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Cognitive Functioning, Conduct Disorder and Substance Use as Predictors of Offending in Adults with ADHD

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Abstract

Attention-deficit/hyperactivity disorder (ADHD) is related to offending, however it is unclear whether offending is directly related to ADHD or whether the multiple correlates and complicating factors associated with both ADHD and offending, such as substance use and low IQ, explain offending. The current study tests whether the relationship between ADHD and offending holds after controlling for IQ, in addition to other important confounds. One-hundred and eighteen patients with a diagnosis of ADHD were separated into groups of offenders (N = 44) and non-offenders (N = 74). Groups were compared in terms of IQ, neuropsychological measures of response inhibition and attention, ADHD symptoms, conduct disordered behaviour and substance use. Logistic regression demonstrated that IQ, substance use and conduct disordered behaviour predicted offending and that a univariate relationship between response inhibition/ADHD symptoms and offending behaviour did not hold when controlling for IQ. These findings indicate that it is important to measure and control for IQ when considering offending in the context of ADHD.

Keywords: ADHD; Offending; Cognitive functioning; IQ

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopment disorder characterized by inattention, hyperactivity and impulsivity [1]. Although ADHD was originally considered a childhood disorder, it is now recognized to persist into adulthood in approximately two-thirds of cases [2,3]. ADHD is frequently comorbid with other psychiatric disorders and is also associated with poor education outcomes, lower economic status, a higher probability of being single, experience of separation or divorced, unemployment and increased risk of committing a criminal offence [4-6]. Over the past decade, there has been increasing interest in the association between ADHD and antisocial behaviour [7,8]. While ADHD is estimated to occur in approximately 2.5% of adults, ADHD is significantly over-represented in prison populations with ADHD prevalence estimates ranging from 15-45% [9-12]. In addition to higher prevalence rates, prisoners with ADHD began offending at an earlier age, were more likely to breach prison discipline and had a higher rate of recidivism [8,13]. Understanding the relationship between ADHD and offending is of major public importance.

Multiple features and correlates of ADHD have been identified that provide plausible explanations for the elevated rates of ADHD diagnoses amongst offenders. Emotional dysregulation, impulsivity, impaired self-control and lower IQ are all documented features of ADHD which are also correlates of offending [14-18]. Furthermore, empirical studies have supported the role of emotional dysregulation, impulsivity, lower IQ and low self-control in explaining offending in ADHD [19-23]. These distinct but related concepts all likely increase offending behaviour through problems in delaying rewards and exerting effective control over behaviour. Emotional dysregulation as a pre-disposition towards and difficulty in handling distress is a feature of ADHD that may increase the likelihood of impulsive behaviour as a response to distressing emotions or as a method of distraction. Likewise, deficits in impulsivity and self-control observed in ADHD have been associated with risk-taking behaviour and difficulties delaying rewards that may lead to offending behaviour through the inability to inhibit anger or as a perceived short-cut towards financial gain [24,25]. The relationship between low IQ and offending behaviour taps into impulsivity and difficulties delaying gratification as well as suggesting that low levels of empathy associated with a low IQ may increase offending behaviour through reduced concern about the violation of social norms to achieve an aim [26]. Understanding the relationship between ADHD and offending, however, is complicated by the co-occurrence of other impairments, problematic behaviours and psychiatric disorders in ADHD which are also associated with offending [21]. In sum, it is difficult to parse out whether ADHD directly contributes to offending behaviour or whether factors co-occuring with ADHD better explain the association (e.g., conduct disorders, substance misuse and personality disorders). A wealth of studies have found conduct disorders [19,27,28] substance misuse [21,29-31] and personality disorders [32,33] to be associated with both ADHD and offending, or precursors to offending such as anti-social behaviour or minor delinquent acts. Other non-psychiatric factors, such as experiencing childhood maltreatment, socio-economic status, deviant peer influences have also be implicated in the relationship between ADHD and offending [21,22,34,35].

Studies that control for confounding factors report a more ambiguous relationship between ADHD and offending. Several studies suggest that the relationship between ADHD and offending is largely or completely mediated by comorbid conditions, particularly conduct disorder [21,36,37]. Other studies, however, have demonstrated that ADHD independently increases the risk of offending when controlling for confounding variables [19,28,38]. Further research is required to ascertain the unique contribution that an ADHD diagnosis plays in predicting offending behaviour.

There are three major methodological issues that make estimating

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the contribution of ADHD to offending behaviour difficult. First, comparing evidence across studies is impaired by differences in how: ADHD is conceptualised and measured (diagnosis vs. dimensional/interview vs. self-report); criminal behaviour is conceptualised and measured (official criminal records vs. self-report/criminal acts vs. non-criminal delinquent behaviour) and which confounding variables are being controlled for across studies [37]. Second, given the large number of closely related confounding variables, it is difficult to design research studies which capture the relationship between ADHD and offending while controlling for the multiple competing variables. Finally, it is difficult to estimate the precise effect which ADHD may have on the pathogenesis of offending behaviour. When offending behaviour is initiated and intensifies variables such as conduct and substance use disorder may be the most reliable predictors, however it is difficult to estimate the effect which ADHD has had on the development of these disorders by the increased likelihood of socioeconomic disadvantage, reduced intellectual ability, heightened interpersonal difficulties and impaired educational performance which accompany ADHD [39].

The challenge of understanding the relationship between intellectual functioning, ADHD and offending is affected by the latter two challenges outlined above. While a number of significant studies in this area have included measures of intellectual functioning within their research designs [22,29,37,40] many other have not [19,23,37,40-44]. Significantly, among the studies which have measured IQ, few have controlled for the contribution of conducted disordered behaviour or substance use, thus weakening inferences about the relationship between intellectual functioning, ADHD and offending.

The Present Study

The present study seeks to examine the relationship between intellectual functioning, ADHD and offending behaviour while controlling for conduct disordered behaviour and substance use. The first objective is to examine psychosocial, behavioural and cognitive differences between offenders and non-offenders in a well-defined sample of ADHD patients. The second objective is test whether behavioural and neuropsychological measures of ADHD symptoms predict offending behaviour while controlling for intellectual functioning and major confounding variables.

Materials and Methods

Participants

One hundred and eighteen individuals diagnosed with Adult ADHD at a specialised ADHD assessment service were recruited for this study. Exclusion criteria for entry in the study included having an intellectual disability, a neurological condition, psychosis or a primary substance use disorder. ADHD was diagnosed by consultant psychiatrists, where psychiatric interviews were guided by the Conners' Adult ADHD Diagnostic Interview for DSM-IV. Participants were divided into two groups: Offender and non-offenders based on self-reported history of having committed at least one criminal offence. The first group was comprised of 44 adult offenders (75% male) diagnosed with ADHD with a mean age of 22.1 (SD = 7.9). The second group consisted of 74 adults non-offenders diagnosed with ADHD (51% male) with an average age of 30.7 (SD = 9.6).

Measures

Offending

Self-report questionnaires assessed offending behaviours. Participants were asked if they had committed an offence or had been convicted of a crime. Thirty-seven percent of the sample had committed an offence and twenty-nine percent had been convicted of a crime. If they had committed an offence, participants were asked to choose from a list of crimes (e.g., drunk and disorderly, burglary/theft, other) to describe each offence.

Cognitive functioning

Response inhibition as well as selective, divided, and switching attention was measured using a battery of tests as described in Bramham et al. [41]. An overview of these tests is provided in Table 1.

Intellectual ability

The Wechsler Abbreviated Scale of Intelligence (WASI) was used to measure intellectual ability [44]. The WASI has demonstrable reliability and validity [45].

ADHD symptoms

ADHD symptoms were measured using the Barkley Adult ADHD Rating Scale (BAARS) [46]. The BAARS consists of self and observer ratings related to three sets of DSM-IV ADHD criteria: Inattention (nine items), hyperactivity (six items), and impulsivity (three items). The questionnaire is completed for both current ADHD symptoms and childhood symptoms. The Barkley scale has demonstrated reliability and validity [41].

Conduct disordered behaviour

A history of conduct disordered behaviour was measured using a self-report questionnaire devised for the purpose of this study. Participants were asked whether they had been suspended, expelled, had engaged in disruptive behaviour at school and whether they had engaged in aggressive behaviour at school. Participants could respond either 'Yes' or 'No'. 'Yes' responses were score as one and 'No' responses were scored as zero. Based on these responses, a scale was constructed ranging from zero to four.

Substance use

Participants reported how frequently they used alcohol, tobacco, cannabis, amphetamines, ecstasy, cocaine, heroin (intravenous), heroin (smoked), LSD/acid, ketamine, magic mushrooms and crack. Frequency of illegal substances was recorded as 'never', 'occasional' or 'frequent' with corresponding values of zero, one and two. Tobacco and alcohol use by respondents were estimated by the number of cigarettes smoked per day and the number of alcohol units consumed per week. Both tobacco and alcohol use was subsequently transformed into three point scales of usage to correspond to the levels of usage of illegal substances. Levels of tobacco use was categorised as 'never', 'moderate' and 'heavy'; moderate tobacco use was classified as fewer than ten cigarettes per day while heavy use was considered to be greater than ten cigarettes. Moderate alcohol use was considered to be less than 21 units of alcohol per week while heavy alcohol use was considered to be in excess of 21 units. Never, moderate and heavy use for alcohol and tobacco was scored as zero, one and two respectively. A scale of substance use was calculated by adding scores for each type of substance. Values ranged from zero to fourteen.

Demographic information

A questionnaire was administered to gather demographic information.

Procedure

Participants were invited by their clinicians to take part in the research and given an information sheet explaining the study. Prior to

Function	Measure
Response inhibition	**Matching familiar figures test [43]** Participants are presented with a target line drawing and asked to identify this picture among five distracters as quickly and as accurately as possible. There are twelve items. Participants are scored on the amount of time taken to recognize the target drawing, and the number of errors made before correctly identifying the matching drawing. Standard scores can be calculated for time taken, number of errors and number of items correct first time.
Selective attention	**Telephone search subtest from Test of Everyday Attention [44]** Participants are presented with pages of a simulated telephone directory and are asked to identify target symbols as quickly and accurately as possible. A score is calculated based on the number of symbols correctly identified divided by the amount of time taken to complete the task.
Divided attention	**Telephone search while counting subtest from Test of Everyday Attention [44]** As for previous test but participant is also required to simultaneously count strings of tones played during the task. A score is based on a dual task decrement, calculated by subtracting the 'Telephone search' task score from a weighted score based on the number of symbols identified on the 'Telephone search whilst counting' test divided by the proportion of correctly counted strings of tones.
Switching attention	**Visual elevator subtest of the Test of Everyday Attention [44]** Participant has to follow a series of pictures of elevator doors and arrows and identify which 'floor' they have reached. The arrows signify changes of direction (i.e., up and down). Accuracy and timing scores are recorded.

Table 1: Neuropsychological assessment measures.

the appointment, participants and informants completed a questionnaire on psychosocial and background factors. On the day of assessment, participants completed the battery of measures previously described.

Analysis

Data analysis was conducted using SPSS (Version 20) [47]. Multiple imputation was performed to handle missing data [48]. Twenty datasets were imputed using all variables of interest, in addition to a small number of auxiliary variables which were highly correlated with variables of interest [49,50]. Neuropsychological measures of response inhibition and attention switching were omitted from multiple imputation given the significant amount of missing data (56.8%). The amount of data missing per variable of interest in addition to changes in mean values and standard deviations are provided in Table 2.

Independent t-tests were carried out to identify difference in mean scores between groups of offenders and non-offenders for all continuous variables. Chi-square analyses examined the strength of the relationships between categorical variables and membership of either the offending or non-offending groups. Univariate and multivariate logistic regression was carried out to examine predictors of offending. Initially, univariate logistic regression was carried out to determine whether a significant association was observed between each predictor and offending. Variables which displayed a significant association were included in a multivariate model. Given the small sample (N = 118), the number of predictors were limited to five. Neuropsychological measures were not included in the main regression analysis, given the high number of missing observation. However, a second regression estimated the relative contribution of cognitive and neuropsychological variables towards classifying offenders.

Results

Offending

The offending group (n = 44) reported 41 criminal convictions in total. Within the offending group, 11 individuals had never been convicted of a criminal offence, 11 individuals had been convicted once, nine had been convicted twice, four had been convicted three times and three people had been convicted either four or five times. Burglary followed by assault were the most common first time offences.

Cognitive functioning

The results of independent t-tests examining mean differences in cognitive functioning between offenders and non-offenders are presented in Table 3.

A significant difference between offenders and non-offenders was observed for response inhibition. Both groups were observed to differ in the total number of error reported for the Familiar Figures Matching test, with the offending group making significantly more errors. No difference in reaction times on the Matching Familiar Figures was found for both groups. Similarly, no differences were observed on any measure of selective, divided or shifting attention. The non-offending group had a significantly higher total IQ and verbal IQ score than the offending group.

ADHD symptoms

Differences in ADHD symptoms between offenders and non-offenders are presented in Table 4.

Offenders were observed to have significantly higher total scores for informant rated current ADHD symptoms as well as higher scores on the impulsivity, hyperactivity and inattention subscales. Similarly, the offending group reported significantly levels of informant rated childhood ADHD symptoms, with higher total and subscale scores. Offenders and non-offenders did not differ on patient-rated current or childhood ADHD symptoms, except for significantly higher levels of patient reported childhood hyperactivity symptoms found in the offending group.

Conduct disordered behaviour and substance use

The results of Chi-Squared and Independent T-Tests between offending and non-offending groups are presented in Table 5.

Results indicate that the offending group was more likely to exhibit conduct disordered behaviour, with a significantly higher proportion than expected expelled, suspended or having behaved aggressively. A similar pattern was observed in relation to substance use, with the offend group reporting higher levels of substance use, as measured by: Units of alcohol consumed per week, tobacco use per day and on the overall substance use scale. Chi-squared tests compared proportions of the offending and non-offending groups in terms of having ever used a substance. No significant differences were observed for levels of individual substance use except for cocaine use, where a standardised residual greater than two was reported.

Regression analysis

The results of univariate and hierarchical multivariate logistic

		Pre-Imputation – M (SD)		Post-Imputation – M (SD)	
Variable	**% (N) Missing**	**Non-Offenders**	**Offenders**	**Non-Offenders**	**Offenders**
Gender (%Male)	0% (0)	51.40%	75%	51.40%	75%
Age	0% (0)	30.74 (9.62)	27.07 (7.92)	30.74 (9.62)	27.07 (7.92)
No. Offences	0% (0)	0 (0)	2.30 (1.02)	0 (0)	2.30 (1.02)
No. Convictions	0% (0)	0.01 (.116)	1.66 (1.53)	0.01 (.116)	1.66 (1.53)
Full Scale IQ Score	4.2% (5)	108.27 (15.43)	95.43 (16.30)	107.99 (15.52)	95.6 (16.27)
Verbal IQ	7.6% (9)	8.95 (3.76)	11.45 (3.14)	11.43 (3.18)	8.88 (3.71)
BAARS – Current Informant	27.1% (32)	33.49 (11.75)	41.73 (9.75)	32.17 (11.28)	39.93 (10.38)
BAARS – Childhood Informant	20.3% (24)	36.13 (12.47)	44 (8.19)	35.12 (11.82)	42.46 (8.57)
BAARS – Current Patient	9.3% (11)	38.73 (7.68)	38.88 (9.24)	38.05 (7.91)	38.39 (9.16)
BAARS – Childhood Patient	9.3% (11)	40.47 (7.34)	43.08 (8.81)	39.74 (7.54)	42.30 (8.74)
Substance Use Scale	4.2% (5)	3.67 (3.05)	6.49 (3.42)	3.69 (3.05)	6.48 (3.46)
Conduct Disordered Scale	6.8% (8)	1.06 (.969)	2.49 (1.02)	1.06 (.967)	2.48 (1.02)

Table 2: Change mean in mean scores and standard deviation following multiple imputations.

Variable	Offend	Non-Offend	t	p
Response inhibition				
Matching Familiar Figures Test Errors	8.00 (5.68)	4.16 (4.10)	277%	0.60%
Matching Familiar Figures Test RT	15.62 (6.27)	20.23 (10.95)	1.889	0.059
Attention				
Selective attention	4.01 (1.28)	3.81 (2.03)	0.388	0.698
Divided attention	2.41 (6.81)	2.26 (2.95)	0.106	0.916
Switching attention (accuracy)	4.40 (1.71)	4.51 (1.61)	0.232	0.817
IQ				
Full Scale IQ score	95.43 (16.30)	108.27 (15.43)	4.185	0.0001
Verbal IQ	8.95 (3.76)	11.45 (3.14)	3.714	0.0001

Table 3: Test of difference on measures of cognitive functioning between offenders and non-offenders.

Current ADHD Symptoms: Informant-rated scale				
Variable	**Offend**	**Non-Offend**	**t**	**p**
Total Score	39.92	32.18	-7.75	0.001
Impulsivity	6.41	498.00%	-144%	0.40%
Hyperactivity	12.51	10.07	-2.44	0.009
Inattention	21	17.13	-3.87	0.003
Childhood ADHD Symptoms: Informant-rated scale				
Variable	**Offend**	**Non-Offend**	**t**	**p**
Total Score	42.46	35.12	-7.34	0.001
Impulsivity	6.65	5.13	-1.52	0.003
Hyperactivity	13.35	10.86	-2.49	0.009
Inattentive	22.46	19.13	-3.33	0.005
Current ADHD Symptoms: Patient-rated scale				
Variable	**Offend**	**Non-Offend**	**t**	**p**
Total Score	38.39	38.05	-0.347	0.834
Impulsivity	12.26	11.57	-0.295	0.54
Hyperactivity	12.26	11.57	-0.689	0.348
Inattention	20.11	20.73	0.636	0.524
Childhood ADHD Symptoms: Patient-rated scale				
Variable	**Offend**	**Non-Offend**	**t**	**p**
Total Score	42.3	39.74	-2.55	0.105
Impulsivity	6.8	6.22	-0.58	0.183
Hyperactivity	13.69	12.03	-1.65	0.029
Inattentive	21.8	21.48	-0.32	0.725

Table 4: Differences in ADHD symptoms between offenders and non-offenders.

regression analysis classifying membership of the offending group are visible in Table 6.

Univariate regression (Table 6) revealed that gender, childhood ADHD symptoms (informant), IQ, conducted disorder behaviour and

Variable	Offend	Non-Offend	χ^2	p
Background Demographics and Conduct disordered behaviour (% Yes/Standardised Res.)				
Expelled from school	43.2% (4)	2.7% (-3.1)	3049.00%	<0.001
Suspended from school	53.8% (2.3)	20.8% (-1.7)	12.58	<0.001
Behaved disruptively at school	88.6% (1.5)	58.1% (-1.2)	12.13	<0.001
Behaved aggressively at school	75% (3)	25.7% (-2.3)	25.67	<0.001
Conduct Disordered Behaviour Scale (M/SD)	2.49 (1.02)	1.06 (.963)	-7.27	<0.001
School leaving age (M/SD)	15.69 (1.23)	16.82 (1.12)	5.10[a]	<0.001
Alcohol and Substance Use (% Yes/Standardised Res.)				
Alcohol units per week (M/SD)	14.95 (17.07)	7.55 (10.31)	-2.92[a]	0.004
Tobacco use per day (M/SD)	10.81 (9.79)	5.69 (8.80)	-2.91[a]	0.002
Cannabis	90.7% (1.4)	61.6% (-1.1)	11.43	0.001
Amphetamines	60.5% (1.9)	30.1% (-1.5)	10.26	0.001
Ecstasy	55.8% (1.5)	32.9% (-1.1)	5.86	0.015
Cocaine	65.1% (2.1)	31.5% (-1.6)	12.41	0.004
Crack	34.9% (1.9)	13.7% (-1.4)	7.18	0.007
Heroin-Intravenous Res	4.7% (0.8)	1.4% (-0.6)	1.16	0.282
Heroin–Smoked	11.6% (1.9)	1.4% (-1.4)	5.81	0.016
LSD	27.9% (1.5)	12.3% (-1.2)	4.43	0.035
Magic Mushrooms	34.9% (1.2)	20.5% (-0.9)	2.9	0.089
Ketamine	14% (1)	6.8% (-0.7)	1.59	0.207
Substance Use Scale (M/SD)	6.48 (3.51)	3.69 (3.02)	-4.5	<0.001

Table 5: Background demographics, substance use and history of conduct disordered behavior.

	Univariate		Multivariate					
			Step 1		Step 2		Step 3	
	Crude Odds Ratio	Sig.	Adjusted Odds Ratio	Sig.	Adjusted Odds Ratio	Sig.	Adjusted Odds Ratio	Sig.
Gender (Female = 1)	0.352	0.013	0.393	0.042	0.319	0.02	0.66	0.517
Childhood ADHD Symptoms (Informant)	1.07	0.003	1.07	0.004	1.05	0.066	0.994	0.835
Total IQ	0.952	0			0.961	0.016	0.956	0.028
Conduct Disordered Scale	3.77	0.003					3.63	0
Substance Use Scale	1.29	0					1.35	0.002

Table 6: Crude and adjusted odds ratio for offending.

substance use were all significantly associated with offending behaviour. Results from subsequent hierarchical multivariate models revealed that ADHD symptoms were no longer associated with offending when IQ was held constant. Likewise, following the inclusion of conduct disordered behaviour and substance use into the model, gender no longer retained statistical significance. Examining the third and final step in the model, a one unit increase in IQ reduced the probability of being classified as an offender by 5% while a ten point increase in IQ reduces the probability by 39%. A one unit increase on the conduct disordered scale, with values ranging from zero to four, corresponded with being approximately 3.6 times more likely of being classified as an offender. An increase of one unit on the substance use scale, with values ranging from zero to 14, made subjects 1.35 times more likely to be classified as offenders. Overall, this model correctly classified 81.24% of subjects. Given the higher proportion of missing data for neuropsychological measures of response inhibition and attention, these variables were excluded from the primary model. However, univariate and multivariate regression was carried out to determine the contribution of neuropsychological variables in classifying offenders when controlling for IQ. A one unit increase in the total number of errors on Matching Familiar Figure test increased the odds of being classified as an offender by approximately 1.2 times (Odds Ratio = 1.18, p = 0.015). However, when controlling for total IQ this association disappeared (Odds Ratio = 1.06, p = 0.515).

Discussion

The purpose of the study was to investigate the relationship between intellectual functioning, ADHD and offending behaviour in a well-defined sample of adults with ADHD. Offenders were more likely to have: Significantly higher levels of impulsivity; lower IQ; elevated current and childhood informant-rated ADHD symptoms as well as self-reported childhood hyperactivity symptoms; increased rates of expulsions, suspensions and aggressive and/or disruptive behaviour in educational settings and higher levels of legal and illegal substance use. Furthermore, results suggest that the association between ADHD and offending may be actually explained by IQ, conduct disorder and substance use.

ADHD symptoms and offending

The contention that ADHD symptoms increase the likelihood of offending behaviour remains contested. Multiple studies support this hypothesis with findings that clinical features of ADHD are independently related to offending [7,28,38]. Furthermore, this effect has been shown to hold when examining self-report symptoms across community and forensic samples as well as in prospective, longitudinal samples of children diagnosed with ADHD and other forms of psychopathology. A major advantage of prospective, longitudinal studies is that it tracks ADHD symptoms, conduct disordered

behaviour and substance use behaviour over time and allows the identification of the temporal ordering of events. This study found that the association between neuropsychological and behavioural measures of ADHD disappeared once confounding variables were controlled for. This supports others' findings that the relationship between ADHD and offending is largely explained by other factors which are frequently comorbid with ADHD, particularly conduct disorders, substance use, self-control and deviant peer influences [21,23,36,37]. Given the cross-sectional nature of this research we cannot, however, exclude the real possibility that conduct disordered behaviour and substance use variables measured in this study are actually measuring the impact of earlier ADHD symptoms.

Intellectual functioning and offending

A negative relationship has been shown to exist between IQ and offending, with lower levels of IQ associated with higher levels of offending [51,52]. This relationship has been shown to hold independently of a wide range of demographic (race, family structure, socio-economic status and neighbourhood) cognitive (impulsivity) and behavioural (conduct disorder and ADHD) factors [22,53,54]. The present study reinforces the importance of IQ in predicting offending behaviour by demonstrating its importance in predicting offending behaviour in a clinical sample of adults with ADHD while controlling for gender, ADHD symptoms, substance use and conduct disordered behaviour.

Neuropsychological factors associated with offending

Little research has been conducted examining neuropsychological differences in delinquent and non-delinquent behaviour in subjects with ADHD. Cauffman, Steinberg [55] found that, when compared with healthy controls, offenders had significantly impaired response inhibition. Likewise, Meier, Perrig [56] found some evidence that the neural correlates of aspects of response inhibition differed when comparing delinquent and non-delinquent subjects with ADHD. The results of the current study support previous findings that response inhibition is associated with offending in adults with ADHD. Nonetheless, this relationship disappears once IQ is controlled for, similar to behavioural measures of ADHD. This result speaks to an ongoing debate about the role which psychological and neuropsychological constructs of impulsivity and self-control play in predicting criminal behaviour by suggesting that neuropsychological deficits do not directly increase the likelihood of offending [55,57].

Substance use and conduct disorder behaviour

Prospective, longitudinal research on the outcomes associated with childhood ADHD and comorbid diagnoses found that children with ADHD and comorbid conduct disorder were more likely to commit offences [28]. Results from the current study found an association between substance use and conduct disordered behaviour in offending behaviour and contributes to broad agreement in the literature that conduct disordered behaviour is implicated in offending behavior [19,22,23,28,37]. Likewise, the association found in this study between substance use and offending behaviour supports previous research carried out in diverse samples, including a national sample of students and both youth and adult offenders [7,8,30,31]. Given the cross-sectional design of the current study it is difficult, however, to understand the pathogenesis of offending behaviour and consequently, whether ADHD symptoms played an important role in predisposing individuals towards conduct disordered behaviour and substance use [20].

Limitations

The results of this study must be considered alongside its limitations. The most significant limitation is the cross-sectional design of the study. Given the complex interplay of inter-related confounding factors in the development of offending, prospective longitudinal designs are required to understand the temporal emergence of risk factors. Nonetheless, this study provides further insight into how multiple risk factors link ADHD and offending. Another important limitation of the study is that self-report measures were used to assess conduct problems, substance use and offending-the reliability and validity of the scales deployed are unknown and consequently, it is difficult to estimate the error in the instruments being used and to generalise to other measures in the field. Furthermore, we cannot rule out the possibility that increased measurement error associated with self-report has led to the misclassification of offenders and resultant biased estimates of the predictor variables in our model. Finally, neuropsychological data were available for less than half of participants. This limited the ability to model neuropsychological data in multivariate models and, as a result, prevented the study from estimating the effect of predictor variables while holding underlying difference in neuropsychological function constant. Despite these limitations, additional significant strengths existed. Since participants were recruited through a national assessment clinic, this ensured that our sample of adults with ADHD was a well-defined group evaluated using reliable criteria for diagnosis. In addition, valid and reliable measures of neuropsychological function and ADHD symptoms were used in the study. Finally, robust techniques were used to handle missing data reducing the risk that systematic patterns in missing data were biasing results.

Conclusions

This is one of the first studies to examine the relationship between cognitive factors, ADHD and offending in a well-defined sample of adults with ADHD. Findings highlight the importance of controlling for IQ when considering the relationship between neuropsychological, ADHD symptoms and offending. In addition, this study provides support for an association between substance use, conduct disordered behaviour and offending behaviour.

References

1. Davidson MA (2008) ADHD in adults: a review of the literature. J Atten Disord 11: 628-641.
2. Barkley RA, Fischer M, Smallish L, Fletcher K (2002) The persistence of attention-deficit/hyperactivity disorder into young adulthood as a function of reporting source and definition of disorder. J Abnorm Psychol 111: 279-289.
3. Biederman J, Monuteaux MC, Mick E, Spencer T, Wilens TE, et al. (2006) Young adult outcome of attention deficit hyperactivity disorder: a controlled 10-year follow-up study. Psychol Med 36: 167-179.
4. Brassett-Grundy A, Butler N (2004) Prevalence and Adult Outcomes of Attention Deficit Hyperactivity Disorder- Evidence form a 30-year prospective longitudinal study. University of London; Bedford Group.
5. Kessler RC, Adler L, Barkley R, Biederman J, Conners CK, et al. (2006) The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey Replication. J Psychiatry 163: 716-723.
6. Usher AM, Stewart LA, Wilton G (2013) Attention deficit hyperactivity disorder in a Canadian prison population. Int J Law Psychiatry 36: 311-315.
7. Young S, Thome J (2011) ADHD and offenders. World J Biol Psychiatry 12 Suppl 1: 124-128.
8. Young S, Wells J, Gudjonsson G (2011) Predictors of offending among prisoners: the role of attention-deficit hyperactivity disorder and substance use. Psychopharmacology 25: 1524-1532.
9. Einarsson E, Sigurdsson JF, Gudjonsson GH, Newton AK, Bragason OO

(2009) Screening for attention-deficit hyperactivity disorder and co-morbid mental disorders among prison inmates. Nord J Psychiatry 63: 361-367.

10. Simon V, Czobor P, Bálint S, Mészáros A, Bitter I (2009) Prevalence and correlates of adult attention-deficit hyperactivity disorder: meta-analysis. Br J Psychiatry 194: 204-211.
11. Retz W, Retz-Junginger P, Hengesch G, Schneider M, Thome J, et al. (2004) Psychometric and psychopathological characterization of young male prison inmates with and without attention deficit/hyperactivity disorder. Eur Arch Psychiatry Clin Neurosci 254: 201-208.
12. Young S, Gudjonsson GH, Wells J, Asherson P, Theobald D, et al. (2009) Attention deficit hyperactivity disorder and critical incidents in a Scottish prison population. Pers Individ Dif 46: 265-269.
13. Gordon V, Williams D, Donnelly P (2012) Exploring the relationship between ADHD symptoms and prison breaches of discipline amongst youths in four Scottish prisons. Public Health 126: 343-348.
14. Barkley R (2006) A theory of ADHD. In: Barkley R, editor. Attention-Deficit Hyperactivity Disorder, (3rd edn.) New York: The Guilford Press.
15. Retz W, Stieglitz RD, Corbisiero S, Retz-Junginger P, Rösler M (2012) Emotional dysregulation in adult ADHD: What is the empirical evidence? Expert Rev Neurother 12: 1241-1251.
16. Loeber R (1990) Development and risk factors of juvenile antisocial behavior and delinquency. Clin Psychol Rev 10: 1-41.
17. Moffitt TE (1990) The neuropsychology of delinquency: A critical review of theory and research. Crime Justice 12: 99-169.
18. Pratt TC, Cullen FT (2000) The empirical Status of Gottfredson and Hirschi's General Theory of Crime: A Meta-Analysis. Criminology 38: 931.
19. Babinski LM, Hartsough CS, Lambert NM (1999) Childhood conduct problems, hyperactivity-impulsivity, and inattention as predictors of adult criminal activity. J Child Psychol. Psychiatry 40: 347-355.
20. Colledge E, Blair R (2001) The relationship in children between the inattention and impulsivity components of attention deficit and hyperactivity disorder and psychopathic tendencies. Pers Individ Dif 30: 1175-1187.
21. Gudjonsson GH, Sigurdsson JF, Sigfusdottir ID, Young S (2014) A national epidemiological study of offending and its relationship with ADHD symptoms and associated risk factors. J Atten Disord 18: 3-13.
22. Satterfield JH, Faller KJ, Crinella FM, Schell AM, Swanson JM, et al. (2007) A 30-year prospective follow-up study of hyperactive boys with conduct problems: adult criminality. J Am Acad Child Adolesc Psychiatry 46: 601-610.
23. Unnever JD, Cullen FT, Pratt TC (2003) Parental management, ADHD, and delinquent involvement: Reassessing Gottfredson and Hirschi's general theory. Justice Quarterly 20: 471-500.
24. Verdejo-García A, Lawrence AJ, Clark L (2008) Impulsivity as a vulnerability marker for substance-use disorders: review of findings from high-risk research, problem gamblers and genetic association studies. Neurosci Biobehav Rev 32: 777-810.
25. Sonuga-Barke EJ (2003) The dual pathway model of AD/HD: an elaboration of neuro-developmental characteristics. Neurosci Biobehav Rev 27: 593-604.
26. Mears DP, Cochran JC (2013) What is the effect of IQ on offending? Crim Justice Behav 40: 1280-1300.
27. Lynam DR (1996) Early identification of chronic offenders: who is the fledgling psychopath? Psychol Bull 120: 209-234.
28. Sibley MH, Pelham WE, Molina BS, Gnagy EM, Waschbusch DA, et al. (2011) The delinquency outcomes of boys with ADHD with and without comorbidity. J Abnorm Child Psychol 39: 21-32.
29. Biederman J, Wilens T, Mick E, Faraone SV, Weber W, et al. (1997) Is ADHD a risk factor for psychoactive substance use disorders? Findings from a four-year prospective follow-up study. J Am Acad Child Adolesc Psychiatry 36: 21-29.
30. Retz W, Rösler M (2009) The relation of ADHD and violent aggression: What can we learn from epidemiological and genetic studies? Int J Law Psychiatry 32: 235-243.
31. Young S, Misch P, Collins P, Gudjonsson G (2011) Predictors of institutional behavioural disturbance and offending in the community among young offenders. Journal Forensic Psychiatry Psychol 22: 72-86.
32. Mannuzza S, Klein RG, Bessler A, Malloy P, LaPadula M (1993) Adult outcome of hyperactive boys. Educational achievement, occupational rank, and psychiatric status. Arch Gen Psychiatry 50: 565-576.
33. Young S, Sedgwick O, Fridman M, Gudjonsson G, Hodgkins P, et al. (2015) Co-morbid psychiatric disorders among incarcerated ADHD populations: a meta-analysis. Psychol Med 45: 2499-2510.
34. De Sanctis VA, Nomura Y, Newcorn JH, Halperin JM (2012) Childhood maltreatment and conduct disorder: Independent predictors of criminal outcomes in ADHD youth. Child Abuse Negl 36: 782-789.
35. Farrington DP, Ttofi MM, Coid JW (2009) Development of adolescence-limited, late-onset, and persistent offenders from age 8 to age 48. Aggress Behav 35: 150-163.
36. Mannuzza S, Klein RG, Moulton JL (2008) Lifetime criminality among boys with attention deficit hyperactivity disorder: a prospective follow-up study into adulthood using official arrest records. Psychiatry Res 160: 237-246.
37. Mordre M, Groholt B, Kjelsberg E, Sandstad B, Myhre AM (2011) The impact of ADHD and conduct disorder in childhood on adult delinquency: A 30 years follow-up study using official crime records. BMC Psychiatry 11: 57.
38. Gudjonsson GH, Sigurdsson JF, Adalsteinsson TF, Young S (2012) The relationship between ADHD symptoms, mood instability, and self-reported offending. J Atten Disord 17: 339-346.
39. Fergusson DM, Lynskey MT, Horwood LJ (1997) Attentional difficulties in middle childhood and psychosocial outcomes in young adulthood. J Child Psychol Psychiatry 38: 633-644.
40. Sourander A, Jensen P, Davies M, Niemelä S, Elonheimo H, et al. (2007) Who is at greatest risk of adverse long-term outcomes? The Finnish From a Boy to a Man study. J Am Acad Child Adolesc Psychiatry 46: 1148-1161.
41. Bramham J, Murphy D, Xenitidis K, Asherson P, Hopkin G, et al. (2012) Adults with attention deficit hyperactivity disorder: an investigation of age-related differences in behavioural symptoms, neuropsychological function and co-morbidity. Psychol Med 42: 2225-2234.
42. Cairns E, Cammock T (1978) Development of a more reliable version of the Matching Familiar Figures Test. Dev Psychol 14: 555.
43. Robertson IH, Ward T, Ridgeway V, Nimmo-Smith I (1994) The test of everyday attention: TEA: Thames Valley Test Company Bury St. Edmunds, UK.
44. Wechsler D (1999) Wechsler Abbreviated Scale of Intelligence (WASI) San Antonio, TX: Harcourt Assessment.
45. Ryan JJ, Brown KI (2005) Enhancing the clinical utility of the WASI: Reliabilities of discrepancy scores and supplemental tables for profile analysis. J Psychoeduc Assess 23: 140-145.
46. Barkley RA, Murphy KR (1998) Attention-deficit hyperactivity disorder: A clinical workbook: Guilford Press.
47. IBM Corporation (2011) IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.
48. Graham JW (2009) Missing data analysis: making it work in the real world. Annu Rev Psychol 60: 549-576.
49. Graham JW, Olchowski AE, Gilreath TD (2007) How many imputations are really needed? Some practical clarifications of multiple imputation theory. Prev Sci 8: 206-213.
50. Hardt J, Herke M, Leonhart R (2012) Auxiliary variables in multiple imputation in regression with missing X: a warning against including too many in small sample research. BMC Med Res Methodol 12: 184.
51. Hirschi T, Hindelang MJ (1977) Intelligence and delinquency: a revisionist review. Am Sociol Rev 42: 571-587.
52. Wilson J, Herrnstein R (1985) Crime and human nature. New York: Simon & Schuster.
53. Lynam DR, Miller DJ, Vachon D, Loeber R, Stouthamer-Loeber M (2009) Psychopathy in adolescence predicts official reports of offending in adulthood. Youth Violence Juv Justice 7: 189-207.
54. Lynam D, Moffitt T, Stouthamer-Loeber M (1993) Explaining the relation

between IQ and delinquency: Class, race, test motivation, school failure, or self-control? J Abnorm Psychol 102: 187.

55. Cauffman E, Steinberg L, Piquero AR (2005) Psychological, neuropsychological and physiological correlates of serious antisocial behavior in adolescence: The role of self-control. Criminol 43: 133.

56. Meier NM, Perrig W, Koenig T (2012) Neurophysiological correlates of delinquent behaviour in adult subjects with ADHD. Int J Psychophysiol 84: 1-16.

57. Gottfredson M, Hirschi T (1990) A general theory of crime. Stanford: Stanford University Press.

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