI)		
	Bivariate	Multivariate (additive)	Multivariate (interactive)
Ⅰ. Maladptive Family Functioning CAs			
Parental mental illness	1.7 (0.6 - 4.6)	0.9 (0.2 - 3.7)	0.7 (0.1 - 3.3)
Parental substance use	3.9 (0.2 - 64.6)	0.2 (0.0 - 73.3)	0.1 (0.0 - 32.2)
Parental criminality	-	-	-
Family violence	8.6 * (1.5 - 48.8)	3.9 (0.3 - 57.6)	2.7 (0.1 - 49.2)
Physical abuse	7.3 * (2.9 - 18.6)	4.1 * (1.2 - 13.8)	3.3 (0.9 - 12.1)
Sexual abuse	0.2 * (0.1 - 0.3)	-	
Neglect	15.1 * (3.8 - 59.5)	5.3 * (1.0 - 29.4)	2.9 (0.4 - 19.4)
X^2(*df*) (*p* value)	-	$X^2(5) = 32.6$ ($p < .001$)	-
Ⅱ. Other CAs			
Parental death	6.2 (1.0 - 38.8)	0.4 (0.0 - 6.1)	0.2 (0.0 - 4.6)
Parental divorce	4.5 * (1.7 - 11.6)	3.7 (0.8 - 17.5)	3.3 (0.6 - 18.0)
Other parental loss	12.5 * (1.3 - 124.5)	3.8 (0.1 - 102.7)	3.6 (0.1 - 145.7)
Physical illness	1.2 (0.5 - 2.9)	0.5 (0.1 - 2.0)	0.4 (0.1 - 1.7)
Economic adversity	2.6 (0.8 - 8.6)	0.7 (0.1 - 5.3)	0.4 (0.0 - 4.7)
X^2(*df*) (*p* value)	-	$X^2(5) = 16.3$ ($p < .01$)	-
X^2(*df*) (*p* value)	-	$X^2(10) = 36.9$ ($p < .001$)	-
Ⅲ. Additional CAs			
Bullying	0.6 (0.3 - 1.3)	0.5 (0.2 - 1.3)	0.5 (0.2 - 1.3)
Hyperactivity	1.0 (0.5 - 2.2)	1.4 (0.5 - 3.7)	1.6 (0.6 - 4.3)
The age of initial HFASD diagnosis	-	1.2 * (1.1 - 1.3)	1.2 * (1.1 - 1.4)
X^2(*df*) (*p* value)	-	$X^2(3) = 30.3$ ($p < .01$)	-
X^2(*df*) (*p* value)	-	$X^2(13) = 53.2$ ($p < .001$)	-
No. of CAs			
≧5	22.8 * (4.7 - 111.6)	-	17.7 (0.6 - 553.2)
X^2(*df*) (*p* value)	-	-	$X^2(14) = 56.7$ ($p < .001$)

* significant at the 0.05 level, two tailed

Table 7

The results of a logistic regression analysis with backward selection

	B	SE	Wald (df=1)	OR	95% CI
The age of initial HFASD diagnosis	0.18	0.05	13.34 ***	1.20 *	(1.1 - 1.3)
Neglect	1.85	0.77	5.70 **	6.34 *	(1.4 - 28.8)
Physical abuse	1.32	0.57	5.30 **	3.73 *	(1.2 - 11.4)
Bullying	-0.84	0.49	2.96 **	0.43	(0.2 - 1.1)
Parental divorce	1.01	0.59	2.96 **	2.74	(0.9 - 8.6)
X^2(5)	49.5 ***				
AIC	138.4				
Correct classification (%)	85.7				

* significant at the 0.05 level, two tailed

** significant at the 0.01 level, two tailed

*** significant at the 0.001 level, two tailed