

Alcohol and Substance Use History Among ADHD Adults: The Relationship With Persistent and Remitting Symptoms, Personality, Employment, and History of Service Use

Journal of Attention Disorders
2014, Vol 18(1) 82–90
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DOI: 10.1177/1087054712446171
jad.sagepub.com


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Abstract

Objective: To profile substance use, personality, service use, and employment in adults with ADHD. **Method:** The sample consisted of 216 consecutive referrals to an adult ADHD service and classified with ADHD, partially or fully remitted ADHD, or no ADHD. Normal controls ($n = 33$) were recruited from a general practitioner's center. Participants completed measures of alcohol and illicit substance use, employment, service use, ADHD symptoms, and personality. **Results:** High rates of substance use were found in participants with current ADHD diagnoses. ADHD participants showed increased rates of personality trait or disorder scores and unemployment. There was some indication that those with ADHD and substance-related impairment place higher demand on services. Individuals with partially remitted ADHD showed similar substance use to those with current ADHD, whereas those in full remission were comparable with normal controls. **Conclusion:** Although ADHD symptoms may remit with time, individuals retaining persisting or partial symptoms have substantial needs in adulthood. (*J. of Att. Dis.* 2014; 18(1) 82-90)

Keywords

ADHD, alcohol, substance use, remitting symptoms, personality, employment, service use

Adults with ADHD commonly experience other mental health problems and behavioral disturbances (Sobanski, 2006), delinquency and offending (Gudjonsson, Sigurdsson, Sigfusdottir, & Young, 2012), and neuropsychological and psychosocial impairment (Young & Gudjonsson, 2008). Substance use or dependency is among the most common comorbidities associated with ADHD (Biederman et al., 2008; Faraone et al., 2007; Knop et al., 2009; Sobanski, 2006; Upadhyaya, 2008). Previous studies suggest up to 52% (Biederman et al., 1995) prevalence of substance use in ADHD samples. Those with ADHD might also experience severe substance use problems (Flory, Milich, Lynam, Leukefeld, & Clayton, 2003), including earlier onset (Arias et al., 2008), greater impairment (Biederman et al., 2008), shorter transition from use to dependence (Biederman et al., 1997), lower treatment success rates (Kolpe & Carlson, 2007), and increased suicide attempts (Huntley et al., 2012). Although full remission of ADHD in adulthood may reduce substance use to a level similar to control samples, individuals reaching partial remission

continue to show increased substance-related impairment (Young & Gudjonsson, 2008).

Available studies suggest that alcohol and cannabis are the most frequently abused substances in ADHD populations (Faraone et al., 2007), followed by lower rates of cocaine and amphetamine abuse (Sullivan & Rudnik-Levin, 2001). However, research is frequently biased toward adolescent or young adult samples, where alcohol and marijuana use is highly prevalent even in the absence of ADHD (Wang, Simons-Morton, Farhat, & Luk, 2009). Some reviews suggest individuals with ADHD abuse more harmful substances such as hallucinogens, cocaine, and nonprescribed

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stimulants (Looby, 2008), although evidence regarding these substances is unclear.

A possible reason for conflicting research findings regarding ADHD and substance use is difficulty making ADHD diagnoses in this client group. Berg (2007) suggested that an ADHD diagnosis may be preferable to a substance use disorder (SUD) diagnosis as this may facilitate access to better psychiatric care. Others suggest that marijuana use presents similarly to ADHD, leading to overdiagnosis of ADHD in drug-using samples (Graham, DuPont, & Gold, 2007). Given the trait-like nature of ADHD symptoms, diagnostic reliability may also be confounded by personality problems. There is little consistency in ADHD diagnostic protocols, which is reflected in fundamentally varied protocols for making research diagnoses (Lopez et al., 2008). This highlights the importance of comprehensive, reliable ADHD assessments in research and clinical settings.

ADHD is widely associated with a range of poor outcomes aside from substance use, including antisocial behavior, employment problems, unsafe driving habits, driving convictions, and relationship difficulties (Barkley, 2002). ADHD symptoms are enduring in nature, and are associated with personality structure and personality problems (Burket, Sajid, Wasiak, & Myers, 2005; Miller, Miller, Newcorn, & Halperin, 2008). It is not yet clear if or how these outcomes interact and whether, for example, substance use might influence the likelihood of poor employment outcomes and interpersonal and personality problems.

This study profiles alcohol and substance use characteristics of 216 individuals referred to a London adult ADHD service. Specifically, we test whether frequency and severity of alcohol and substance misuse is influenced by ADHD, including ADHD in full and partial remission. We hypothesized that different subtypes of ADHD (combined, predominantly inattentive, or predominantly hyperactive/impulsive) might relate to different substances, benefiting from self-medication of different symptoms, and also that ADHD and substance use links might influence or be influenced by personality characteristics, history of service use, and employment status.

Our protocol addresses several methodological problems of previous research by using diagnostic procedures consistent with recommendations from the European Network Adult ADHD Consensus Statement (Kooij et al., 2010). By recruiting from an adult clinic, we hoped to avoid bias toward adolescence and early adulthood. This study also investigates a full range of substance use, including Class A substances and alcohol. Participants included clinical and normal control (NC) groups to control for substance use in the normal population and in non-ADHD psychiatric caseloads. In addition, this is the first study to our knowledge to investigate substance use in individuals who met ADHD

diagnostic criteria in childhood but were classified in full remission in adulthood.

Method

Participants

The sample consisted of new consecutive referrals (meeting inclusion criteria) to an adult ADHD service in London, who attended a first-appointment clinical assessment. Exclusion criteria included an IQ less than 70, a history of severe mental illness or brain damage, or a pervasive developmental disorder. Participants had not previously received an ADHD diagnosis and were not currently prescribed any ADHD medication.

Participants recruited from the ADHD service were divided into four groups according to their ADHD status, determined from a *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) semistructured interview: (a) ADHD group (ADHD)—met childhood and current *DSM-IV* diagnostic criteria for ADHD following clinical assessment; (b) partial remission (PR) group—clinical assessment indicated met childhood criteria and subthreshold current ADHD symptoms. Subthreshold current symptoms were defined as a current *DSM-IV* checklist of symptoms (DCS) score of 17+ (a score of 17 representing one standard deviation above the population mean; Young & Gudjonsson, 2008); (c) remission group (RG)—clinical assessment indicated met childhood criteria but scored below 17 on DCS; and (d) clinical control (CC) group—referred to the ADHD service but clinical assessment indicated patients did not meet childhood or current diagnostic criteria for ADHD. Primary psychopathology within this group included anxiety (39%), depression (34%), personality disorders (15%), and other, for example, dysphoria (12%); (e) a normal control (NC) recruited from a general medical practitioners' (GP) surgery. The controls had been recruited previously for a study using similar methodology (Young, Toone, & Tyson, 2003) from advertisements placed at a GP surgery.

Procedure

When attending their first-appointment assessment (i.e., none had a previous diagnosis of ADHD), referrals were approached by one of the practitioners involved in the assessment (SY) and invited to participate in the study. All referrals consented for data obtained in the course of their clinical assessment to be used in the research study. Participants then underwent a comprehensive clinical assessment that included a psychiatric diagnostic evaluation for ADHD based on *DSM-IV* diagnostic criteria and a clinical interview of the individual's past and current personal, occupational, and social functioning. This

Table 1. Sample Characteristics and Alcohol/Substance Use.

	ADHD groups			Controls	
	ADHD group	ADHD partial remission	ADHD remission group	Normal controls	Clinical controls
<i>n</i>	88	43	18	33	67
<i>M</i> age	25.15	26.5	22.8	25.0	33.3
Male (%)	80.7	74.4	77.8	66.7	67.2
Unemployment (%)	44.3	40.5	22.2	3.0	41.5
<i>M</i> (SD) DSM score (0-36)	29.6 (3.9)	22.4 (3.0)	12.8 (2.7)	10.0 (7.14)	24.8 (6.5)
Alcohol use (% "marked" or "severe" use)					
Pre-18	69.0	51.4	29.4	69.7	36.0
Post-18	81.7	85.2	45.5	95.3	54.3
Last 12 months	72.4	65.9	56.3	63.7	46.2
Substance use (% "marked" or "severe" use)					
Pre-18	27.6	23.3	11.8	3.0	17.2
Post-18	31.3	38.2	9.1	9.5	29.3
Last 12 months	24.4	19.0	0.0	3.0	13.6

Note: DSM = Diagnostic and Statistical Manual of Mental Disorders.

evaluation incorporated self-reported information and where possible informant information and supporting documentation, such as school reports where available.

Measures

All patients assessed at the ADHD clinic completed the DCS. This 18-item questionnaire takes around 5 min to complete and asks individuals to rate the frequency of each ADHD symptom as "never," "sometimes," or "often."

The ADHD Adult Functioning Interview (ADHD-AFI) is a semistructured interview of childhood and adulthood functioning, covering education; occupation; antisocial behavior; social functioning; prior health, education, and social service use; and alcohol and substance use (cannabis, cocaine, heroin, speed, glue, lysergic acid diethylamide [LSD], ecstasy, and any other substances). References to substance use throughout this article refer to substances recorded on this measure.

The ADHD-AFI asks individuals about the frequency of alcohol and drug use in childhood (prior to 18 years) and in adulthood. For each period, an individual is given a frequency rating of "not at all," "once or twice," "intermittent," or "regular" user for alcohol, and separately for illicit substances. Severity of alcohol use and severity of substance use is rated as "none," "mild," "marked," or "severe." Therefore, each individual receives 12 alcohol/illicit substance ratings (three time points for severity and frequency, for alcohol and illicit substances). Interrater reliability is reported as .78 to .98 for all scales (Young et al., 2003).

History of health, education, and service use is classified by two scores indicating the number of different interventions received (e.g., extra schooling, educational psychologist, social

worker; range = 0-8, $M = 2.76$, $SD = 1.6$) and the total number of interventions received (range = 0-47, $M = 5.79$, $SD = 6.0$).

The Standardized Assessment of Personality (SAP; Pilgrim & Mann, 1990) is an informant-report questionnaire based on International Classification of Diseases (ICD-10; World Health Organisation, 1992) diagnostic criteria. The SAP identifies participants as exhibiting *nil*, *trait*, or *disorder* for nine personality disorders: paranoid, antisocial, histrionic, anxious, schizoid, impulsive, anankastic, dependent, and borderline. For this study, informants were parents.

Results

Overall Severity of Alcohol and Illicit Substance Use

Severity of alcohol use was high in the NCs and all the CCs groups (Table 1). Severity scores for alcohol showed a similar pattern across clinical and control groups, increasing between pre-18 and post-18, and reducing between post-18 and the past 12 months. This is consistent with other findings of an increase in drinking in late teens/early 20s seen in the United Kingdom, followed by a reduction later (Institute of Alcohol Studies, 2010). This pattern was mirrored here in substance use. Table 1 shows that the ADHD and PR groups showed the greatest severity of substance use at all time points, with much lower ratings in the RG, whose scores were comparable with NCs.

Group Differences in Alcohol and Substance Use

Eight Kruskal-Wallis tests were carried out to identify differences across clinical groups in alcohol and substance

Table 2. Kruskal–Wallis Comparison of Alcohol and Substance Use Severity and Frequency Across Clinical Groups.

	Pre-18	Post-18
Alcohol		
Severity	24.334***	21.682***
Frequency	14.836**	16.997**
Substances		
Severity	18.690***	12.608*
Frequency	20.269***	22.060***

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. Post Hoc Mann–Whitney Test Scores for Comparing the ADHD Group With the PR and RG Groups.

	PR	RG
Alcohol severity		
Pre-18	1,181.5	380.5***
Post-18	807.5	178.0**
Alcohol frequency		
Pre-18	1,126.0*	467.0*
Post-18	695.0	199.0*
Substance severity		
Pre-18	1,613.0	484.0*
Post-18	985.0	192.5**
Substance frequency		
Pre-18	1,729.0	500.0*
Post-18	824.0*	187.5***

Note: PR = partial remission; RG = remission group.
* $p < .05$. ** $p < 0.01$. *** $p < 0.006$.

use, severity, and frequency pre-18 and post-18. A significant effect of group (ADHD, PR, RG, NC, CC) was found on severity and frequency of alcohol and substance use at each time point (Table 2).

As links between ADHD and alcohol and substance use are already well documented, the finding that groups differed in alcohol and substance frequency and severity pre- and post-18 was unsurprising. We were particularly interested in comparing the ADHD group with the PR and RGs to investigate whether a reduction in ADHD symptoms might be linked with reduced alcohol and substance use. Post hoc Mann–Whitney tests were used for these comparisons. The ADHD group was compared with the PR and RGs for alcohol and substance frequency and severity pre-18 and post-18 (Table 3). Results are additionally reported with a more conservative Bonferroni correction for each group's multiple comparisons applied at a level of $p < .006$.

The PR group showed no differences to the ADHD group in alcohol or substance use with the more conservative comparisons. Although there is some indication of a reduced

risk of alcohol and substance-related harm in the PR group compared with the ADHD group in the less conservative comparisons, this demonstrates that individuals who retain only partial symptomatology (and so whom might be ineligible or unlikely to seek services) remain at risk of substance use.

The RG showed highly significant differences to the ADHD group in some areas; this group had lower alcohol severity ratings pre-18 and lower substance frequency ratings post-18, as well as less frequent and severe use than the ADHD group in each measure at each time point. This implies that as ADHD symptoms remit, so too might associated risk of substance abuse.

Due to strong correlations between frequency and severity scores in alcohol and substance use, only severity scores have been analyzed further.

Substance Choice

Highest prevalence rates for every substance were reported by either the ADHD or PR group (Table 4). Significant differences were found between groups in use of cannabis, cocaine, speed, LSD, and ecstasy. The RG showed the lowest prevalence rates in cannabis, cocaine, heroin, speed, and other illicit substances. This is consistent with our finding of reduced alcohol and substance frequency and severity in the RG than the ADHD group, but not in the PR group compared with the ADHD group.

A striking link between ADHD symptoms and substance use is seen for cannabis; only 12% of the PR group and 25% of the ADHD group reported never to have used cannabis. However, cannabis use was also high in the CC group; thus, this may represent a more general link between psychiatric symptoms and cannabis use.

Within the ADHD group, no differences were identified in substance choice between those with different diagnostic subtypes (combined, predominantly inattentive, or predominantly hyperactive), $\chi^2(2) = .496$, $p = .780$. There was also no effect of diagnostic subtype on severity of alcohol use, $H(2) = 1.685$, $p = .431$, or severity of substance use, $H(2) = .223$, $p = .896$.

Personality

A total of 165 parent informants completed the SAP. High rates of personality disorder scores were identified in groups with a current or previous ADHD diagnosis (ADHD group 30% at least one personality disorder scored, PR 19%, RG 22%), compared with the lower rates found in the CC group (10%) and NC group (0%).

Chi-square analysis showed group differences in personality disorder and trait ratings in dissocial ($x = 25.824$, $df = 8$, $p < .01$) and impulsive personality categories ($x = 40.435$, $df = 8$, $p < .001$). Higher rates of impulsive or

Table 4. Prevalence of Use by Substance and Clinical Group.

	Cannabis	Cocaine	Heroin	Speed	Glue	LSD	Ecstasy	Other
ADHD	0.75	0.34	0.15	0.49	0.20	0.36	0.40	0.20
PRG	0.88	0.35	0.12	0.44	0.19	0.28	0.37	0.26
RG	<i>0.39</i>	<i>0.11</i>	<i>0.00</i>	<i>0.17</i>	0.11	0.11	0.22	<i>0.17</i>
NC	0.55	0.12	0.03	0.21	<i>0.06</i>	<i>0.06</i>	<i>0.12</i>	0.18
CC	0.71	0.32	0.14	0.47	0.09	0.29	0.23	0.21
Chi-square	20.328**	9.508*	5.972	13.071*	6.715	12.681**	12.305*	0.924

Note: LSD = lysergic acid diethylamide; PRG = partial remission group; RG = remission group; NC = normal control; CC = clinical control. The highest prevalence values are in bold and the lowest prevalence values are in italics.

* $p \leq .05$. ** $p < .01$.

dissocial personality disorder scores were seen in participants with ADHD than any other clinical group. The groups with a current or previous ADHD diagnosis (ADHD, RG, PR) had consistently more trait and disorder scores for dissocial and impulsive personality disorders than those without (NC, CC).

Participants who had received an ADHD diagnosis at some point (i.e., including those in full or PR) were divided into two groups: those with one or more personality traits or disorders identified on the SAP and those without. The severity of alcohol and substance use was compared between the two groups using chi-square analysis and no significant differences found. Thus, personality factors may not have a role in the association between ADHD and alcohol and illicit substance use.

Service Use

Data on the number of intervention types received were available for all 249 participants and on total number of interventions for 207 participants. Across the whole sample, mean number of intervention types was 2.84 (range = 0-8, $SD = 1.6$) and mean total number of interventions was 5.79 (range = 0-47, $SD = 6.0$).

It was hypothesized that participants in the ADHD groups (ADHD, PR, RG) would use more service types and have a greater number of total interventions than NCs and CCs. Therefore, the three ADHD groups were collapsed into one group (ALL-ADHD), and their intervention type and total number scores were compared with the NCs and CCs using a one-way ANOVA. The homogeneity of variance assumption was broken for both variables, and therefore, a one-way ANOVA with Welch correction was applied. A significant effect of group was found on number of types of intervention, $F(2, 86.330) = 29.233, p < .001$, and on total number of interventions, $F(2, 103.372) = 44.007, p < .001$.

Within the ALL-ADHD group, we hypothesized that those with an impairing level of substance use severity would utilize more total interventions and types of

interventions than those without impairing substance use, and that this pattern would be repeated in alcohol use. Service use of those in the ALL-ADHD group who had been rated as having an impairing level of use ("marked" or "severe") of alcohol was compared with those who were not. There was no difference in the number of intervention types ($U = 2,448.0, p = .398$; one-tailed). There was a significant difference between those with and without impairing alcohol use in total number of interventions, with those without impairing alcohol use receiving more total interventions, the opposite of our expectations ($U = 1,318.5, p < .05$; two-tailed). By contrast, individuals with impairing substance use severity received a greater number of intervention types ($U = 1,421.0, p \leq .05$; one-tailed) and a higher total number of interventions ($U = 966.0, p < .05$; one-tailed), indicating that a combination of ADHD and substance use causing additional impairment is linked to greater demand on services. The interaction between ADHD and alcohol in relation to service use is less clear, but reduced service use in those with ADHD and impairing alcohol use might indicate difficulty or reluctance in accessing services while using alcohol. Mean scores are shown in Figure 1.

Employment and ADHD

Information on employment status was available for 237 participants. Unemployment rates were highest in the ADHD group (44.3%), followed by CCs (41.5%), PR group (40.5%), and then the RG (22.2%), and were lowest in the NC group (3.0%). Chi-square analysis showed a significant difference in employment status between groups ($\chi^2 = 30.596, df = 8, p < .001$). Interestingly, the highest proportion of students were found in the RG (44.4%), which was substantially higher than PR (21.4%) and ADHD groups (12.7%), and higher than the NC group (30.3%). This could indicate that ongoing ADHD symptoms impair the ADHD group sufficiently to reduce the likelihood of remaining in education postsecondary, but that there are particularly positive educational outcomes for individuals

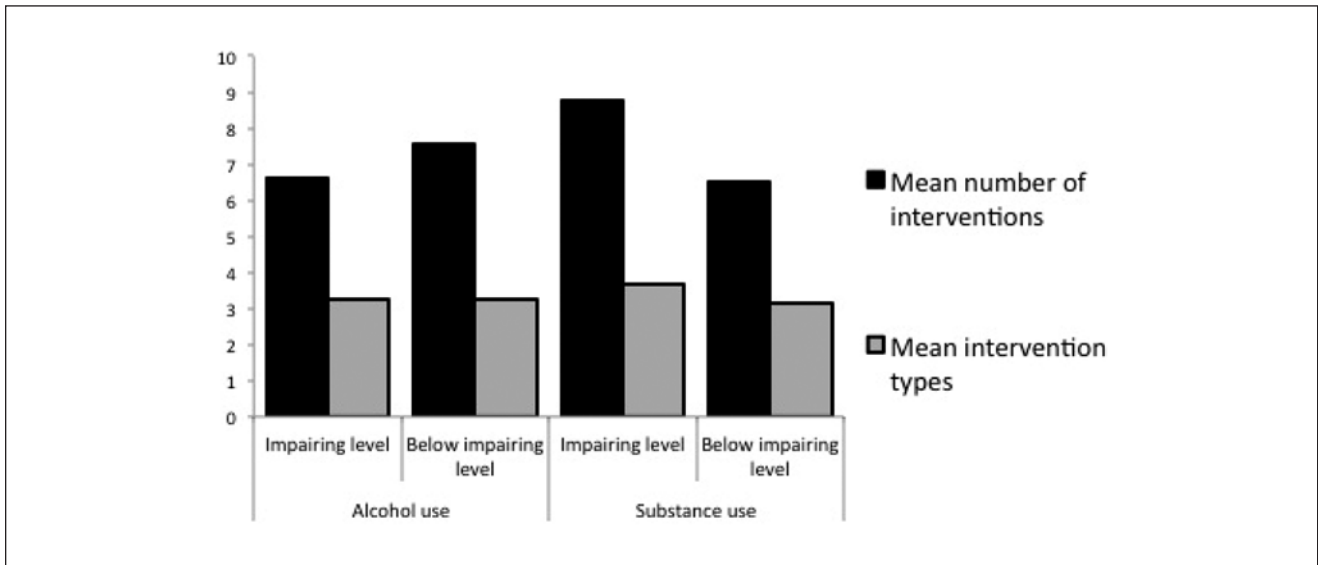


Figure 1. Service use by alcohol and substance use in the ALL-ADHD group.

with ADHD in remission. Within the ADHD group, no between-group differences in employment status were noted between those with and without impairing levels of illicit substance or alcohol use.

Discussion

The results highlight the ongoing and complex needs of adults with a history of ADHD. To our knowledge, this is the first study to consider the association between persisting and remitting ADHD symptoms, substance use, and associated problems. The high rates of substance use, particularly illicit substance use, in the individuals referred to the adult ADHD service suggest a need for clinicians to assess for substance use carefully and routinely. This might involve systematic screening for substance use and forming closer links between ADHD and substance misuse services.

Alcohol use was severe and frequent in all groups, with no clear effect of ADHD. It is unknown why alcohol use was so highly prevalent within the NC sample. The sample was recruited from a GP's surgery, and this may be an effect of the demographic of that practice or location. As a result, it is not possible to reach firm conclusions about possible ADHD/alcohol links from this study.

Substance use was less frequent and less severe across all groups than alcohol use. Participants with persistent ADHD symptoms (i.e., the ADHD and PR group) showed greatest severity at each time point. These two groups also showed highest prevalence of using every substance considered. In contrast, the RG showed similar rates to the NC group in each of the substances. ADHD diagnostic subtype did not influence substance use or severity, or

substance choice. Our findings suggest that individuals in PR may need similar levels of support to those retaining full symptoms, and should perhaps not be excluded from ADHD services. Our finding of ongoing needs in this group is consistent with a large-scale prospective follow-up study of children diagnosed with ADHD, which identified adulthood impairment (*M* follow-up age = 27 years) even where some symptoms had remitted (Barkley, Fischer, Smallish, & Fletcher, 2006), and findings that although symptoms objectively improve with age, the subjective experience of individuals with ADHD may be that they worsen (Bramham et al., 2012).

The high rates of impulsive and dissocial personality problems in individuals referred to the ADHD service highlight issues of comorbidity and the diagnostic overlap between ADHD and personality problems. Dissocial personality is strongly predicted by earlier conduct disorder (Goldstein et al., 2007), which is highly comorbid with ADHD in adolescence (Turgay, 2005). Severe childhood ADHD has been identified as a vulnerability factor for developing personality disorder in adulthood (Matthies et al., 2011). However, the relationship between ADHD, personality, and SUD is likely to be complex; for example, Cluster B personality disorders share certain inherent traits with ADHD symptoms, and it has been suggested that personality disorganization might be more helpful in understanding and treating people with ADHD than diagnosing personality disorder (Gudjonsson, Wells, & Young, 2010). However, ADHD has been associated with Clusters A and C personality disorders that are less phenomenologically similar to ADHD symptoms (Matthies et al., 2011). Although no evidence was found that

personality problems increase risk of substance use in ADHD in this sample, other possible impairments and the impact of personality on treatment may be relevant, and it is not yet clear how SUD might interact with the ADHD and personality relationship.

In addition to high rates of substance use, participants in the ADHD and PR groups showed almost doubled rates of unemployment, compared with the full RG. These poor employment outcomes are consistent with large-scale studies of ADHD in adults. A longitudinal prospective follow-up of children with ADHD in Milwaukee, Barkley et al. (2006), for example, found that 22% of 158 adults diagnosed as "hyperactive" in childhood were neither working nor in education, compared with 7% of controls. The Milwaukee study identified weaker work performance and increased rates of dismissal in ADHD participants compared with controls, which might explain the higher rates of unemployment seen in the ADHD groups in the current study.

National Institute for Health and Clinical Excellence (NICE; 2008) guidelines acknowledge links between ADHD and SUDs and that this may contribute to increasing medical expenses. The estimated cost of an adult with ADHD is estimated in the United States as US\$5,600 (2001 prices), compared with US\$2,700 for a matched comparison adults without ADHD. Given the increased service use we have identified in adults with ADHD and substance use, it is feasible that this may be even higher. It would be naive to assume that our identification of lower levels of service use in individuals with ADHD and impairing alcohol use represents overall reduced service costs and need. This might indicate that individuals access services later in life (by which time, effective intervention might require more resources) or that those individuals access services other than those investigated here.

Few studies have investigated SUDs in ADHD postadolescence. This study begins to address this, but remains limited as the mean age of participants recruited from the ADHD service was in the 20s for each group, and may not apply to adults with ADHD in later life. NCs were 7 to 11 years older than those identified to have ADHD. Nevertheless, participants were well beyond the age at which clients are transitioned from child and adolescent services (Young, Murphy, & Coghill, 2011), and the findings suggest high rates of dual diagnosis in young adults presenting for ADHD assessment in adult services.

As is common in ADHD research, our sample showed a male bias. This reflects the higher prevalence of ADHD in males than females (Kessler et al., 2006) and subsequent higher rates of male referrals. For this reason, possible gender differences in vulnerability to substance misuse in ADHD are not investigated here. The recent findings from a community study of almost 11,000 pupils (male and female) in the final 3 years of compulsory education in

Iceland demonstrate the susceptibility of young persons with ADHD symptoms to smoking, alcohol, and illicit drug use, possibly as a means of self-medication, and shows that there is a need for early identification and treatment to reduce the risk of escalation (Gudjonsson et al., 2012). Sampling from an ADHD service allowed us to ensure comprehensive diagnostic protocols for the research methodology. However, it is possible that individuals referred to the ADHD service might have sought referral due to impairments associated with their symptoms. Individuals with lesser impairment might not wish or need to engage with ADHD services; alternatively, they may have lower accessibility to secondary care services. Nevertheless, although for these reasons our estimates of impairment might be elevated, the level of impairment associated with substance use is sufficient to be confident that substance misuse is an important consideration postadolescence in ADHD services.

Future research might usefully extend this study to investigate the effects of treatment in individuals presenting with comorbid ADHD and substance misuse. For example, clients with ADHD might be less able to engage with substance misuse services, inattention might limit the effectiveness of talking therapies, and impulsivity might pose an increased relapse risk. Treatment of ADHD might reduce substance misuse and/or enhance treatment success. Potential future studies should include individuals in PR from ADHD symptoms, who may have significant needs.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: SY has given educational talks at meetings sponsored by Janssen-Cilag, Shire, Novartis, Eli-Lilly and Flynn-Pharma and has received research grants from Janssen-Cilag, Eli-Lilly and Shire. ZH has no conflicts of interest to declare.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

- Arias, A., Gelernter, J., Chan, G., Weiss, R., Brady, K., Farrer, L., & Kranzler, H. (2008). Correlates of co-occurring ADHD in drug-dependent subjects: Prevalence and features of substance dependence and psychiatric disorders. *Addictive Behaviors*, 33, 1199-1207. Retrieved from <http://dx.doi.org/10.1016/j.addbeh.2008.05.003>
- Barkley, R. A. (2002). Major life activity and health outcomes associated with attention-deficit/hyperactivity disorder. *Journal of Clinical Psychiatry*, 63(Suppl. 12), 10-15. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12562056>

- Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2006). Young adult outcome of hyperactive children: Adaptive functioning in major life activities. *Journal of the American Academy of Child & Adolescent Psychiatry, 45*, 192-202. Retrieved from <http://dx.doi.org/10.1097/01.chi.0000189134.97436.e2>
- Berg, J. (2007). Substance misuse disguised as ADHD? *British Journal of Psychiatry, 191*, 457. Retrieved from <http://dx.doi.org/10.1192/bjp.191.5.457>
- Biederman, J., Petty, C., Wilens, T., Fraire, M., Purcell, C., Mick, E., . . . Faraone, S. V. (2008). Familial risk analyses of attention deficit hyperactivity disorder and substance use disorders. *American Journal of Psychiatry, 165*, 107-115. <http://dx.doi.org/10.1176/appi.ajp.2007.07030419>
- Biederman, J., Wilens, T., Mick, E., Faraone, S. V., Weber, W., Curtis, S., . . . Soriano, J. (1997). Is ADHD a risk factor for psychoactive substance use disorders? Findings from a four-year prospective follow-up study. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*, 21-29. Retrieved from <http://dx.doi.org/10.1097/00004583-199701000-00013>
- Biederman, J., Wilens, T., Mick, E., Milberger, S., Spencer, T., & Faraone, S. (1995). Psychoactive substance use disorders in adults with attention deficit hyperactivity disorder (ADHD): Effects of ADHD and psychiatric comorbidity. *American Journal of Psychiatry, 152*, 1652-1658.
- Bramham, J., Murphy, D., Xenitidis, K., Asherson, P., Hopkin, G., & Young, S. (2012). Adults with attention deficit hyperactivity disorder: An investigation of age-related differences in behavioural symptoms, neuropsychological function and co-morbidity. *Psychological Medicine, 28*, 1-10. Retrieved from <http://dx.doi.org/10.1017/S0033291712000219>
- Burket, R., Sajid, M., Wasiak, M., & Myers, W. (2005). Personality comorbidity in adolescent females with ADHD. *Journal of Psychiatric Practice, 11*, 131-136.
- Faraone, S., Wilens, T., Petty, C., Antshel, K., Spencer, T., & Biederman, J. (2007). Substance use among ADHD adults: Implications of late onset and subthreshold diagnoses. *American Journal on Addictions, 16*(Suppl. 1), 24-32. Retrieved from <http://dx.doi.org/10.1080/10550490601082767>
- Flory, K., Milich, R., Lynam, D., Leukefeld, C., & Clayton, R. (2003). Relation between childhood disruptive behavior disorders and substance use and dependence symptoms in young adulthood: Individuals with symptoms of attention-deficit/hyperactivity disorder are uniquely at risk. *Psychology of Addictive Behaviors, 17*, 151-158. Retrieved from <http://dx.doi.org/10.1037/0893-164X.17.2.151>
- Goldstein, R., Compton, W., Pulay, A., Ruan, W., Pickering, R., Stinson, F., & Grant, B. (2007). Antisocial behavioral syndromes and DSM-IV drug use disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence, 90*, 145-158. Retrieved from <http://dx.doi.org/10.1016/j.drugalcdep.2007.02.023>
- Graham, N., DuPont, R., & Gold, M. (2007). Letters to the editor symptoms of ADHD or marijuana use? *American Journal of Psychiatry, 164*, 973.
- Gudjonsson, G. H., Sigurdsson, J. F., Sigfusdottir, I. D., & Young, S. (2012). An epidemiological study of ADHD symptoms among young persons and the relationship with cigarette smoking, alcohol consumption and illicit drug use. *Journal of Child Psychology and Psychiatry, 53*, 304-312. Retrieved from <http://dx.doi.org/10.1111/j.1469-7610.2011.02489.x>
- Gudjonsson, G. H., Wells, J., & Young, S. (2010). Personality disorders and clinical syndromes in ADHD prisoners. *Journal of Attention Disorders*. Advance online publication. Retrieved from <http://dx.doi.org/10.1177/1087054710385068>
- Huntley, Z., Maltezos, S., Williams, C., Morinan, A., Hammon, A., Ball, D., . . . Asherson, P. (2012). *Rates of undiagnosed attention deficit hyperactivity disorder in London drug and alcohol detoxification units*. Manuscript submitted for publication.
- Institute of Alcohol Studies. (2010). Binge drinking—Nature, prevalence and causes. *IAS Factsheet*. Retrieved from http://www.ias.org.uk/resources/factsheets/binge_drinking.pdf
- Kessler, R. C., Adler, L., Barkley, R., Biederman, J., Conners, C., Demler, O., . . . Zaslavsky, A. M. (2006). The prevalence and correlates of adult ADHD in the United States: Results from the National Comorbidity Survey Replication. *American Journal of Psychiatry, 163*, 716-723. Retrieved from <http://dx.doi.org/10.1176/appi.ajp.163.4.716>
- Knop, J., Penick, E., Nickel, E., Mortensen, E., Sullivan, M., Murtaza, S., . . . Gabrielli, W. F. (2009). Childhood ADHD and conduct disorder as independent predictors of male alcohol dependence at age 40. *Journal of Studies on Alcohol and Drugs, 70*, 169-177.
- Kolpe, M., & Carlson, G. (2007). Influence of attention-deficit/hyperactivity disorder symptoms on methadone treatment outcome. *American Journal on Addictions, 16*, 46-48. Retrieved from <http://dx.doi.org/10.1080/10601330601080073>
- Kooij, S. J. J., Bejerot, S., Blackwell, A., Caci, H., Casas-Brugué, M., Carpentier, P. J., . . . Asherson, P. (2010). European consensus statement on diagnosis and treatment of adult ADHD: The European Network Adult ADHD. *BMC Psychiatry, 10*, 67. Retrieved from <http://dx.doi.org/10.1186/1471-244X-10-67>
- Looby, A. (2008). Childhood attention deficit hyperactivity disorder and the development of substance use disorders: Valid concern or exaggeration? *Addictive Behaviors, 33*, 451-463. Retrieved from <http://dx.doi.org/10.1016/j.addbeh.2007.10.006>
- Lopez, B., Schwartz, S., Prado, G., Huang, S., Rothe, E., Wang, W., & Pantin, H. (2008). Correlates of early alcohol and drug use in Hispanic adolescents: Examining the role of ADHD with comorbid conduct disorder, family, school, and peers. *Journal of Clinical Child and Adolescent Psychology, 37*, 820-832. Retrieved from <http://dx.doi.org/10.1080/15374410802359676>
- Matthies, S., van Elst, L., Feige, B., Fischer, D., Scheel, C., Krogmann, E., . . . Philipsen, A. (2011). Severity of childhood

- attention-deficit hyperactivity disorder—A risk factor for personality disorders in adult life? *Journal of Personality Disorders*, 25, 101-114. Retrieved from <http://dx.doi.org/10.1521/pedi.2011.25.1.101>
- Miller, C., Miller, S., Newcorn, J., & Halperin, J. (2008). Personality characteristics associated with persistent ADHD in late adolescence. *Journal of Abnormal Child Psychology*, 36, 165-173. Retrieved from <http://dx.doi.org/10.1007/s10802-007-9167-7>
- National Institute for Health and Clinical Excellence. (2008). *Attention deficit hyperactivity disorder: Diagnosis and management of ADHD in children, young people and adults*. Retrieved from <http://www.nice.org.uk/nicemedia/live/12061/42059/42059.pdf>
- Pilgrim, J., & Mann, A. (1990). Use of the ICD-10 version of the Standardized Assessment of Personality to determine the prevalence of personality disorder in psychiatric in-patients. *Psychological Medicine*, 20, 985-992.
- Sobanski, E. (2006). Psychiatric comorbidity in adults with attention-deficit/hyperactivity disorder (ADHD). *European Archives of Psychiatry and Clinical Neuroscience*, 256(Suppl. 1), 26-31. Retrieved from <http://dx.doi.org/10.1007/s00406-006-1004-4>
- Sullivan, M., & Rudnik-Levin, F. (2001). *Attention deficit/hyperactivity disorder and substance abuse: Diagnostic and therapeutic considerations. Adult attention deficit disorder: Brain mechanisms and life outcomes* (pp. 251-270). New York, NY: New York Academy of Sciences.
- Turgay, A. (2005). Treatment of comorbidity in conduct disorder with attention-deficit hyperactivity disorder (ADHD). *Essential Psychopharmacology*, 6, 277-290.
- Upadhyaya, H. (2008). Substance use disorders in children and adolescents with attention-deficit/hyperactivity disorder: Implications for treatment and the role of the primary care physician. *Primary Care Companion to Journal of Clinical Psychiatry*, 10, 211-221.
- Wang, J., Simons-Morton, B., Farhat, T., & Luk, J. (2009). Socio-demographic variability in adolescent substance use: Mediation by parents and peers. *Prevention Science*, 10, 397-397. Retrieved from <http://dx.doi.org/10.1007/s11121-009-0145-x>
- World Health Organisation (WHO). (1992). *ICD-10 Classifications of Mental and Behavioural Disorder: Clinical Descriptions and Diagnostic Guidelines*. Geneva: World Health Organisation.
- Young, S., & Gudjonsson, G. (2008). Growing out of attention-deficit/hyperactivity disorder: The relationship between functioning and symptoms. *Journal of Attention Disorders*, 12, 162-169. Retrieved from <http://dx.doi.org/10.1177/1087054707299598>
- Young, S., Murphy, C., & Coghill, D. (2011). Avoiding the "twilight zone": Recommendations for the transition of services from adolescence to adulthood for young people with ADHD. *BMC Psychiatry*, 11, 174. Retrieved from <http://dx.doi.org/10.1186/1471-244X-11-174>
- Young, S., Toone, B., & Tyson, C. (2003). Comorbidity and psychosocial profile of adults with attention deficit hyperactivity disorder. *Personality and Individual Differences*, 35, 743-755. Retrieved from [http://dx.doi.org/10.1016/S0191-8869\(02\)00267-2](http://dx.doi.org/10.1016/S0191-8869(02)00267-2)

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