The role of emotional distress and ADHD on institutional behavioural disturbance and recidivism among offenders

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Introduction

Research has shown that rates of psychopathology are over-represented among prisoners. Findings from the Bureau of Justice Statistics demonstrate that half of US prison inmates suffer from a mental health disorder (James & Glaze, 2006). A meta-analysis of 109 samples including 33,588 prisoners in 24 countries spanning four decades found that high levels of psychiatric morbidity are consistently reported in prisoners (Fazel & Seewald, 2012). This may be partly explained by the closure of psychiatric hospitals and high rates of substance misuse (i.e., dual diagnosis) in offenders (Baillargeon, Binswanger, Penn, Williams, & Murray, 2009).

International studies have also reported high rates of attention deficit hyperactivity disorder (ADHD) in prison settings (Gonzalez, Velez-Pastrana, Ruiz Varcancel, Levin, & Albizu-Garcia, 2012; Young et al., 2011; Young, Wells, & Gudjonsson, 2011). ADHD is a neurodevelopmental disorder with early childhood onset that persists into adulthood in 40-60% of cases (Faraone, Biederman, & Mick, 2006). It is characterized by patterns of disabling emotional and behavioral symptoms, as well as cognitive deficits of attention and impulsivity (American Psychiatric Association, 2000) and poor coping strategies (Young, 2005; Young, Chadwick, Heptinstall, Taylor, & Sonuga-Barke, 2005). The worldwide pooled prevalence of adult ADHD is 2.5% (Simon, Czobor, Balint, Meszaros, & Bitter, 2009), but estimates in prison samples consistently report significantly higher rates of ADHD in correctional settings compared with community samples, with screening methods revealing approximately 45% for male youth offenders (Retz et al., 2004; Rosler

et al., 2004), 30% for adult offenders (Einarsson, Sigurdsson, Gudjonsson, Newton, & Bragason, 2009; Gudjonsson, Sigurdsson, Young, Newton, & Peersen, 2009; Young et al., 2009) and 10% for female adult offenders (Edvinsson, Bingeors, Lindstrom, & Lewander, 2010; Rosler, Retz, Yaqoobi, Burg, & Retz-Junginger, 2009). Recent estimates based on standard DSM-IV criteria range from 10.5% to 16% (Cahill et al., 2012; Coolidge, Segal, Klebe, Cahill, & Whitcomb, 2009).

With the caveat that some studies have used self-rating scales to attain diagnostic classification, all reports consistently report significantly higher rates of ADHD in correctional settings compared with the community. Moreover, offenders with ADHD are more likely to have higher rates of co-occurring psychiatric disorders and greater impairment including mood and anxiety disorders (Einarsson, et al., 2009; Rosler, et al., 2009), personality disorders (Einarsson, et al., 2009; Gudjonsson, Wells, & Young, 2010) and substance misuse (Ginsberg, Hirvikoski, & Lindefors, 2010; Gonzalez, et al., 2012; Gudjonsson, Wells, & Young, 2011; Rosler, et al., 2009; Young, Wells, et al., 2011).

Aside from clinical comorbidity, ADHD has also been associated with criminogenic issues and with difficulties engaging with the criminal justice system. There is evidence that ADHD may play a role in the motivation for offending (Gudjonsson, et al., 2011), that it has implications for the manner of responding to police questioning (Gudjonsson, Young, & Bramham, 2007), with a higher probability of giving a false confession (Gudjonsson, Sigurdsson, Bragason, Newton, & Einarsson, 2008; Gudjonsson, Sigurdsson, Sigurdottis, &

Young, 2012b), and with increased likelihood for engaging in critical incidents and aggression within institutional settings and recidivism (Young, et al., 2009; Young, Wells, et al., 2011).

Behavioural disturbances are a common occurrence within correctional setting and misconduct often leads to adjudications or further convictions that, in turn, prevent early release or extend the prison tariff. In spite of these important consequences, factors that lead prisoners to engage in these incidents have received little attention in the literature (Gudjonsson & Young, 2011). A previous study by our group (Young et al., 2009) found that persisting ADHD symptoms predicted verbal and physical aggression and total frequency of critical incidents in prison. The findings held when controlling for the influence of antisocial personality (ASP) traits, suggesting that these incidents are more likely to be driven by the impulsivity and lack of emotional/behavioural regulation characteristics of ADHD symptomatology. Similar findings have also been reported in young offenders (Young, Misch, Collins & Gudjonsson, 2011) and in mentally disordered offenders (Young, Gudjonsson, Ball, & Lam, 2003; Young, Misch, Collins, & Gudjonsson, 2011).

It is becoming increasingly recognized that ADHD is associated with core deficits in emotion regulation (Barkley, 2001; Barkley & Fischer, 2010; Martel, 2009), suggesting that existing psychopathology and/or associated emotional distress may underlie behavioural

outbursts. Furthermore core ADHD symptoms, such as a difficulty delaying gratification and disinhibition, may make incarceration particularly demanding for these individuals who have a compromised ability to regulate their emotions. Retz and Rösler (2009) have outlined a model that differentiates between *reactive-affective* and *proactive* types of delinquent and violent behaviors in offenders with ADHD. In this model, reactive-affective violence is characterized by unplanned, spontaneous acts, and driven by impulsivity and emotion. Proactive offences, by contrast, are exemplified by premeditated acts that are most associated with antisocial tendencies (Retz & Rosler, 2009). Supporting this view, these authors reported a strong association between ADHD and reactive violent aggression in a small inmate sample ($n = 66$), while proactive violence (i.e. instrumental violence) lacked any association with ADHD. This is consistent with the assertion that, in people with ADHD, offending is likely associated with poor emotional regulation (Gudjonsson, Sigurdsson, Adalsteinsson, & Young, 2012; Gudjonsson, et al., 2009). This may also explain 'reactive' antisocial behaviour in the community which, in turn, lead to higher rates of recidivism (Retz & Rosler, 2009).

The present study aimed to build on previous research by examining the role of emotional distress and ADHD symptomatology in explaining behavioural disturbances in prison (more likely to be reactive), and type of offending. First, we specifically set out to investigate the relative contributions of emotional distress and ADHD symptoms to prison records of behavioural disturbance and recidivism by developing a model to test whether there is an incremental effect of both beyond that of ASP traits. In addition, we aimed to

test the relative contribution of emotional distress and ADHD symptoms beyond the effect of ASP traits separately for violent and non-violent type of offences.

Aims of the study

The study hypotheses are:

- i. Offenders with ADHD symptoms would report elevated rates of psychopathology compared with their peers as measured by the subscales of the *Symptom Checklist-90 (SCL-90)* (Derogatis, 2000; Derogatis, Lipman, & Covi, 1973).
- ii. Emotional distress and ADHD symptoms would explain behavioural disturbance in prison and recidivism above and beyond ASP traits.
- iii. Emotional distress and ADHD symptoms would explain offending behaviour more likely to represent reactive (i.e., violent and sexual offences), in contrast to non-violent offences (e.g., acquisitive).

Method

Participants

A total of 196 male prisoners from Aberdeen prison consented to participate. Mean age was 30.0 (s.d. 8.2). The sample was predominantly white, with an ethnic composition of 184 (94.8%) white Europeans, 6 (3.1%) Black African/Caribbean and 4 (2.1%) from other ethnicity. Inmates were excluded from participating in the study if they had served less than three months of their current sentence, if they were acutely physically or mentally unwell and/or posed a risk to researchers. The index offences were acquisitive ($n = 63$, 32%), violent ($n = 50$, 25%), traffic violations ($n = 47$, 24%), drugs ($n = 23$, 12%), arson ($n = 3$, 1%), sex ($n = 2$, 1%), and other ($n = 10$, 5%). Nearly all of the prisoners (192; 92%) had one or more previous convictions.

Participants were classified into two groups based on their self-ratings on the Diagnostic and Statistical Manual-IV Checklist of Symptoms (DCS) (American Psychiatric Association, 1994) as follows:

ADHD group: This group consisted of individuals who were presenting with persisting ADHD symptoms, i.e. those with 'syndromatic' persistence who continued to meet full ADHD diagnostic criteria, and those with 'symptomatic' persistence who were sub-threshold of the full criteria and classified to be in partial remission. Classification for the 'syndromatic' category required six or more inattentive items or six or more hyperactive/impulsive items (both rated as 'often') to be present in childhood on the ADHD DCS Childhood Symptom Scale (see measures below). In addition, for those

meeting this childhood criteria, participants were required to meet the same criteria on the ADHD DCS Current Symptom Scale. Participants in partial remission of their symptoms were classified by meeting the childhood ADHD criteria described above, plus a total score of ≥ 17 for symptoms in the last 6 months on the DCS Current Symptom Scale. A score of 17 represents one standard deviation above the mean score obtained by a normal population (Young & Gudjonsson, 2008).

Non-ADHD group: This group consisted of individuals who were not presenting with persisting ADHD symptoms. Hence classification for this category was all those who either did not meet the ADHD criteria in childhood described above or who were classified as being in full remission of their ADHD symptoms. The full remission category was categorised by participants who met the criteria for ADHD in childhood but who obtained a total score of <17 on the ADHD DCS Current Symptom Scale.

Measures

Diagnostic and Statistical Manual-IV Checklist of Symptoms (DCS) (American Psychiatric Association, 1994) - the DCS is an 18 item self-rating scale relating to ADHD symptoms that directly corresponds with DSM-IV criteria. Nine items each relate to dimensions of attention and hyperactivity/impulsivity respectively and are scored on a 3-point rating scale (0=never, 1=sometimes, 2=often). Participants completed the questionnaire twice, once self-reporting symptoms in childhood (DCS Childhood Symptom Scale) and again reporting current symptoms in the last 6 months (DCS Current Symptom Scale). In the

present study, the DCS childhood and current scores were summed and used as a continuous trait dimension for correlation and regression analysis.

Symptom Checklist-90 (SCL-90)(Derogatis, 2000; Derogatis, et al., 1973) - the SCL-90 is comprised of 90 self-rated items enquiring about symptoms experienced over the past week and rated on a five-point scale. It provides nine psychopathology symptom subscales: Somatization, Obsessive/Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation and Psychoticism. In addition there are three global indices of distress associated with the SCL-90: (1) the Global Severity Index (GSI), which combines information concerning the number of symptoms reported with the intensity of perceived distress; (2) the Positive Symptom Distress Index (PSDI) which reflects the average level of distress reported for the symptoms that were endorsed (our outcome measure of emotional distress), and (3) the Positive Symptom Total (PST) which measures frequency of symptoms endorsed by the respondent regardless of the level of distress reported. In the present study the SCL-90 PSDI was used as the index of emotional distress. Alpha reliability for the SCL subscales has varied between .77-.91 (Derogatis, Rickels, & Roch, 1976).

The Millon Clinical Multiaxial Inventory – III (MCMI-III)(Millon, 1997) – the MCMI-III is a 175-item true-false inventory comprised of 24 scales derived from Millon's Theory of Personality that parallel the DSM-III and DSM-IV Axis I and II diagnostic categories. The 24 scales are grouped into categories of enduring personality characteristics (Axis II) and psychopathology (Axis I; Clinical Syndromes) and the findings of this data are reported elsewhere (Gudjonsson, Wells, & Young, 2012; Young, Wells, et al., 2011). In the present

study only the Axis II antisocial personality scale (referred to in this paper as 'ASP traits') was used.

Behavioural disturbances in prison were measured by the prison wing record of critical incidents over the previous three months. In the present study we calculated the total sum of critical incidents. These included events of verbal aggression, physical aggression, property damage, self-injury and arson.

Criminal recidivism was operationalized as the total number of previous convictions obtained from official criminal records at the prison. 'Violent/Sexual' offences were scaled as the total sum of these types of offences per participant. 'Non-violent' offences were the sum of acquisitive, traffic and drug offences per participant included in the study.

Procedure

Participants were recruited from a Scottish prison over three years. All prospective participants were given detailed information about the nature and purpose of the study. Written consent was obtained from all participants. Data was collected by research assistants who were fully trained on all aspects of the use, administration and scoring of all questionnaires and procedures. Participants completed a battery of self-rated questionnaires and when necessary poor readers were given assistance but this did not include interpretation of test items or advice on how to answer the questions. Critical incidents were obtained from prison wing records for the three months prior to the date of assessment. Socio-demographic information and history of prior convictions was collected from the prison records.

Statistical analyses

Independent mean t tests contrasts were performed to compare the participants with and without ADHD on all SCL-90 subscales. Contrasts for total previous convictions and critical incidents rates between groups were performed using non-parametric Mann-Whitney U tests. The effect size was analysed using Cohen's d . Pearson r correlations were performed for all SCL-90 subscales and DCS childhood and current ADHD total score.

Hierarchical multiple regression models were developed to test the direct associations of current ADHD symptoms and emotional distress with number of behavioural disturbances in prison, number of previous incarcerations (recidivism), violent and non-violent offences. Separate models were tested for each forensic outcome in four blocks following the same order: age (block 1), a continuous measure of ASP traits (MCMI-III, block 2), emotional distress (SCL-90 PSDI, block 3), and current ADHD symptoms (DCS total score, block 4).

To test the potential Effect-Modification between ADHD symptoms and emotional distress, we repeated all the regressions by adding an ADHD by emotional distress interaction in Block 5. Additional interaction effects by ASP traits were also explored in all adjusted models. There was no evidence for such moderation effects, therefore, we only provide data in the tables with regard to the first four blocks.

Results

Current emotional distress and comorbid psychopathology

Out of the total sample, 27 (14%) met the screening criteria for ADHD (see Table 1).

Compared to the non-ADHD group, ADHD participants had significantly greater psychopathology on all SCL-90 subscales with mainly large effect sizes. Current ADHD symptoms correlated most highly with SCL-90 GSI, PST and Obsessive/Compulsive subscales.

<Insert Table 1 about here>

Institutional behavioural disturbance in prison and recidivism

Differences in total recidivism and critical incidents rates between the ADHD and non-ADHD groups were tested by non-parametric Mann-Whitney U tests. Recidivism based on criminal arrest records were significantly lower amongst non-ADHD participants ($z = -2.1$, $p < .036$). Total incidents of behavioural disturbance were also significantly lower in the non-ADHD group ($z = -3.9$, $p < .001$).

Table 2 includes the correlations between the variables used in all multiple regressions of this study. Most of these variables are significant, with some exceptions (ASP and both categories of offences with SCL-90 PSDI). Emotional distress and current ADHD symptoms are significantly and moderately related ($r = .307$, $P < .001$). Both are significantly correlated with critical incidents, but the effect sizes are medium for ADHD and low for emotional distress.

<Insert Table 2 about here>

We employed independent hierarchical multiple regression models to test the hypothesis that both emotional distress and current ADHD symptoms would explain behavioural disturbance in prison, recidivism, violent and non-violent offending, above and beyond ASP traits. All models were developed using the same predictors in the same fashion: Block 1 for participants' age, Block 2 a continuous measure of ASP traits, Block 3 for emotional distress, and Block 4 for current ADHD symptoms.

<Insert Table 3 about here>

Table 3 shows that in regard to behavioural disturbance (critical incidents), both emotional distress and ADHD current symptoms explained their variance above and beyond age and ASDP traits, adding 3.8% and 6.4% to the variance in Blocks 3 and 4, respectively (a total of 10.2% incremental contribution). Entering ADHD current symptoms in Block 4 showed that much of the effect of emotional distress is mediated by ADHD symptoms. Judging by the β values on the last block, the larger effects on the outcome variable (critical incidents) were ADHD symptoms ($\beta = 0.04$) and emotional distress ($\beta = 0.01$).

<Insert Table 4 about here>

With regard to total recidivism (Table 4), current ADHD symptoms explained the variance in recidivism beyond age and ASDP when introduced in the last block (Block 4 $\Delta R^2 = 2.8\%$). Emotional distress only showed a modest association (two-tailed, $p < .10$) on this model.

Entering ADHD current symptoms in Block 4 decreased the effect of emotional distress on the model. Judging by the β values, the larger effects on the outcome variable (recidivism) were age ($\beta = -0.02$), ASP traits ($\beta = 0.01$), and ADHD symptoms ($\beta = 0.03$).

Violent and non-violent offences

Out of the four predictors, only current ADHD symptoms added significantly to the variance in violent offences, but this only explained 3.9% (Table 5; $\beta = 0.03$).

<Insert Table 5 about here>

With regard to non-violent offences, following a similar tendency as the model for recidivism, emotional distress also showed a significant trend (two-tailed, $p < .10$) in the criterion variable beyond age and **ASP**. In Block 3, emotional distress added 1.7% to the overall variance, which combined with the effects of age and ASP explained a total of 13.0% of the model variance. However, entering ADHD current symptoms in Block 4 mediated the mild effect of emotional distress on this offence category.

ADHD, depression/anxiety and forensic outcomes

In view of the high correlation indices (> 0.50) between current ADHD symptoms and SCL-90 subscales of anxiety and depression, and that both are conceptually linked to emotional distress, we performed unplanned separate models in order to assess their contribution to all forensic outcomes: behavioural disturbance, recidivism, violent and non-violent crimes. All models were adjusted for age and antisocial personality traits, and included ADHD current symptoms and either anxiety or depression simultaneously

to assess their direct contribution to the outcomes. The results of these analyses are in Supplementary Table 1. Current ADHD was significantly ($p < 0.05$) associated with all forensic outcomes but either anxiety or depression symptoms were significant on these adjusted models.

Discussion

Two out of three hypotheses were supported. First, offenders with ADHD symptoms reported elevated rates of psychopathology compared with their peers (i.e., other prisoners) as measured by the SCL-90 with mostly large effect sizes across the subscales. Secondly, both emotional distress and ADHD symptoms explained behavioural disturbance in prison and recidivism beyond ASP traits, but the effects were considerably stronger for critical incidents than recidivism. However, contrary to expectations, ADHD symptoms were associated with *both* types of offences, violent and non-violent. Only the finding that current ADHD symptoms are more strongly associated with behavioural disturbances, including violence in prison is indicative of greater likelihood of reactive (i.e., impulsive) offending.

Taken together, the present findings provide some support for the conceptual distinction between reactive and premeditated/instrumental violence, with the former being more likely observed amongst offenders with ADHD. In their model, Retz and Rösler (Retz & Rosler, 2009) argued that reactive (i.e., impulsive) violence is most consistent with ADHD symptomatology, as opposed to instrumental and premeditated violence, which is usually typical among offenders with ASPD. ADHD is better at predicting critical incidents in prison than general recidivism after controlling for age and ASPD. Not dissimilar from our findings, in a 13-year follow up study (Barkley, Fischer, Smallish, & Fletcher, 2004), child hyperactivity was related to offending in young adults, but there was an absence of association with what the authors designated as *predatory-overt* offending (e.g., theft, antisocial behaviour). As in the present study, Gudjonsson et al. (Gudjonsson, Sigurdsson,

Sigurdottis, & Young, 2012c) recently found that both ADHD symptoms and emotional factors similarly explained violent versus non-violent offences. This was a large community based epidemiological survey of minor self-reported violent and non-violent offending. In contrast, our current report relies on the official record of actual criminal offences, which may explain the somewhat more robust findings included here. In this context, we report important and innovative results and provide initial evidence of a specific pathway of ADHD symptomatology relating to reactive violence as measured by critical incidents within prison. Paired with the significant association with recidivism, this proves to be a valuable contribution to knowledge in the field of forensic psychology and psychiatry and sets the stage for promising research avenues. Nevertheless, future studies should employ a more comprehensive approach to classification of types of offending.

The ADHD group had greater psychopathology as assessed by the SCL-90. This is supported by a wealth of literature that indicates that adults with ADHD are at an increased risk for suffering from comorbid mental health disorders (Biederman, Faraone, Mick, & Lelon, 1995; Biederman et al., 2006; Gonzalez, et al., 2012; Kessler et al., 2006; Levin et al., 2004; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993; Young, Toone, & Tyson, 2003). Among the clinical syndromes included in the SCL-90 subscales, the obsessional/compulsive subscale revealed the highest correlation with ratings of current ADHD symptoms. Whilst this seems to differ from our previous finding that the MCMI-III Axis II compulsive subscale has an inverse relationship with ADHD symptoms (Gudjonsson, Wells, et al., 2012), the discrepancy most likely reflects that the low score obtained on the MCMI-III Compulsive subscale is an indicator of disorganized personality. In contrast, the

SCL-90 obsessive/compulsive subscale evaluates the presence of clinical symptoms. This is an important distinction, which has not been previously addressed in the literature, which could potentially be explained by ADHD comorbidity with autistic spectrum disorders. **The SCL-90 anxiety and depression subscales were also highly correlated with current ADHD, however testing their direct effects reveal it's the comorbid ADHD symptoms driving the associations with all forensic outcomes studied.**

The significant group differences and large effect found for the SCL-90 global indices (GSI, PSDI and PST) indicate that the ADHD offenders have a propensity to endorse more symptoms and more emotional distress than their peers. This suggests both frequency and intensity of clinical symptoms and this seems to be expressed by them in the form of emotional outbursts within the institution that lead to critical incidents. The risk of depression and suicide is high within prison settings, especially in the first few days, and young people with ADHD may be at greater risk of acting out on the impulse to self-harm and/or to act violently towards others. These behaviours will almost certainly lead to institutional sanctions, which may include adjudications and criminal convictions acquired whilst serving the current tariff. In turn this is likely to make early parole less likely and in some cases extend their sentence.

Emotional distress and current ADHD symptoms had an incremental effect over antisocial personality disorder traits, with ADHD symptoms being a more powerful predictor both with regard to behavioural disturbance and general recidivism. Longitudinal prospective studies have shown that repeated offending often forms part of a life-long pattern of unlawful behaviour, with onset in early adolescence for ADHD youths. In their 26 year

follow-up study, (Gudjonsson *et al.*, 2012e) found significantly more recidivist cases in a sample previously diagnosed with ADHD during childhood. Specifically from the total cohort of original cases, among those who had been arrested, 75% of adults with a history of ADHD had been arrested more than once compared with 36% of non-ADHD probands.

The present study also indicated the strong contribution of ASP in recidivism, which is in line with studies that have attempted to distinguish between the contribution of ADHD symptoms and conduct disorder (CD) to repeat offending using a cross-sectional cohort (Gudjonsson, Sigurdsson, Sigfurdottis, et al., 2012c; Gudjonsson, Wells, et al., 2012) and prospective longitudinal methodology (Young, Taylor, & Gudjonsson, submitted). Others have recently found an association between multiple incarcerations and suffering psychiatric illness, with an incremental effect of multiple comorbidities (Baillargeon, et al., 2009).

A useful framework to contextualize these findings is that of self-regulation and ADHD. When conceptualized as a disorder of the executive functions, ADHD symptoms arise through developmental stages as a failure to form adequate controls, such as inhibiting automated responses or regulate and direct attention (Barkley, 1997, 2001). It has been argued that emotional dysregulation may play a role in disruptive and disorganization central to ADHD (Barkley, 2001; Barkley & Fischer, 2010; Martel, 2009; Martel, Nigg, & von Eye, 2009). This is consistent with other findings that have linked ADHD to mood dysregulation (Asherson, 2005), and to Borderline Personality (Gudjonsson, Wells, et al., 2012; Philipsen et al., 2008), a disorder characterized by emotional turmoil and

disorganization. This is also consistent with the relationship between ADHD and vulnerability to violent offending.

The greatest limitation of the study is that ADHD classification was based on a self-reported symptom rating scale that is likely to have included some false positive identifications. However these followed DSM-IV symptom criteria requiring frequent endorsement of symptoms both in childhood and adulthood. Second, the sample was all male and predominantly white-European. A particular strength of the study is that behavioural measures were obtained from prison data recorded and kept on prison wings and previous convictions were obtained from official records.

What is most striking is that none of the participants in the study had a diagnosis of ADHD or were receiving treatment and the under-recognition of ADHD in offending populations is increasingly becoming recognised. Nevertheless this means that there are individuals who are not receiving the appropriate treatment and/or rehabilitation. Indeed, pharmacological treatment is likely to substantially increase the likelihood that they will meaningfully engage in rehabilitation programs, education, and occupational and social activities. A large treatment effect has been reported for treating offenders with ADHD medication (Ginsberg, Hirvikoski, Grann, & Lindefors, 2012) or with cognitive-behavioral therapy (CBT) (Young *et al.*, 2012). Psychiatrists remain circumspect about the treatment of young people in prisons with stimulant medication, mainly due to the high rates of substance misuse reported in this population (Ginsberg, et al., 2012; Young, Wells, et al., 2011). Nevertheless, many young people may have been self-medicating with illicit substances (Gudjonsson, Sigurdsson, Sigfurdottis, & Young, 2012a) and in non-offending

populations treatment with stimulant medication has not increased misuse of substances.

Indeed, some studies have found support for a protective effect with a reduction in substance use (Biederman, 2003; Wilens, Faraone, Biederman, & Gunawardene, 2003).

Importantly, Ginsberg et al. (2012), whose sample had a history of substance misuse, reported that there was no abuse of substances during their period of study (tested by regular urine samples). The greatest treatment effect seems to be achieved by the provision of multimodal treatments, including psychological treatments that have been specifically developed for youths and adults with ADHD and antisocial behaviour (Emilsson *et al.*, 2011). Hopefully these findings will increase the confidence of forensic psychiatry to treat adults with ADHD in prison settings.

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Susan Young obtained a doctorate in clinical psychology from University College London in 1999 and a PhD in psychology from King's College, University of London, in 1999. She is a senior lecturer in forensic clinical psychology at the Institute of Psychiatry, King's College, London. Her main research interests are in the areas of neurodevelopmental disorder, ADHD, and forensic psychology. She was a member of the National Institute for Health and Clinical Excellence (NICE) ADHD Clinical Practice Guideline Development Group (2009) and is Vice President of the UK Adult ADHD Network (www.UKAAN.org).

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Table 1: Mean comparison on SCL-90 scales and their correlations with child and adult ADHD symptoms

SCL-90 scales	No ADHD (n = 169)	ADHD (n = 27)	<i>t</i>	Cohen's <i>d</i>	Pearson <i>r</i> (n = 196)	
	M (SD)	M (SD)			Child ADHD	Current ADHD
Somatization	57.0 (13.3)	66.5 (11.6)	-3.51**	0.76	0.224**	0.420***
Obsessive/Compulsive	57.5 (12.4)	69.0 (10.9)	-4.55***	0.99	0.363***	0.556***
Interpersonal Sensitivity	55.7 (12.6)	66.8 (12.5)	-4.22***	0.88	0.355***	0.496***
Depression	58.7 (13.4)	69.9 (12.8)	-4.04***	0.85	0.352***	0.527***
Anxiety	54.9 (14.4)	69.0 (11.6)	-4.84***	1.1	0.314***	0.501***
Hostility	55.8 (12.2)	64.6 (13.3)	-3.46**	0.69	0.364***	0.406***
Phobic Anxiety	54.1 (10.1)	65.0 (12.4)	-5.02***	0.96	0.258***	0.513***
Paranoid Ideation	55.2 (11.3)	64.4 (13.2)	-3.84***	0.75	0.291***	0.419***
Psychoticism	56.6 (11.2)	67.6 (12.5)	-4.62***	0.92	0.321***	0.489***
Global Severity Index (GSI)	59.0 (13.3)	70.8 (12.0)	-4.33***	0.93	0.354***	0.533***
Positive Symptom Total (PST)	57.0 (12.3)	66.7 (8.8)	-3.94***	0.91	0.390***	0.545***
Positive Symptom Distress Index (PSDI)	58.8 (10.6)	67.6 (11.1)	-3.99***	0.81	0.147*	0.307***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 2. Bivariate correlations (*r*) between all key variables: age, ASP, emotional distress, current ADHD symptoms, behavioural disturbance, recidivism and 'violent' and 'non-violent' offences

	ASP traits	Emotional Distress (PSDI)	ADHD Symptoms (adult)	behavioural disturbance	Recidivism	Violent offences	Non- violent offences
Age	-0.276***	-0.014	-0.182*	-0.141*	-0.259***	-0.101	-0.261***
ASP traits	-	0.060	0.268***	0.149*	0.276***	0.106	0.276***
Emotional distress (PSDI)		-	0.307***	0.190**	0.121 [†]	0.096	0.118
ADHD symptoms			-	0.342***	0.288***	0.246***	0.279***
behavioural disturbance				-	0.220**	0.116	0.219**
Recidivism					-	0.514***	0.998***
Violent offences						-	0.453***
Non-violent offences							-

[†] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$

Note: ASP = Antisocial Personality, PSDI = Positive Symptom Distress Index

Table 3. Summary of Multiple Regression analysis for behavioural disturbances in prison

	Block 1	Block 2	Block 3	Block 4
Predictors	β /t-values	β /t-values	β /t-values	β /t-values
Age	-0.02/-1.98*	-0.01/-1.47	-0.01/-1.41	-0.01/-1.02
ASP traits	-	0.01/1.61	0.01/1.83 [†]	0.00/0.83
PSDI (SCL- 90)	-	-	0.02/2.82**	0.01/1.49
ADHD adult total score	-	-	-	0.04/3.75***
F value	3.93*	3.29*	4.91**	7.45***
R ²	0.020	0.033	0.071	0.135

Note: ASP = Antisocial Personality, PSDI = Positive Symptom Distress Index

Block 2 $\Delta R^2 = 0.013$, ns.; Block 3 $\Delta R^2 = 0.038$, $p < 0.01$; Block 4 $\Delta R^2 = 0.064$, $p < 0.001$

[†] $p < 0.10$, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 4. Summary of Multiple Regression analysis for recidivism

	Block 1	Block 2	Block 3	Block 4
Predictors	β /t-values	β /t-values	β /t-values	β /t-values
Age	-0.03/-3.74***	-0.02/-2.81**	-0.02/-2.77**	-0.02/-2.51*
ASP traits	-	0.01/3.13**	0.01/3.28**	0.01/2.54*
PSDI (SCL- 90)	-	-	0.01/1.97 ⁺	0.01/1.04
ADHD adult total score	-	-	-	0.03/2.51*
F value	14.00***	12.22***	9.56***	8.94***
R ²	0.067	0.112	0.130	0.158

Note: ASP = Antisocial Personality, PSDI = Positive Symptom Distress Index

Block 2 $\Delta R^2 = 0.045$, $p < 0.01$; Block 3 $\Delta R^2 = 0.018$, $p = 0.051$; Block 4 $\Delta R^2 = 0.028$, $p < .05$

⁺ $p < 0.10$, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 5. Summary of Multiple Regression analyses for total number of violent and non-violent offences

	Block 1	Block 2	Block 3	Block 4
	β /t-values	β /t-values	β /t-values	β /t-values
<i>Model 1: violent offences</i>				
Age	-0.01/-1.42	-0.01/-1.05	-0.01/-1.01	-0.01/-0.70
MCMII-III ASP	-	0.00/1.14	0.01/1.23	0.00/0.47
PSDI (SCL-90)	-	-	0.01/1.40	0.00/0.40
ADHD adult total score	-	-	-	0.03/2.82**
F value	2.01	1.66	1.77	3.36*
R ²	0.010	0.017	0.027	0.066
<i>Model 2: non-violent offences</i>				
Age	-0.03/-3.77***	-0.02/-2.84**	-0.02/-2.80**	-0.02/-2.55*
MCMII-III ASP	-	0.01/3.14**	0.01/3.28**	0.01/2.57*
PSDI (SCL-90)	-	-	0.01/1.91 [†]	0.01/1.02
ADHD adult total score	-	-	-	0.03/2.37*
F value	14.21***	12.35***	9.56***	8.75***
R ²	0.068	0.113	0.130	0.155

Note: ASP = Antisocial Personality, PSDI = Positive Symptom Distress Index

Model 1: Block 2 $\Delta R^2 = 0.007$, ns.; Block 3 $\Delta R^2 = 0.010$, ns.; Block 4 $\Delta R^2 = 0.039$, $p < 0.01$

Model 2: Block 2 $\Delta R^2 = 0.045$, $p < 0.01$; Block 3 $\Delta R^2 = 0.017$, $p < 0.10$; Block 4 $\Delta R^2 = 0.025$, $p < 0.01$

[†] $p < 0.10$, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Supplementary table 1. Adjusted associations of SCL-90 anxiety and depression subscales with forensic outcomes

	Behavioural Disturbance	Recidivism	Violent crimes	Non-violent crimes
Predictors	beta	beta	beta	beta
Anxiety ^a	0.01	0.00	-0.01	0.00
ADHD	0.04**	0.03*	0.03**	0.03*
Depression ^b	0.01	0.00	0.00	0.00
ADHD	0.04**	0.03*	0.03*	0.03*

Note: Direct contributions of SCL-90 anxiety^a or depression^b and ADHD symptoms on models adjusted for age and antisocial personality traits

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$