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Childhood trauma exposure in substance use disorder patients with and without ADHD

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GvdG, wrote the proposal, coordinated the IASP study, was involved in the data management and data analyses, KvE-vO, AS, JF, E-TB, FM, ZD, CB, MF, JAR-Q, SVF, SA, SK, GD, coordinated the local data collection, KvE-vO, SV, MF, SC, BJ, AS, MK, SK, SV, IASP research group collected data FRL, WvdB, MWJK, PJC, JAR-Q, AS contributed to the design of the study and commented on the manuscript. MWJK supervised the data management, and commented on the manuscript. All authors contributed to interpretation of the data, commented on the manuscript and approved the final version.

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Abstract

Background—Childhood trauma exposure (CTE) is frequently reported by those with substance use disorders (SUDs). SUDs also frequently co-occur with attention deficit hyperactivity disorder (ADHD).

Objective—To investigate the role of childhood trauma exposure (CTE) in the presence and the persistence of ADHD in treatment seeking SUD patients.

Method—Data was derived from the International ADHD in Substance Use Disorder Prevalence (IASP) study. A structured interview was administered to 1274 treatment-seeking SUD patients aged 18 to 65.

Results—CTE was present in 53.5% of the patients and comorbid adult ADHD in 14.1%. CTE was significantly associated with ADHD: the prevalence of adult ADHD with and without CTE was 19.4% and 8.5% (OR adjusted for age, gender, main substance of abuse, BPD, and ASPD 1.91 [95% CI 1.29–2.81]). CTE was not associated with the severity of adult ADHD or with the persistence of childhood ADHD into adulthood.

Conclusions—CTE is common in SUD patients and associated with adult ADHD but not with the persistence of childhood ADHD into adulthood. These findings suggest that the increased rate of adult ADHD in SUD patients with CTE is not the consequence of a negative effect of CTE on the persistence of childhood ADHD into adulthood, but a direct expression of the high rate of childhood ADHD in SUD patients with CTE.

Keywords

Childhood trauma; Substance use disorders; Comorbidity; ADHD

1. Introduction

It has been known for decades that substance use disorder (SUD) patients frequently suffer from comorbid psychiatric disorders, especially internalizing disorders such as anxiety and mood disorders (Chan, Dennis, & Funk, 2008; Chen et al., 2011; Karam et al., 2015). More

recently, there is a growing in interest of SUD and comorbid externalizing disorders, including attention deficit hyperactivity disorder (ADHD). ADHD is a prevalent childhood neurodevelopmental disorder, that often persists into adulthood e.g. (Faraone, Biederman, & Mick, 2006; Groenman et al., 2013) and adult ADHD is currently seen as one of the most frequent psychiatric comorbidities both in general population subjects with SUD and in treatment seeking SUD patients (Kessler et al., 2006; Emmerik-van Oortmerssen et al., 2014).

ADHD affects 2.6–4.5% of the children worldwide (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015) and 2.1–3.1% of the adults (Simon, Czobor, Bálint, Mészáros, & Bitter, 2009), and the presence of ADHD is associated with risk behaviors (Kaye et al., 2014) negative life events (Bernardi et al., 2012), academic underachievement (Frazier, Youngstrom, Glutting, & Watkins, 2007), and higher mortality (Dalsgaard, Ostergaard, Leckman, Mortensen, & Pedersen, 2015). Although ADHD symptoms may wane with time or change character, e.g. the overt hyperactivity in childhood may be present as an inner restlessness in adults, functional impairments frequently persist into adulthood (Faraone et al., 2006). The association between ADHD and SUD is well-established (Groenman et al., 2013; Charach, Yeung, Climans, & Lillie, 2011; Lee, Humphreys, Flory, Liu, & Glass, 2011; van de Glind et al., 2014) and a recent meta-analysis of 29 studies has shown that ADHD is present in 25% of the adolescents and 21% of the adults with SUD (Emmerik-van Oortmerssen et al., 2012).

The clinical presentation of comorbid SUD and ADHD is complex; comorbidity with other psychiatric disorders is high (Carpentier et al., 2011; van Emmerik-van Oortmerssen et al., 2014; Wilens et al., 2005), and individuals with ADHD frequently have more severe SUD and poorer prognosis of SUD treatment (Kaye, Darke, & Torok, 2013; Rounsaville et al., 1991). Adding to this complexity, both disorders are associated with childhood trauma exposure (CTE) including sexual, physical and emotional abuse, physical and emotional neglect, and family violence is associated with a higher incidence of psychiatric disorders such as mood disorders, anxiety disorders (including post-traumatic stress disorder: PTSD), and SUD (Elliott et al., 2014; Fenton et al., 2013; Green et al., 2010; Kendler et al., 2000; Magnusson et al., 2012; Scott, Wolfe, & Wekerle, 2003; Weich, Patterson, Shaw, & Stewart-Brown, 2009; Whittle et al., 2013). High rates of CTE are found in clinical samples with alcohol use disorder (55%–73%) (Huang, Schwandt, Ramchandani, George, & Heilig, 2012; Schwandt, Heilig, Hommer, George, & Ramchandani, 2013; Windle, Windle, Scheidt, & Miller, 1995), and drug use disorders (44–74%) (Darke & Torok, 2013; Oviedo-Joekes et al., 2011). CTE has also been associated with a wide range of adverse outcomes such as behavioral problems (De Sanctis, Nomura, Newcorn, & Halperin, 2012; Gilbert et al., 2009), lower educational achievements (Jonson-Reid, Drake, Kim, Porterfield, & Han, 2004; Perez & Widom, 1994), and abnormalities in the neurobiology of the brain (Lim, Radua, & Rubia, 2014; Teicher, Anderson, Ohashi, & Polcari, 2014). CTE in treatment seeking SUD patients is associated with elevated rates of other psychiatric disorders and suicide (Huang et al., 2012; Darke & Torok, 2013; Banducci, Hoffman, Lejuez, & Koenen, 2014). Similarly, CTE is associated with increased psychiatric comorbidity in patients with ADHD (Bernardi et al., 2012; Antshel et al., 2013; Biederman et al., 2014; McLeer, Callaghan, Henry, & Wallen, 1994; Rucklidge, Brown, Crawford, & Kaplan, 2006). Taken together, CTE has been shown to have a negative impact a variety of outcomes in different populations and it is therefore

important to understand more about the role of CTE in clinically complex groups of patients with ADHD and SUD.

Although both ADHD and SUD have been associated with CTE and although CTE has a potentially negative effect on the prognosis of both disorders, the role of CTE in SUD-ADHD comorbidity has not yet been studied. In the present study we utilize data from a large European sample of treatment seeking substance users to investigate the role of CTE in SUD-ADHD comorbidity.

2. Objective

First, we investigate the effect of CTE on the prevalence of childhood and adult ADHD in treatment seeking SUD patients. Second, we investigate whether CTE in SUD patients is associated with a higher severity of ADHD symptoms and whether CTE in SUD patients affects the persistence of ADHD from childhood to adulthood.

3. Materials and methods

The data in the present study was collected between 2009 and 2011 as part of the International ADHD in Substance Abuse Prevalence (IASP) study (van de Glind et al., 2013) consisting of two phases: a screening phase and a full assessment phase. IASP is an international multi-center study in treatment seeking SUD patients from 10 countries. Patients from Australia, Belgium, France, Hungary, Netherlands, Norway, Spain, Sweden, Switzerland and the United States) participated in the screening phase and patients from seven of these countries also participated in the full assessment phase (France, Hungary, Netherlands, Norway, Spain, Sweden, and Switzerland). Participating sites included both inpatient and outpatient treatment services for both alcohol and drug use disorders [for a detailed methods description, see (van de Glind et al., 2013)].

In the first phase, the participants filled out a short questionnaire on demographics and substance use, and completed the World Health Organization Adult ADHD Self-Report Scale (ASRS) symptom checklist (Kessler et al., 2005). The ASRS is an 18-item questionnaire based on the criteria for ADHD in adulthood according to the Diagnostic and Statistical Manual of Mental Disorders Text Revised [DSM-IV-TR; (APA, 2000)]. The symptoms are rated from “never” to “very often” and scored from 0 to 4.

In the second phase (1-2 weeks after the phase 1 assessment), an extensive psychiatric interview (2-3 h) was administered to assess ADHD and other common comorbid psychiatric disorders on SUD patients. For the diagnosis of ADHD we used the Conners' Adult ADHD Diagnostic Interview for DSM-IV (CAADID); an instrument with proven reliability and validity (Epstein & Kollins, 2006; Ramos-Quiroga et al., 2012). CAADID is a semi-structured interview consisting of two parts. Part I collects information on demographics, developmental course, ADHD risk factors, and psychopathology and was filled out by the patient before the interview. Part II was administered by a trained clinician to investigate the presence of DSM-IV ADHD in childhood and in adulthood. Adult ADHD was regarded to be present if (A) at least 6 of the 9 ADHD symptoms of inattention and/or hyperactivity/impulsivity were present, (B) age of onset was below age 12; (C) symptoms

were pervasive; (D) ADHD symptoms caused functional impairment; and (E) no other mental disorder better explained the symptoms. For each symptom the interview contains examples of typical behaviors associated with that symptom in adulthood and in childhood. To assess the criterion E, the following semi-structured interviews were completed: (a) the Mini International Neuropsychiatric Interview (M.I.N.I.) Plus version 5.0.0 (Sheehan et al., 1998) to assess prior and current episodes of mood disorders (current and lifetime depression, manic episode/hypomania), SUD and antisocial personality disorder (ASPD); (b) the borderline module of the Structured Clinical Interview for DSM-IV Axis II [SCID II: (Williams et al., 1992) to assess the presence of borderline personality disorder (BPD)].

For the assessment of CTE, we used dichotomous questions about childhood maltreatment from part I of the CAADID childhood environmental risk factors section, including sexual, physical and emotional abuse, neglect and family violence (As a child or adolescent, did you ever experience any of the following? Sexual abuse Y/N, Physical abuse Y/N etc.).

The study was approved by the ethics committee in each participating country and all patients provided written informed consent.

3.1. Participants

Between 2009 and 2011, treatment seeking SUD patients in ten countries, aged 18–65 years were invited to participate in the study. Participating sites included both inpatient and outpatient treatment services for both alcohol and drug use disorders. There were no formal exclusion criteria but some patients were unable participate in the study (e.g. those presenting with acute intoxication, or acute deterioration of a serious psychiatric or somatic disorder). Only patients with valid CAADID data ($N = 1274$) for diagnostic assessment of ADHD were included in the present study. Of these, 63 had not answered questions about CTE and were regarded as drop out. The majority of participants was male (73.4%) with a mean age of 40.0 ($SD = 11.2$); most were single or divorced (74%) and not working (unemployed, sick leave or social benefit; 70.5%). Primary alcohol and drug use disorders were about equally distributed: 54.6% and 45.4%, respectively. The prevalence of comorbid DSM-IV childhood and adult ADHD in the total sample of SUD patients was 21.3% and 14.1%, respectively with a significantly higher prevalence of adult ADHD in primary drug use disorder patients compared to primary alcohol use disorder patients ($OR\ 2.26$). Detailed description of sample characteristics was presented in a previous publication by van de Glind et al. (2014).

3.2. Statistical analyses

3.2.1. Prevalence of CTE and the association of CTE and adult ADHD—Chi-square on dichotomous and t -tests on dimensional measures were calculated for demographic variables, main substance of abuse and the presence of CTE. To quantify the effect of CTE on the presence of childhood and adult ADHD, we calculated the risk for ADHD in bivariate analyses as odds ratios and relative risks for those with and without (specific types of) CTE. To quantify the effect of the trauma load, i.e. presence of several types of CTE, the number of (specific types of) CTEs on ADHD in SUD patients was

calculated with zero CTEs as the reference group. A trend test for the effect of increasing number of CTE was calculated.

Logistic regressions were performed for the above analyses controlling for age (at time of study) and sex. As the sample characteristics differed for the primary substance of abuse (alcohol versus drugs), logistic regression analyses included an interaction term for main substance of abuse (alcohol/drugs) and the separate trauma variables. The interaction analyses were performed for main substance of abuse and trauma, main substance of abuse and the specific types of trauma and main substance of abuse and number of traumas. No significant interactions were found and therefore no interaction terms were included in the final models. As a next step, logistic regression analyses were performed including BPD and ASPD in the model.

3.2.2. Role of CTE in ADHD persistence and symptom severity—*t*-Tests were used to assess the difference in mean levels of ADHD symptom severity (total score from the 18 items of the ASRS) for the presence or absence of the different types of CTE. To test the interaction between the number of multiple CTE and ADHD symptom severity, a simple linear regression was performed. The effect of CTE on the persistence of childhood ADHD into adulthood was examined using analyses stratified for those with and without childhood ADHD (all SUD patients with an adult ADHD diagnosis had childhood ADHD by definition). Statistical analyses were conducted with SAS v9.3 and with SPSS v22.

4. Results

4.1. Prevalence of CTE

The prevalence rates for the different types of CTE in the total sample were: sexual abuse 13.2%, physical abuse 28.6%, emotional abuse 38.3%, violence in the family 27.7%, and neglect (emotional or physical) 22.4%. Among the CTE types, only ‘neglect’ was significantly associated with the primary substance of abuse: more drug than alcohol use disorder patients reported neglect (26.4% and 19.3% respectively; $p = 0.004$).

Of the total sample 649 (53.6%) reported at least one CTE. Table 1 presents characteristics for CTE and non CTE groups. CTE was associated with being female (OR 1.97; 95% CI 1.52-2.57), being younger ($p = 0.024$), being on sick leave (OR 1.54; 95% CI 1.09-2.18) and being on disability benefit (OR 1.48; 95% CI 1.01-2.18). Furthermore, CTE was associated with the presence of a comorbid diagnosis of childhood ADHD (OR 2.61; 95% CI 1.94-3.51) and adult ADHD (OR 2.6; 95% CI 1.833-7.1) in these treatment seeking SUD patients.

4.2. Association of CTE and adult ADHD

Table 2 presents the results for the logistic regression analyses with adult ADHD as the dependent variable, CTE (subtypes and numbers) as the independent variable, and age, sex, and primary substance of abuse (alcohol or drugs), BPD, and ASPD as covariates. Single type of trauma and multiple types of trauma (as a continuous variable) were analyzed separately. All types of CTE except physical abuse were associated with ADHD. In addition,

the number of CTEs was associated with adult ADHD, with four or five CTEs resulting in ORs of 2.10 (95% CI 1.18–3.75) and 2.84 (95% CI 1.24–6.50), respectively.

4.3. CTE and ADHD persistence—To investigate the effect of CTE on the persistence of ADHD we compared the prevalence of adult ADHD for those with childhood ADHD with and without CTE. Of 186 individuals with CTE and childhood ADHD, 127 (68.3%) had ADHD in adulthood and of 75 individuals with childhood ADHD without CTE, 48 (64.0%) had ADHD in adulthood. The association between any CTE and the persistence of ADHD was not significant after controlling for the potential confounding effects of age, sex, primary substance of abuse, BPD, and ASPD (OR 0.99; 95% CI 0.53–1.85).

4.4. CTE and ADHD severity—For SUD patients with a comorbid diagnosis of adult ADHD no differences were found in self-reported ADHD symptom severity between those with and without CTE single type (Table 3). A simple linear regression analysis of ASRS score and multiple traumas gave a mean increase in ASRS score of 0.1 per number of traumas for those with ADHD ($p = 0.844$) and 1.3 for those without ADHD ($p < 0.0005$).

5. Discussion

The findings from this international multi-center study show a high frequency of childhood trauma (53.6%) in treatment seeking SUD patients consistent with earlier findings in SUD populations (Huang et al., 2012; Oviedo-Joekes et al., 2011). SUD patients with childhood trauma show increased rates (19.5%) of ADHD compared to those without trauma (8.5%); this was true for majority of single type (emotional and sexual abuse, violence in the family and neglect) and multiple types of trauma. This effect was independent of sex, age, primary substance of abuse (alcohol/drugs), BPD, and ASPD. Trauma was not associated with ADHD symptom severity among ADHD patients, but trauma was associated with increased symptom levels in ASRS among those not diagnosed with ADHD. Neither single nor multiple types of trauma were associated with the persistence of ADHD from childhood to adult age.

To our knowledge, no prior studies have investigated the association between trauma and ADHD in treatment seeking SUD patients. The results of the present study show a strong association between CTE and the presence of ADHD in treatment seeking SUD patients. This is important because both CTE and ADHD, concurrently and independently, have a negative influence on the course and outcome of SUD treatment (Kaye et al., 2013; Rounsaville et al., 1991; Wilens & Fusillo, 2007).

CTE did not affect the persistence of childhood ADHD into adulthood. It has been debated whether childhood abuse and neglect may cause ADHD-like symptoms (agitation, difficulties concentrating) leading to inflated rates of ADHD. If that was the case, one might expect that the ADHD persistence rate would be affected by the presence of CTE. However, there was no significant effect of CTE on the persistence of childhood ADHD to adult ADHD, the ADHD persistence rate in SUD patients with CTE (68%) was well within the range of the existing literature (Faraone et al., 2006; Lara et al., 2009) confirming that CTE

does not affect the persistence of childhood ADHD into adulthood in the present sample of treatment seeking SUD patients.

How are these findings to be understood? High rates of childhood trauma could be a consequence of childhood ADHD. For example, impulsive behavior may lead to potentially risky situations exposing the child to traumatic events. However, this does not explain the relation between parental neglect and ADHD, although it could be argued that the behavior of ADHD children can negatively affect the caregivers' ability to adequately care for the child. Impulsivity of the child is also less likely to play a role in sexual abuse in children, since the majority of the childhood sexual perpetrators are care givers, close relatives or somebody else the child knows relatively well (Finkelhor, Shattuck, Turner, & Hamby, 2014). However, with growing age and autonomy that leads to more contacts outside home environment, impulsivity in adolescents with ADHD could play a role in victimization through sexual abuse. This cross-sectional study does not allow us to make causal inferences about the observed strong association between childhood trauma and ADHD and - although we controlled for age, sex, primary substance of abuse and other comorbidities (BPD and ASPD), other aspects such as socioeconomic and familial factors and genetic loading may each play a role and more research is needed to disentangle cause and effect.

We found that CTEs were also associated with ADHD symptoms among SUD patients not meeting diagnostic criteria. This finding is novel and intriguing. On one hand, it might reflect the fact that CTEs can lead to ADHD-like symptoms (agitation, difficulties concentrating). On the other hand, it is consistent with the idea that, rather than being a categorical entity, ADHD is better conceived as a dimension of cognitive and behavioral dysregulation in the population. Because the latter idea is supported by twin studies (Levy, Hay, McStephen, Wood, & Waldman, 1997) further work should investigate if it also applies to the association between ADHD and CTEs.

An important clinical implication of the study is the need to carefully assess history of abuse and neglect and its consequences in treatment seeking SUD patients, also indicated by the high prevalence of PTSD in SUD patients (Farrugia et al., 2011; Read, Brown, & Kahler, 2004). Prior research indicates that individuals with ADHD may be vulnerable to the development of PTSD after traumatic experiences (Adler, Kunz, Chua, Rotrosen, & Resnick, 2004). We did not assess patients for PTSD and, therefore, cannot see whether PTSD due to CTE is associated with ADHD in this sample.

5.1. Limitations

Some methodological limitations need to be considered when interpreting the results. First, CTE was assessed with single dichotomous questions (yes/no) for each type of trauma providing no information on severity or reoccurrence of (specific) trauma exposures. However, the prevalence of childhood maltreatment in our study was similar to previous studies using different assessment procedures (Huang et al., 2012; Darke & Torok, 2013). Second, retrospective data is susceptible to recall bias and may lead to under or over reporting of childhood trauma. Finally, in real life differentiating between types of abuse is difficult as they often co-occur e.g. emotional abuse is often closely entwined with physical abuse and sexual abuse can hardly be separated from physical abuse. These factors may

result in participants reporting the most serious type of abuse and failing to report the other – less severe -types of abuse, but this is probably true for both SUD patients with and without ADHD and it is therefore not very likely that it influences the relationship between CTE and ADHD in the current study.

6. Conclusions

To conclude, this combination of findings suggest that the increased rate of adult ADHD in SUD patients with childhood trauma is not the consequence of a negative effect of CTE on the persistence of childhood ADHD into adulthood, but a direct expression of the high rate of childhood ADHD in SUD patients with CTE. The high prevalence of childhood maltreatment in treatment seeking substance users with ADHD calls for early interventions in children and adolescents with ADHD. Also, in adult treatment seeking SUD patients, assessment of traumatic experiences is of major importance.

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References

- Adler LA, Kunz M, Chua HC, Rotrosen J, Resnick SG. Attention-deficit/hyperactivity disorder in adult patients with posttraumatic stress disorder (PTSD): Is ADHD a vulnerability factor? *Journal of Attention Disorders*. 2004; 8(1):11–16. Epub 2005/01/27. [PubMed: 15669598]
- Antshel KM, Kaul P, Biederman J, Spencer TJ, Hier BO, Hendricks K, et al. Posttraumatic stress disorder in adult attention-deficit/hyperactivity disorder: Clinical features and familial transmission. *The Journal of Clinical Psychiatry*. 2013; 74(3):e197–e204. Epub 2013/04/09. [PubMed: 23561240]
- APA. Diagnostic and statistical manual of mental disorders 4th edition Text revision edition. Washington, DC: The American Psychiatric Association; 2000.

- Banducci AN, Hoffman E, Lejuez CW, Koenen KC. The relationship between child abuse and negative outcomes among substance users: Psychopathology, health, and comorbidities. *Addictive Behaviors*. 2014; 39(10):1522–1527. Epub 2014/07/01. [PubMed: 24976457]
- Bernardi S, Faraone SV, Cortese S, Kerridge BT, Pallanti S, Wang S, et al. The lifetime impact of attention deficit hyperactivity disorder: Results from the National Epidemiologic Survey on alcohol and related conditions (NESARC). *Psychological Medicine*. 2012; 42(4):875–887. Epub 2011/08/19. [PubMed: 21846424]
- Biederman, J., Petty, C., Spencer, TJ., Woodworth, KY., Bhide, P., Zhu, J., et al. The World Journal of Biological Psychiatry. Vol. 15. The Official Journal of the World Federation of Societies of Biological Psychiatry; 2014. Is ADHD a risk for posttraumatic stress disorder (PTSD)? Results from a large longitudinal study of referred children with and without ADHD; p. 49-55. Epub 2013/04/24
- Chan YF, Dennis ML, Funk RR. Prevalence and comorbidity of major internalizing and externalizing problems among adolescents and adults presenting to substance abuse treatment. *Journal of Substance Abuse Treatment*. 2008; 34:14–24. [PubMed: 17574804]
- Carpentier PJ, van Gogh MT, Knapen LJ, Buitelaar JK, De Jong CA. Influence of attention deficit hyperactivity disorder and conduct disorder on opioid dependence severity and psychiatric comorbidity in chronic methadone-maintained patients. *European addiction research*. 2011; 17(1): 10–20. Epub 2010/10/01. [PubMed: 20881401]
- Charach A, Yeung E, Climans T, Lillie E. Childhood attention-deficit/hyperactivity disorder and future substance use disorders: Comparative meta-analyses. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2011; 50(1):9–21. Epub 2010/12/16. [PubMed: 21156266]
- Chen KW, Banducci AN, Guller L, Macatee RJ, Lavelle A, Daughters SB, et al. An examination of psychiatric comorbidities as a function of gender and substance type within an inpatient substance use treatment program. *Drug and Alcohol Dependence*. 2011; 118:92–99. [PubMed: 21514751]
- Dalsgaard S, Ostergaard SD, Leckman JF, Mortensen PB, Pedersen MG. Mortality in children, adolescents, and adults with attention deficit hyperactivity disorder: a nationwide cohort study. *Lancet*. 2015 Epub 2015/03/03.
- Darke S, Torok M. Childhood physical abuse, non-suicidal self-harm and attempted suicide amongst regular injecting drug users. *Drug and Alcohol Dependence*. 2013; 133(2):420–426. Epub 2013/08/03. [PubMed: 23906996]
- De Sanctis VA, Nomura Y, Newcorn JH, Halperin JM. Childhood maltreatment and conduct disorder: Independent predictors of criminal outcomes in ADHD youth. *Child Abuse & Neglect*. 2012; 36:11–12. 782–789. Epub 2012/11/14.
- Elliott JC, Stohl M, Wall MM, Keyes KM, Goodwin RD, Skodol AE, et al. The risk for persistent adult alcohol and nicotine dependence: The role of childhood maltreatment. *Addiction*. 2014; 109(5): 842–850. Epub 2014/01/10. [PubMed: 24401044]
- van Emmerik-van Oortmerssen K, van de Glind G, van den Brink W, Smit F, Crunelle CL, Swets M, et al. Prevalence of attention-deficit hyperactivity disorder in substance use disorder patients: A meta-analysis and meta-regression analysis. *Drug and Alcohol Dependence*. 2012; 122:1–2. 11–19. Epub 2012/01/03. [PubMed: 22153943]
- van Emmerik-van Oortmerssen K, van de Glind G, Koeter MW, Allsop S, Auriacombe M, Barta C, et al. Psychiatric comorbidity in treatment-seeking substance use disorder patients with and without attention deficit hyperactivity disorder: Results of the IASP study. *Addiction*. 2014; 109(2):262–272. Epub 2013/10/15. [PubMed: 24118292]
- Epstein JN, Kollins SH. Psychometric properties of an adult ADHD diagnostic interview. *Journal of Attention Disorders*. 2006; 9(3):504–514. Epub 2006/02/17. [PubMed: 16481667]
- Faraone S, Biederman J, Mick E. The age dependent decline of attention-deficit/hyperactivity disorder: A meta-analysis of follow-up studies. *Psychological Medicine*. 2006; 36(36):159–165. [PubMed: 16420712]
- Farrugia PL, Mills KL, Barrett E, Back SE, Teesson M, Baker A, et al. Childhood trauma among individuals with co-morbid substance use and post traumatic stress disorder. *Mental Health and Substance Use: Dual Diagnosis*. 2011; 4(4):314–326. Epub 2011/10/11. [PubMed: 21984884]

- Fenton MC, Geier T, Keyes K, Skodol AE, Grant BF, Hasin DS. Combined role of childhood maltreatment, family history, and gender in the risk for alcohol dependence. *Psychological Medicine*. 2013; 43(5):1045–1057. Epub 2012/08/14. [PubMed: 22883538]
- Finkelhor, D., Shattuck, A., Turner, HA., Hamby, SL. *The Journal of Adolescent Health*. Vol. 55. Official Publication of the Society for Adolescent Medicine; 2014. The lifetime prevalence of child sexual abuse and sexual assault assessed in late adolescence; p. 329-333. Epub 2014/03/04
- Frazier TW, Youngstrom EA, Glutting JJ, Watkins MW. ADHD and achievement: Meta-analysis of the child, adolescent, and adult literatures and a concomitant study with college students. *Journal of Learning Disabilities*. 2007; 40(1):49–65. Epub 2007/02/06. [PubMed: 17274547]
- Gilbert R, Widom CS, Browne K, Fergusson D, Webb E, Janson S. Burden and consequences of child maltreatment in high-income countries. *Lancet*. 2009; 373(9657):68–81. Epub 2008/12/06. [PubMed: 19056114]
- Green JG, McLaughlin KA, Berglund PA, Gruber MJ, Sampson NA, Zaslavsky AM, et al. Childhood adversities and adult psychiatric disorders in the national comorbidity survey replication I: Associations with first onset of DSM-IV disorders. *Archives of General Psychiatry*. 2010; 67(2): 113–123. Epub 2010/02/04. [PubMed: 20124111]
- Groenman AP, Oosterlaan J, Rommelse N, Franke B, Roeyers H, Oades RD, et al. Substance use disorders in adolescents with attention deficit hyperactivity disorder: A 4-year follow-up study. *Addiction*. 2013; 108(8):1503–1511. Epub 2013/03/20. [PubMed: 23506232]
- Huang MC, Schwandt ML, Ramchandani VA, George DT, Heilig M. Impact of multiple types of childhood trauma exposure on risk of psychiatric comorbidity among alcoholic inpatients. *Alcoholism, Clinical and Experimental Research*. 2012; 36(6):1099–1107. Epub 2012/03/17.
- Jonson-Reid M, Drake B, Kim J, Porterfield S, Han L. A prospective analysis of the relationship between reported child maltreatment and special education eligibility among poor children. *Child Maltreatment*. 2004; 9(4):382–394. Epub 2004/11/13. [PubMed: 15538037]
- Karam R, Breda V, Picon F, Rovaris D, Victor M, Salgado C, et al. Persistence and remission of ADHD during adulthood: A 7-year clinical follow-up study. *Psychological Medicine*. 2015 Jan. 23:1–12.
- Kaye S, Darke S, Torok M. Attention deficit hyperactivity disorder (ADHD) among illicit psychostimulant users: A hidden disorder? *Addiction*. 2013; 108(5):923–931. Epub 2012/12/12. [PubMed: 23227816]
- Kaye S, Gilseman J, Young J, Carruthers S, Allsop S, Degenhardt L, et al. Risk behaviours among substance use disorder treatment seekers with and without adult ADHD symptoms. *Drug and Alcohol Dependence*. 2014; 1(4):70–77. Nov.
- Kendler KS, Bulik CM, Silberg J, Hettema JM, Myers J, Prescott CA. Childhood sexual abuse and adult psychiatric and substance use disorders in women: An epidemiological and cotwin control analysis. *Archives of General Psychiatry*. 2000; 57(10):953–959. Epub 2000/10/04. [PubMed: 11015813]
- Kessler RC, Adler L, Ames M, Demler O, Faraone S, Hiripi E, et al. The World Health Organization. Adult ADHD Self-Report Scale (ASRS): A short screening scale for use in the general population. *Psychological Medicine*. 2005; 35(2):245–256. Epub 2005/04/22. [PubMed: 15841682]
- Kessler RC, Adler L, Barkley R, Biederman J, Conners CK, Demler O, et al. The prevalence and correlates of adult ADHD in the United States: Results from the National Comorbidity Survey Replication. *American Journal of Psychiatry*. 2006; 163(4):716–723. [PubMed: 16585449]
- Lara C, Fayyad J, de Graaf R, Kessler RC, Aguilar-Gaxiola S, Angermeyer M, et al. Childhood predictors of adult attention-deficit/hyperactivity disorder: Results from the World Health Organization World Mental Health Survey Initiative. *Biological Psychiatry*. 2009; 65(1):46–54. Epub 2008/11/14. [PubMed: 19006789]
- Lee SS, Humphreys KL, Flory K, Liu R, Glass K. Prospective association of childhood attention-deficit/hyperactivity disorder (ADHD) and substance use and abuse/dependence: A meta-analytic review. *Clinical Psychology Review*. 2011; 31(3):328–341. Epub 2011/03/09. [PubMed: 21382538]

- Levy F, Hay DA, McStephen M, Wood C, Waldman ID. Attention-deficit hyperactivity disorder: A category or a continuum? Genetic analysis of a large-scale twin study. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1997; 36:737–744. [PubMed: 9183127]
- Lim L, Radua J, Rubia K. Gray matter abnormalities in childhood maltreatment: A Voxel-wise meta-analysis. *The American Journal of Psychiatry*. 2014 Epub 2014/05/02.
- Magnusson A, Lundholm C, Goransson M, Copeland W, Heilig M, Pedersen L. Familial influence and childhood trauma in female alcoholism. *Psychological Medicine*. 2012; 42(2):381–389. Epub 2011/07/30. [PubMed: 21798111]
- McLeer SV, Callaghan M, Henry D, Wallen J. Psychiatric disorders in sexually abused children. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1994; 33(3):313–319. Epub 1994/03/01. [PubMed: 8169175]
- Oviedo-Joekes E, Marchand K, Guh D, Marsh DC, Brissette S, Krausz M, et al. History of reported sexual or physical abuse among long-term heroin users and their response to substitution treatment. *Addictive Behaviors*. 2011; 36:1–2. 55–60. Epub 2010/09/22. [PubMed: 20888700]
- Perez CM, Widom CS. Childhood victimization and long-term intellectual and academic outcomes. *Child Abuse & Neglect*. 1994; 18(8):617–633. Epub 1994/08/01. [PubMed: 7953902]
- Polanczyk GV, Salum GA, Sugaya LS, Caye A, Rohde LA. Annual Research Review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. 2015; 56(3):345–365. Epub 2015/02/05.
- Ramos-Quiroga JA, Diaz-Digon L, Comin M, Bosch R, Palomar G, Chalita JP, et al. Criteria and concurrent validity of adult ADHD section of the psychiatry research interview for substance and mental disorders. *Journal of Attention Disorders*. 2012 Epub 2012/08/24.
- Read JP, Brown PJ, Kahler CW. Substance use and posttraumatic stress disorders: Symptom interplay and effects on outcome. *Addictive Behaviors*. 2004; 29(8):1665–1672. Epub 2004/09/29. [PubMed: 15451135]
- Rounsaville BJ, Anton SF, Carroll K, Budde D, Prusoff BA, Gawin F. Psychiatric diagnoses of treatment-seeking cocaine abusers. *Archives of General Psychiatry*. 1991; 48(1):43–51. Epub 1991/01/01. [PubMed: 1984761]
- Rucklidge JJ, Brown DL, Crawford S, Kaplan BJ. Retrospective reports of childhood trauma in adults with ADHD. *Journal of Attention Disorders*. 2006; 9(4):631–641. Epub 2006/05/02. [PubMed: 16648230]
- Schwandt ML, Heilig M, Hommer DW, George DT, Ramchandani VA. Childhood trauma exposure and alcohol dependence severity in adulthood: Mediation by emotional abuse severity and neuroticism. *Alcoholism, Clinical and Experimental Research*. 2013; 37(6):984–992. Epub 2013/01/03.
- Scott KL, Wolfe DA, Wekerle C. Maltreatment and trauma: Tracking the connections in adolescence. *Child and Adolescent Psychiatric Clinics of North America*. 2003; 12(2):211–230. viii. Epub 2003/05/03. [PubMed: 12725009]
- Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *The Journal of Clinical Psychiatry*. 1998; 59(Suppl 20):22–33. quiz 4-57. Epub 1999/01/09.
- Simon V, Czobor P, Bálint S, Mészáros A, Bitter I. Prevalence and correlates of adult attention-deficit hyperactivity disorder: meta-analysis. *The British Journal of Psychiatry: the Journal of Mental Science*. 2009; 194(3):204–211. Mar. [PubMed: 19252145]
- Teicher MH, Anderson CM, Ohashi K, Polcari A. Childhood maltreatment: Altered network centrality of cingulate, precuneus, temporal pole and insula. *Biological Psychiatry*. 2014; 76(4):297–305. Epub 2013/11/12. [PubMed: 24209775]
- van de Glind, G., Van Emmerik-van Oortmerssen, K., Carpentier, PJ., Levin, FR., Koeter, MW., Barta, C., et al. International Journal of Methods in Psychiatric Research. 2013. The International ADHD in Substance Use Disorders Prevalence (IASP) study: Background, methods and study population. Epub 2013/09/12
- van de Glind G, Konstenius M, Koeter MW, van Emmerik-van Oortmerssen K, Carpentier PJ, Kaye S, et al. Variability in the prevalence of adult ADHD in treatment seeking substance use disorder

patients: Results from an international multi-center study exploring DSM-IV and DSM-5 criteria. *Drug and Alcohol Dependence*. 2014; 134:158–166. Epub 2013/10/26. [PubMed: 24156882]

Weich S, Patterson J, Shaw R, Stewart-Brown S. Family relationships in childhood and common psychiatric disorders in later life: Systematic review of prospective studies. *The British Journal of Psychiatry: the Journal of Mental Science*. 2009; 194(5):392–398. Epub 2009/05/02. [PubMed: 19407266]

Whittle S, Dennison M, Vijayakumar N, Simmons JG, Yucel M, Lubman DI, et al. Childhood maltreatment and psychopathology affect brain development during adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2013; 52(9):940–952. e1. Epub 2013/08/27. [PubMed: 23972696]

Wilens TE, Kwon A, Tanguay S, Chase R, Moore H, Faraone SV, et al. Characteristics of adults with attention deficit hyperactivity disorder plus substance use disorder: the role of psychiatric comorbidity. *The American journal on addictions/American Academy of Psychiatrists in Alcoholism and Addictions*. 2005; 14(4):319–327. Epub 2005/09/29.

Wilens TE, Fusillo S. When ADHD and substance use disorders intersect: Relationship and treatment implications. *Current Psychiatry Reports*. 2007; 9(5):408–414. Epub 2007/10/05. [PubMed: 17915081]

Williams JB, Gibbon M, First MB, Spitzer RL, Davies M, Borus J, et al. The Structured Clinical Interview for DSM-III-R (SCID). II. Multisite test-retest reliability. *Archives of General Psychiatry*. 1992; 49(8):630–636. Epub 1992/08/11. [PubMed: 1637253]

Windle M, Windle RC, Scheidt DM, Miller GB. Physical and sexual abuse and associated mental disorders among alcoholic inpatients. *The American Journal of Psychiatry*. 1995; 152(9):1322–1328. Epub 1995/09/01. [PubMed: 7653688]

Highlights

- CTE was more frequent in adult treatment seeking SUD patients with comorbid ADHD compared to those without ADHD.
- CTE was not associated with severity of ADHD symptoms.
- CTE did not effect the persistence of ADHD into adulthood.

Table 1

Characteristics of treatment seeking substance users with childhood trauma exposure (CTE yes) and without childhood trauma exposure (CTE no).
Logistic regression with CTE as the independent variable and demographics as the dependent variable.

	CTE yes (n = 649) ^a	CTE no (n = 562) ^a	OR	95% CI	p-Value
Sex (% female)	217 (33.4)	113 (20.1)	1.97	1.52–2.57	<0.0001
Age, y (mean, SD)	39.5 (10.6)	41.0 (11.7)			0.024
Civil status ^b n (%)					0.053
Living with partner	67 (10.5)	39 (7.0)	1.23	0.90–1.68	0.190
Divorced	112 (17.5)	117 (21.0)	0.98	0.67–1.42	0.896
Single	359 (56.0)	297 (52.3)	1.71	1.06–2.75	0.028
Housing ^c n (%)					0.126
Homeless/shelter	58 (9.3)	43 (7.9)	1.27	0.81–1.99	0.307
Alone	289 (46.4)	223 (40.9)	1.22	0.92–1.61	0.174
With friends	29 (4.7)	24 (4.4)	1.13	0.63–2.03	0.674
With parents	194 (19.1)	85 (13.6)	0.77	0.53–2.75	0.151
Occupation ^d n (%)					0.047
Unemployed	251 (38.7)	212 (28.5)	1.29	0.98–1.70	0.067
Sick leave	120 (18.5)	85 (15.4)	1.54	1.09–2.18	0.014
Disability benefit	87 (13.4)	64 (11.6)	1.48	1.01–2.18	0.043
Main substance of abuse ^e n (%)					
Illicit drugs	303 (23.8)	236 (18.5)	1.23	0.98–1.54	0.079
ADHD					
Childhood	186 (14.6)	75 (5.9)	2.61	1.94–3.51	<0.0001
Adult	127 (10.0)	48 (3.8)	2.61	1.83–3.71	<0.0001

^aMissing information on CTE (n = 63).

^bMissing information on social status (n = 75).

^cMissing information on housing (n = 106).

^dMissing information on occupation (n = 91).

Missing information on main substance of abuse (n = 12).

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Table 2

Logistic regression with type of childhood traumatic experience (CTE) as independent variable and ADHD as a dependent variable, controlled for age, sex, and main substance of abuse (drug/alcohol), BPD and ASPD.

	OR	95% CI	p-Value
CTE ^a	1.91	1.29–2.81	0.001
Type of CTE			
Sexual abuse ^b	2.16	1.36–3.43	0.001
Physical abuse ^c	1.27	0.87–1.86	0.211
Emotional abuse ^c	1.61	1.12–2.33	0.010
Violence in the family ^b	1.39	0.96–2.02	0.084
Neglect (physical or emotional) ^c	1.62	1.09–2.40	0.016
Number of CTE ^d			
1	1.75	1.04–2.95	0.036
2	1.89	1.09–3.30	0.025
3	1.77	0.99–3.16	0.054
4	2.10	1.18–3.75	0.012
5	2.84	1.24–6.50	0.014

^aMissing information on CTE (n = 63).

^bMissing information on CTE (n = 61).

^cMissing information on CTE (n = 60).

^dMissing information on CTE (n = 62).

Table 3

Self-reported ADHD symptoms (ASRS total score for 18 items) for treatment seeking substance users with and without ADHD by type of trauma.

		ASRS total score M (SD)			
		CTE Yes M (SD)	CTE No M (SD)	95% CI of difference	p-Value
Sexual abuse					
ADHD yes		46.3(11.4)	47.9(10.9)	-6.7 to 3.3	0.503
ADHD no		32.8(13.4)	29.7(12.3)	0.5 to 5.7	0.020
Physical abuse					
ADHD yes		47.3(12.2)	47.8(10.0)	-4.6 to 3.6	0.808
ADHD no		31.9(13.3)	29.4(12.2)	0.6 to 4.4	0.008
Emotional abuse					
ADHD yes		48.8(11.5)	46.3(10.1)	-1.3 to 6.3	0.202
ADHD no		31.3(13.0)	28.8(12.0)	1.9 to 5.2	<0.0001
Violence in the family					
ADHD yes		48.4(11.7)	47.0(10.4)	-2.6 to 5.4	0.496
ADHD no		32.3(12.7)	29.3(12.3)	1.2 to 4.8	0.002
Neglect (physical or emotional)					
ADHD yes		46.9(11.6)	48.0(10.6)	-5.3 to 3.2	0.616
ADHD no		33.5(11.9)	29.2(12.5)	2.3 to 6.2	<0.0001
Multiple CTE					
ADHD yes		47.6(1.1)	47.6(1.8)	-4.2 to 4.2	0.998
ADHD no		31.7(0.6)	28.5(0.6)	1.6 to 4.8	<0.0001

Missing information on ASRS total score or CTE (n = 204).