

Published in final edited form as:

*Drug Alcohol Depend*. 2013 July 1; 131(0): 78–84. doi:10.1016/j.drugalcdep.2012.12.003.

# The prevalence of substance use disorders and psychiatric disorders as a function of psychotic symptoms

**William V. Lechner**[a,*], **Jennifer Dahne**[b], **Kevin W. Chen**[c], **Alison Pickover**[d], **Jessica M. Richards**[b], **Stacey B. Daughters**[e], and **C.W. Lejuez**[b]

[a]Department of Psychology, Oklahoma State University, Stillwater, OK 74075, United States

[b]Center for Addictions, Personality, and Emotion Research, University of Maryland, College Park, MD 20742, United States

[c]Center for Integrative Medicine, and Department of Psychiatry, University of Maryland School of Medicine, Baltimore, MD 21201, United States

[d]Department of Psychology, University of Memphis, Memphis, TN 38152, United States

[e]Department of Psychology, University of North Carolina, Chapel Hill, NC 27599, United States

## Abstract

**Background—**Psychotic symptoms represent one of the most severe and functionally impairing components of several psychological disorders. One group with particularly high rates of psychotic symptoms is chronic substance users. However, the literature on psychotic symptoms and substance use is quite narrow and has focused almost exclusively on drug-induced psychosis, neglecting the population of substance users with psychotic symptoms occurring independently of acute drug effects.

**Method—**The current study examined demographics, substance dependence, and psychiatric comorbidities among substance users with current (CurrSx), past (PastSx), and no psychotic symptoms (NoSx). Patients ($n$ = 685) were sequential admissions to a residential substance use treatment center from 2006 to 2009.

**Results—**Compared to NoSx, those who endorsed CurrSx were significantly more likely to meet criteria for lifetime alcohol dependence and lifetime amphetamine dependence. CurrSx were more likely than PastSx to meet for lifetime cannabis dependence. Additionally, CurrSx were more likely to meet criteria for a comorbid psychiatric disorder compared to NoSx, and evidenced a greater number of current psychiatric disorders. NoSx were less likely than both CurrSx and PastSx to meet criteria for Borderline Personality Disorder.

[*]Corresponding author. Tel.: +1 405 744 0326. William.lechner@okstate.edu (W.V. Lechner).

**Contributors**

William Lechner took the lead on developing the conceptualization for the paper, conducting the relevant statistical analyses, and preparing the manuscript. Jennifer Dahne, Kevin Chen, Jes-sica Richards, Stacey Daughters and Carl Lejuez worked closely with William Lechner and contributed extensively on manuscript preparation, literature review, and paper conceptualization. Alison Pickover was extensively involved with data management and participated in generating new written material for the manuscript. All authors contributed to and have approved the final manuscript.

**Conflict of interest**

There are no conflicts of interest.

**Conclusion—**Individuals with non-substance induced psychotic symptoms appear to meet criteria for specific substance use disorders and psychiatric disorders at higher rates than those without psychotic symptoms; these effects were most evident for those with current as opposed to past symptoms. Findings suggest that these individuals may need specialized care to address potential psychiatric comorbidities and overall greater severity levels relative to substance users without psychotic symptoms.

### Keywords

Substance dependence; Psychiatric disorders; Psychotic symptoms; Comorbidity inpatient treatment

## 1. Introduction

Psychotic symptoms, including delusional beliefs and hallucinatory experiences, are associated with significant psychosocial impairment (Granholm et al., 2009, 2011; Tarrier et al., 1993) and may place affected individuals at a heightened risk of developing clinically relevant psychotic disorders including schizophrenia (Fonseca-Pedrero et al., 2011; Laurens et al., 2007; Lataster et al., 2009). Incidence of psychotic symptoms in the general population has been reported to range from 4.8% to 8.3% depending on the specific symptom examined (Nuevo et al., 2012). Substance users represent one group with particularly high rates of psychotic symptoms (Kuzenko et al., 2011; Smith et al., 2009), and these symptoms can pose significant challenges during substance use treatment. Indeed, individuals with substance use disorders and co-occurring psychosis frequently evidence less motivation to change, reduced treatment engagement, and an increased likelihood of dropping out of treatment prematurely relative to individuals with substance use disorders alone (for review, see Horsfall et al., 2009).

Despite the clear negative impact that psychotic symptoms can have on substance users, relatively little is known about this group, as the available literature on substance use and psychotic symptoms has focused almost exclusively on acute drug-induced psychosis (Barnett et al., 2008; Smith et al., 2009). In the few studies that have examined non-substance induced psychosis among substance users, the studies were often limited to a narrow set of drug classes (e.g., Dekker et al., 2009; Kuzenko et al., 2011; Salo et al., 2011; Lichlyter et al., 2011) and most did not address key variables such as psychiatric comorbidity. One study that did assess a wide range of drug classes and psychiatric comorbidities reported elevated rates of dependence and comorbidity among individuals endorsing psychotic symptoms (McMillan et al., 2009). However, the methodology utilized in this study did not examine specific psychotic symptoms and relied on participant recall of previous psychiatric diagnoses made by health care providers. A more recent study examining the effects of substance abuse on subsequent psychotic symptoms revealed that a significant portion of the occurrence of subclinical psychotic symptoms in adulthood may be attributed to excessive cannabis and multiple-drug use during adolescence (Rosller et al., 2012). However, the design of the study restricts direct causal interpretations and Diagnostic and Statistical Manual of Mental Disorders criteria were not used to classify substance use in all cases. Additionally, both of these studies (Rosller et al., 2012 and McMillan et al.,

2009) used a general population rather than participants within a clinical setting for substance use treatment. Thus, the field lacks a clear clinical picture of individuals with co-occurring substance use disorders and non-substance induced psychosis presenting for treatment.

To better characterize this particularly at-risk group, the current study examined demographic characteristics, substance dependence, and psychiatric comorbidity among substance users with current, past, and no psychotic symptoms utilizing the Structured Clinical Interview for the DSM-IV and the Diagnostic Interview for Personality Disorders. The study was conducted in a residential drug treatment setting that required full detox prior to entry and constant sobriety throughout treatment, which holds several strengths for the purposes of this report. First, assessing individuals in the context of sobriety allows for the isolation of psychotic symptoms from acute drug effects. Second, this approach provides a control for contextual factors that may differ between those with and without psychotic symptoms outside of the treatment setting that might differentially impact assessment. Third, although the residential setting does limit generalizability to the larger group of substance users not in treatment or in a less restrictive form of treatment, there are aspects of this setting that may increase generalizability by limiting differential self-exclusion by more impaired individuals due to the burden of study participation. Specifically, the center takes in a broad range of voluntary and court-mandated individuals and once enrolled in the center, research participation requires no travel and little other investment on the part of the individual. This removal of several barriers to participation and the subsequent impact on differential self-selection may be especially important in a study focused on psychotic symptoms. The purpose of the current study was to assess results presented in previous research indicating that individuals endorsing psychotic symptoms evince a greater likelihood of meeting dependence criteria for several substances including marijuana (Rosller et al., 2012; Dekker et al., 2009), cocaine (Kuzenko et al., 2011), amphetamines (Lichlyter et al., 2011), as well as Poly-drug use (Rosller et al., 2012), within the context of the improvements in methodology listed previously. Additionally, we aimed to assess previous results indicating that individuals endorsing psychotic symptoms often meet criteria for mood and anxiety disorders at an increased rate relative to individuals with no history of psychotic symptoms (Michail and Birchwood, 2009; Koreen et al., 1993). Lastly, we examined differences between individuals endorsing past versus current psychotic symptoms in terms of meeting criteria for substance use, mood, and anxiety disorders.

## 2. Methods

### 2.1. Participants

Patients ($n$ = 685) were sequential admissions into an inpatient substance use treatment facility in Washington, D.C. from 2006 to 2009. The mean age of the sample was 43 ($SD$ = 10.5). The majority of the sample was male (65.9%) and court-mandated to treatment (70.8%). The majority of the sample consisted of African Americans (90.3%), followed by Caucasians (4.5%), Hispanics (1.8%), American Indian/Alaskan Natives (.5%), Asians (.3%), and individuals identifying as “other” (2.6%). At the time of admission into the treatment center, participants were required to submit a negative urine drug screen. Those

with positive drug screens had to complete a detoxification program and evidence no acute pharmacological effects of drug use before they were admitted to the facility; there was great variety in the detoxification programs used across participants but most included medical assistance over several days. Inpatient treatment typically ranged from 28 to 180 days and was dependent on the patients' treatment funding sources. Patients were only permitted to leave the facility for scheduled appointments such as psychiatric and primary care appointments. Drug-testing occurred on a weekly basis and any use was grounds for immediate removal from the center. Because patients were assessed early in their treatment, none had been removed from treatment at the time of assessment. Patients were involved in a number of daily programs intended to help them develop a substance-free lifestyle. These programs were based on Alcoholics Anonymous and Narcotics Anonymous techniques and included relapse prevention skills training.

### 2.2. Recruitment and consent

Intake assessments were conducted by doctoral level graduate students and senior research staff with patients during their first week at the inpatient substance use treatment center. The assessments served two purposes: (1) to provide diagnostic information to treatment staff at the center, and (2) to gather data for the current study. Patients were invited to participate in research following the intake assessment and were provided details regarding how information collected during the assessment would be used. Data for the current study includes only cases where informed consent was obtained from patients following the assessment (<5% of patients declined to provide informed consent). The study protocol was reviewed and approved by the University of Maryland Institutional Review Board.

### 2.3. Measurements

Information regarding Axis I disorders and Antisocial Personality Disorder (ASPD) was garnered using the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders IV (SCID-IV; First et al., 1995). A brief assessment of demographic information was also included and the Diagnostic Interview for Personality Disorders (DIPD) was used to assess Borderline Personality Disorder (BPD), as it has been argued to be a more comprehensive measure of BPD than the SCID-IV (Zanarini et al., 1987). Patients met criteria for psychotic symptoms using the SCID-IV if they evidenced either delusions or hallucinations as defined by the Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV). Current psychotic symptoms were indicated if the individual reported experiencing the symptoms in the past month, whereas lifetime psychotic symptoms were indicated if psychotic symptoms were reported as ever occurring, but not in the past month. In the context of the assessment, we were careful to exclude substance-induced psychotic symptoms. In all cases where a psychotic symptom was endorsed, the interviewer only indicated the symptom was present if at least one episode was entirely unrelated to acute pharmacological effects. This was determined with a very comprehensive timeline of substance use and psychiatric symptoms with the requirement that symptoms occur during periods of sobriety of at least 3 days. For patients without any period of sobriety the assessment focused on ensuring the symptoms occurred outside of periods of acute intoxication. As such we feel confident that psychotic symptoms could be separated from acute drug effects, but it should be noted that the etiological basis of psychotic symptoms

cannot be determined with complete accuracy due to lack of information related to the age of onset of the symptoms. Moreover, our assessment could not separate chronic substance use effects given the possibility of residual symptoms of substance induced psychotic symptoms remaining even after the acute effects of the substance had dissipated.

Patients were diagnosed with current substance dependence with the SCID-IV if they endorsed at least three symptoms of dependence for at least one month within the past year (all symptoms did not have to meet threshold in the same month). Lifetime dependence was diagnosed when patients met threshold at any point in their lives including current dependence. Substance abuse was not assessed given the severity of the sample and the secondary status of abuse compared to a dependence diagnosis. Interviewers attended to the timeline of substance dependence to differentially diagnose Axis I disorders due to substance use or other underlying causes. Diagnoses were made only when symptoms could not be tied directly to acute substance intoxication or the effects of withdrawal from a substance

Extensive training and comprehensive weekly supervision by a doctoral level clinical psychologist was provided to interviewers to ensure accuracy of diagnoses. As part of training, interviewers viewed the complete video protocol from the developers of the SCID-IV, conducted two mock interviews using the SCID-IV and the DIPD, observed two full interviews by experienced interviewers at the inpatient treatment center, conducted a final certification practice interview using the SCID-IV and DIPD, and participated in weekly supervision. Clinical questions were addressed and group feedback regarding diagnoses was provided during weekly supervision meetings. When disagreements occurred, discussion continued until consensus was reached and changes were made.

### 2.4. Analytic strategy

The completed questionnaires and diagnostic interviews were carefully reviewed and checked for completeness or obvious errors before data entry. Data were double entered into SPSS (versions 14–18 over the course of the study) so potential inconsistencies or inaccuracies could be easily detected and resolved. There were occasional missing data points due to non-responses such as: “don’t know” or “refused”. We did not implement any imputation procedure for these missing data except for income, where we filled ($n$ = 30 missing) with the mean income in order to maximize the number of cases included in the analyses. Therefore, for the majority of variables examined, the $N$’s will vary across analyses. The current data differs from our previous and independent data collection from Chen et al., 2011 where we utilized longer assessments to establish current and past dependence independently. Our new strategy was implemented to reduce the duration of the SCID as requested by the treatment center. Descriptive analyses, ANOVAs, and chi-square tests from the 2 × 3 contingency table were used to examine demographic characteristics and the prevalence of substance dependence and psychiatric comorbidities of different subgroups by psychotic symptom status. Odds ratios from logistic regressions were utilized to report differences between specific subgroups for categorical variables, and Tukey’s HSD was used to test the significance of differences in pair-wise comparisons in ANOVA for continuous variables. Appropriate demographic covariates were determined by a significant

univariate relationship between the demographic variable and the outcome variable for logistic regressions. Significant demographic differences were then entered as covariates along with the three main psychotic groups; current psychotic symptoms, past psychotic symptoms, and no psychotic symptoms. For logistic regressions comparing current psychotic symptoms and past psychotic symptoms to no psychotic symptoms, the no symptoms group served as the reference point. For logistic regressions comparing current psychotic symptoms with past psychotic symptoms, the past psychotic symptoms group served as the reference.

## 3. Results

### 3.1. Psychotic symptoms and demographic differences

Overall, 10.9% ($n$ = 75) of the sample reported one or more current psychotic symptoms (i.e., CurrSx), 6.7% ($n$ = 46) of the sample had past but not current symptoms (PastSx), and 82.3% ($n$ = 564) of the sample endorsed no psychotic symptoms (NoSx). The rates of specific delusions endorsed within the current study ranged from .3% (Bizarre Delusions) to 5.7% (Delusions of Reference), and rates of specific hallucinations ranged from 2.2% (other hallucinations; e.g. Tactile, Olfactory) to 16.8% (auditory hallucinations). Descriptive analyses of demographic characteristics by psychotic symptoms status are shown in Table 1; only significant differences are discussed here. CurrSx were older ($M$ = 46.1) than PastSx ($M$ = 42.2) and NoSx ($M$ = 42.8). CurrSx evidenced a lower percentage of males than NoSx. PastSx had a greater rate of unemployment than NoSx. CurrSx, compared to NoSx, had higher rates of previous treatment for a substance use disorder, psychiatric treatment, and psychiatric medication. No significant group differences were evidenced for race, income per month, education, or time in jail.

### 3.2. Comorbid psychotic symptoms and substance use disorders

Table 2 presents the prevalence of DSM-IV substance use disorders as a function of psychotic symptom status. Overall, compared to NoSx, those who endorsed CurrSx evinced significantly greater odds of meeting criteria for lifetime alcohol dependence (OR = 1.89, C.I. = 1.54–3.10) and lifetime amphetamine dependence (OR = 4.31, C.I. = 1.36–13.55). CurrSx demonstrated greater odds of meeting criteria for lifetime cannabis dependence than Past Sx (OR = 2.89, C.I. = 1.07–7.79), however no significant differences in lifetime cannabis dependence emerged between these groups and NoSx. CurrSx had a higher number of lifetime dependence diagnoses ($M$ = 1.88) compared to NoSx ($M$ = 1.42).

### 3.3. Comorbid psychotic symptoms and other psychiatric disorders

Table 3 indicates the presence of DSM-IV mood, anxiety, and personality disorders as a function of psychotic symptom status. Generally, CurrSx had greater odds of meeting criteria for a current comorbid psychiatric disorder compared to NoSx (OR = 5.81, C.I. 2.45–13.74) and PastSx (OR = 3.40 C.I. = .10–.89). CurrSx also evidenced a greater number of current psychiatric disorders as compared to NoSx (1.25 vs. .49) and PastSx (1.25 vs. . 58).

Specific to individual disorders, CurrSx had greater odds of meeting criteria for current mood disorders compared to NoSx (OR = 3.36, C.I. = 2.02–5.56) and PastSx (OR = 2.81, C.I. = 1.25–6.31). More specifically, CurrSx had greater odds of meeting criteria for Current Major Depressive Disorder and Bipolar Disorder compared to NoSx, (See Table 3 for Odds Ratios). PastSx also had greater odds of meeting criteria for Current Bipolar Disorder compared to NoSx. An examination of current anxiety disorder diagnoses revealed a similar pattern to what was observed in current mood disorders. Specifically, CurrSx evidenced greater odds for meeting criteria for current anxiety disorders than NoSx (OR = 3.33, C.I. = 1.91 = 5.78). More specifically, CurrSx demonstrated greater odds for meeting criteria for Current Panic Disorder, Current Social Phobia, Current Specific Phobia, Current Obsessive Compulsive Disorder, and Current Post-Traumatic Stress Disorder as compared to NoSx (See Table 3 for odds ratios). When examining the DSM-IV personality disorders of Borderline and Antisocial as a function of psychotic symptom status, CurrSx and PastSx had greater odds of meeting criteria for Borderline Personality Disorder than NoSx, (OR = 4.87, C.I. = 2.73–8.62) and (OR = 2.53, C.I. = 1.18–5.42), respectively.

## 4. Discussion

The current study examined rates of substance use disorders and psychiatric disorders among those endorsing current, past, or no psychotic symptoms in a sample of substance users in residential drug treatment. This paper marks the first effort to our knowledge to characterize substance using individuals with psychotic symptoms independent of acute substance-induced psychotic symptoms in a clinical setting, with a particular focus on demographic characteristics, substance dependence, and psychiatric comorbidities. Individuals with comorbid substance dependence and non-drug induced psychotic symptoms represent an important population to study as their psychotic symptoms are likely to persist following drug cessation, making them a functionally different group than individuals who only evidence acute drug-induced psychosis. These functional differences suggest that they may have unique treatment needs. As such, knowing more about the prevalence of comorbid substance dependencies and psychiatric disorders within this group of individuals is the first step toward improving the treatments available to substance users presenting with a dual diagnosis.

Regarding substance use disorders, CurrSx differed from NoSx, as the former evidenced elevated rates of lifetime alcohol dependence and lifetime amphetamine dependence. It is important to note that significant differences in the prevalence of cocaine dependence as a function of psychotic symptom status were observed; however when age was entered into the logistic regression as a covariate the odds ratios for these variables were not significant. Overall, our findings suggest an increased prevalence of lifetime alcohol and amphetamine dependence, as well as a greater total number of lifetime substance use disorders, among substance-using patients reporting current psychotic symptoms.

The increased prevalence of amphetamine dependence (as well as cocaine dependence before controlling for age) among CurrSx is comparable to the findings reported by Kuzenko et al. (2011), who reported elevated rates of cocaine use among individuals with a history of two or more psychotic symptoms in a community sample. Neither our study, nor

Kuzenko et al. examined specific mechanisms driving the apparent relationship between psychotic symptoms and the use of cocaine and other stimulants in particular, as opposed to other addictive substances. However, some have suggested that brain dopaminergic pathways, which are implicated both in drug reward, as well as the neuropathology of schizophrenia and psychotic symptoms (i.e., hallucinations and delusions), may play a role (Rosller et al., 2012; Chambers et al., 2001; Curran et al., 2004). Given that stimulants, including amphetamine and cocaine, exert their addictive properties by working directly on dopaminergic receptors, it is perhaps unsurprising that the link between stimulant use and psychosis has been reported consistently across studies (Dalmau et al., 1999; Degenhardt and Hall, 2001; Farrell et al., 2002; McKetin et al., 2006; Ringen et al., 2008; Salo et al., 2011). Despite these theoretical connections, more work is certainly needed in order to clarify the role of dopaminergic functioning in the relationship between psychosis and increased vulnerability to stimulant dependence in particular, as well as the causal directionality of these relationships.

Our findings of increased total number of substance dependence diagnoses among individuals with CurrSx are also largely consistent with previous findings from research conducted in the general population, such that individuals reporting a history of psychotic symptoms were more likely to meet criteria for substance dependence across every drug examined (McMillan et al., 2009). Our results extend the findings of McMillan et al. (2009) as the design of the current study targeted substance users in a clinical setting who are at a greater for psychosis relative to the general population, provided greater control for sobriety during assessment, and utilized a carefully tailored methodology for assessing psychotic symptoms independent of the acute effects of a substance.

Conversely, some of our findings appear to contrast with extant data on psychosis and substance use. First, we did not observe increased rates of hallucinogen dependence among CurrSx, which contrasts with the significant relationship between psychedelic drug use and psychotic symptoms reported in previous studies (Kuzenko et al., 2011). However, it is worth noting that Kuzenko et al. (2011) operationalized “substance use” as having used a particular drug five times or more in one’s lifetime, whereas the current study assessed DSM-IV diagnoses of substance dependence based on responses to a structured interview. Similarly, we did not observe the increased prevalence of cannabis use among individuals with psychotic symptoms, as is commonly reported in the literature (Rosller et al., 2012; Dekker et al., 2009). Again, this apparent inconsistency may in fact be due to our rather strict threshold for identifying individuals who use cannabis. That is, we operationalized substance use in the current study as meeting DSM-IV criteria for substance dependence. Thus, it is possible that individuals with psychotic symptoms may indeed be at an increased risk of having used both hallucinogens and cannabis, but they may not necessarily be at an increased risk of becoming dependent on these drugs.

Beyond substance use, patients endorsing current psychotic symptoms also had a higher prevalence of comorbid psychiatric disorders than those without psychotic symptoms. Patients endorsing current psychotic symptoms were more likely than those with no history of psychotic symptoms to have comorbid mood and anxiety disorders, an expected result given that mood and anxiety disorders have been associated with both psychosis (Michail

and Birchwood, 2009; Koreen et al., 1993) and withdrawal from chronic drug use (e.g., Koob, 2010). Additionally, individuals with current or past psychotic symptoms were more likely than individuals with no history of psychotic symptoms to meet diagnostic criteria for Borderline Personality Disorder. Given the severity of this disorder, as well as the overlapping diagnostic criteria with psychosis (e.g., stress-induced paranoia in BPD), the differences could be expected. The absence of a significant difference in BPD rates between CurrSx and PastSx also is somewhat expected given the largely stable nature of this personality disorder over the lifetime (Miller et al., 1993; Trull et al., 2000).

Overall, findings suggest that substance users with co-occurring psychotic symptoms in residential drug treatment evidence a higher prevalence of dependence on alcohol and amphetamine, and a higher prevalence of psychiatric disorders. However, this study included limitations that are important to consider when interpreting the results. First, the sample consisted of individuals entering an inpatient treatment center for substance use rehabilitation, a group that is important for study but certainly not generalizable to all substance users. Second, the sample was also limited to largely one race and a specific geographic location, Washington, DC, which may have affected the types of substances used most frequently, and the demographics of the patient population. Therefore, this study should be supplemented with replication among additional populations and in other settings. Although biological testing is conducted and a negative urine drug screen is required before admission to the treatment facility, it is possible that patients could be experiencing prolonged withdrawal effects, which could be responsible for some of the psychotic symptoms endorsed. Additionally, recall bias may have influenced reporting of lifetime psychotic symptoms. The current study was also limited by the small sample size of individuals endorsing sedative, current amphetamine, and poly-drug dependence. Future studies should include adequate samples of these individuals to draw conclusions regarding the relations between these particular substance use disorders and psychotic symptom status. Additionally, the use of substance dependence as a criterion for inclusion in the current analysis rather than substance use limits the generalizability of the findings beyond individuals meeting full criteria for dependence and neglects individuals who are using at less severe levels. Similarly, individuals were included in the CurrSx and PastSx group categories if they reported any number of unusual perceptual experiences (e.g., visual, auditory, olfactory, or tactile hallucinations) or unusual beliefs that were inconsistent with their cultural background (e.g., persecutory, grandiose, or other unusual delusions); however, participants in the current study were not diagnosed with any particular DSM-IV psychotic disorder, such as schizophrenia. Therefore, it is unclear if our findings will necessarily generalize to populations of individuals diagnosed with schizophrenia. Finally, lack of information on age of onsets for psychotic symptoms, psychiatric disorders, and substance use disorders made it impossible to judge the potential causal relationships between psychotic symptoms and substance use disorders, or between psychotic symptoms and other psychiatric disorders. Future studies may seek to use longitudinal designs to elucidate the temporal relationships between the onset of each disorder type, and identify the directionality of any causal relationships that exist.

### 4.1. Conclusion

Limitations aside, the current study represents an important first step in understanding the clinical characteristics of substance users with non-substance induced psychotic symptoms. Results indicated that individuals with psychotic symptoms largely met criteria for specific substance use disorders and psychiatric disorders at higher rates than those not experiencing psychotic symptoms. These effects tend to be more pronounced among those with current psychotic symptoms relative to past psychotic symptoms but were evident for some psychiatric conditions regardless of whether the psychotic symptoms were current or past, and these relationships hold even after controlling for relevant demographic characteristics. Future research will need to replicate this work in other settings with more diverse samples, while working to identify potential mechanisms underlying the relationship between psychotic symptoms and psychiatric comorbidity among substance users, as well as the directionality of any causal relationships. Moreover, future researchers should work to identify more effective strategies to improve assessment and intervention for these highly vulnerable individuals.

## Acknowledgments

**Role of funding source**

This work was supported in part by NIDA grant R01 DA19405 awarded to Carl W. Lejuez. Aside from the grant review process, the funding source was not involved in the design, data collection, analysis, and interpretation, the writing of this report, nor the decision to submit this paper.

## References

Barnett, JH.; Fletcher, PC.; Cappa, SF.; Abutalebi, J.; Démonet, J-F.; Fletcher, PC.; Garrard, P. Cognition in schizophrenia. In: Cappa, SF.; Abutalebi, J.; Demonet, J-F.; Fletcher, PC.; Garrard, P., editors. Cognitive Neurology: A Clinical Textbook. Oxford University Press; New York: 2008. p. 419-446.

Chambers RA, Krystal JH, Self DW. A neurobiological basis for substance abuse comorbidity in schizophrenia. Bio Psychiatry. 2001; 50:71–83. [PubMed: 11526998]

Chen KW, Banducci LG, Macatee RJ, Lavelle A, Daughters SB, Lejuez CW. An examination of psychiatric comorbidities as a function of gender and substance type within an inpatient substance use treatment program. Drug Alcohol Depend. 2011; 118:92–99. [PubMed: 21514751]

Curran C, Byrappa N, Mcbride A. Psychosis: systematic review. Br J Psychiatry. 2004; 185:196–204. [PubMed: 15339823]

Dalmau A, Bergman B, Brismar B. Psychotic disorders among inpatients with abuse of cannabis, amphetamine, and opiates: do dopaminergic stimulants facilitate psychiatric illness? Eur Psychiatry. 1999; 14:366–371. [PubMed: 10683620]

Degenhardt L, Hall W. The association between psychosis and problematical drug use among Australian adults: findings from the National Survey of Mental Health and Well-Being. Psychol Med. 2001; 31:659–668. [PubMed: 11352368]

Dekker N, Linszen DH, De Haan L. Reasons for cannabis use and effects of cannabis use as reported by patients with psychotic disorders. Psychopathology. 2009; 42:350–360. [PubMed: 19752588]

Farrell M, Boys A, Bebbington P, Brugha T, Coid J, Jenkins R, Lewis G, Meltzer H, Marsden J, Singleton N, Taylor C. Psychosis and drug dependence: results from a national survey of prisoners. Br J Psychiatry. 2002; 181:393–398. [PubMed: 12411264]

First MB, Spitzer RL, Gibbon M, Williams JBW. The structured clinical interview for DSM-III-R personality disorders (SCID-II): I. description. J Personal Disord. 1995; 9:83–91.

Fonseca-Pedrero E, Paino M, Lemos-Giráldez S, Sierra-Baigrie S, Ordoñez-Camblor N, Muñiz J. Early psychopathological features in Spanish adolescents. Psicothema. 2011; 23:87–93. [PubMed: 21266147]

Granholm E, Ben-Zeev D, Link PC. Social disinterest attitudes and group cognitive-behavioral social skills training for functional disability in schizophrenia. Schizophr Bull. 2009; 35:874–883. [PubMed: 19628761]

Granholm E, Ben-Zeev D, Link PC, Bradshaw KR, Holden JL. Mobile assessment and treatment for schizophrenia (MATS): a pilot trial of an interactive text-messaging intervention for medication adherence, socialization, and auditory hallucinations. Schizophr Bull. 2011; 38:414–425. [PubMed: 22080492]

Horsfall J, Cleary M, Hunt GE, Walter G. Psychosocial treatments for people with co-occurring severe mental illnesses and substance use disorders (dual diagnosis): a review of empirical evidence. Harv Rev Psychiatry. 2009; 17:24–34. [PubMed: 19205964]

Koob GF. The role of CRF and CRF-related peptides in the dark side of addiction. Brain Res. 2010; 1314:3–14. [PubMed: 19912996]

Koreen AR, Siris SG, Chakos M, Alvir J. Depression in first-episode schizophrenia. Am J Psychiatry. 1993; 150:1643–1648. [PubMed: 8105706]

Kuzenko N, Sareen J, Beesdo-Baum K, Perkonigg A, Höfler M, Simm J, Lieb R, Wittchen HU. Associations between use of cocaine, amphetamines, or psychedelics and psychotic symptoms in a community sample. Acta Psychiatr Scand. 2011; 123:466–474. [PubMed: 21054283]

Lataster T, Wichers M, Jacobs N, Mengelers R, Derom C, Thiery E, Van Os J, Myin-Germeys I. Does reactivity to stress cosegregate with subclinical psychosis? A general population twin study. Acta Psychiatr Scand. 2009; 119:45–53. [PubMed: 18822092]

Laurens KR, Hodgins S, Maughan B, Murray RM, Rutter ML, Taylor EA. Community screening for psychotic-like experiences and other putative antecedents of schizophrenia in children aged 9–12 years. Schizophr Res. 2007; 90:130–146. [PubMed: 17207968]

Lichlyter B, Purdon S, Tibbo P. Predictors of psychosis in individuals with primary stimulant addictions. Addict Behav. 2011; 36:137–139. [PubMed: 20850224]

McKetin R, McLaren J, Lubman DI, Hides L. The prevalence of psychotic symptoms among methamphetamine users. Addiction. 2006; 101:1473–1478. [PubMed: 16968349]

McMillan KA, Enns MW, Cox BJ, Sareen J. Comorbidity of Axis I and II mental disorders with schizophrenia and psychotic disorders: findings from the national epidemiologic survey on alcohol and Related Conditions. Can J Psychiatry. 2009; 54:477–486. [PubMed: 19660170]

Michail M, Birchwood M. Social anxiety disorder in first-episode psychosis: incidence, phenomenology and relationship with paranoia. Br J Psychiatry. 2009; 195:234–241. [PubMed: 19721113]

Miller FT, Abrams T, Dulit R, Fyer M. Psychotic symptoms in patients with borderline personality disorder and concurrent axis I disorder. Hosp Community Psychiatry. 1993; 44:59–61. [PubMed: 8436363]

Nuevo R, Chatterji S, Verdes E, Naidoo N, Arango C, Ayuso-Mateos JL. The continuum of psychotic symptoms in the general population: a cross-national study. Schizophr Bull. 2012; 38:475–485. [PubMed: 20841326]

Ringen PA, Melle I, Birkenæs AB, Engh JA, Færden A, Jónsdóttir H, Nesvag R, Vaskinn A, Friis S, Larsen F, Opjordsmoen S, Sundet K, Andreassen OA. Illicit drug use in patients with psychotic disorders compared with that in the general population: a cross-sectional study. Acta Psychiatr Scand. 2008; 117:133–138. [PubMed: 18081921]

Rosller W, Hengartner MP, Angst J, Ajdacic-Grss V. Linking substance use with symptoms of subclinical psychosis in a community cohort over 30 years. Addiction. 2012; 107:1174–1184. [PubMed: 22151745]

Salo R, Flower K, Kielstein A, Leamon MH, Nordahl TE, Galloway GP. Psychiatric comorbidity in methamphetamine dependence. Psychiatr Res. 2011; 186:356–361.

Smith MJ, Thirthalli J, Abdallah AB, Murray RM, Cottler LB. Prevalence of psychotic symptoms in substance users: a comparison across substances. Compr Psychiatry. 2009; 50:245–250. [PubMed: 19374969]

Tarrier N, Beckett R, Harwood S, Baker A, Yusupoff L, Ugarteburu I. A trial of two cognitive-behavioural methods of treating drug-resistant residual psychotic symptoms in schizophrenic patients: I. outcome. Br J Psychiatry. 1993; 162:524–532. [PubMed: 8481745]

Trull TJ, Sher KJ, Minks-Brown C, Durbin J, Burr R. Borderline personality disorder and substance use disorders: a review and integration. Clin Psychol Rev. 2000; 20:235–253. [PubMed: 10721499]

Zanarini MC, Frankenburg FR, Chauncey DL, Gunderson JG. The Diagnostic Interview for Personality Disorders: interrater and test-retest reliability. Compr Psychiatry. 1987; 28:467–480. [PubMed: 3691072]

*Drug Alcohol Depend*. Author manuscript; available in PMC 2015 August 03.

**Table 1**

Demographic characteristics of patients by psychotic symptoms status.

| Demographic characteristics ($N \leq 685$) | Current psychotic symptom (75) | Past not current psychotic (46) | Never had psychotic symptom (564) | $F/\chi^2$ | $p$ | Pair-wise comparison ($p$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Current vs. past | Current vs. never | Past vs. never |
| Age [M (SD)] | 46.1 (8.28) | 42.23 (9.15) | 42.78 (11.04) | 3.29 | .038 | .020 | .033* | .941 |
| Gender (%male) | 48.6% | 59.1% | 69.5% | 13.98 | .001 | .272 | <.001** | .150 |
| Income per month [M (SD)] | 443 (621.37) | 367 (590.20) | 685 (4562.51) | .20 | .819 | – | – | – |
| Race (%African American) | 91.8% | 95.5% | 89.9% | 1.60 | .448 | – | – | – |
| Education (%<high school) | 41.1% | 54.5% | 36.8% | 5.70 | .058 | – | – | – |
| Employment (% unemployed or lay-off) | 84.7% | 95.3% | 74.3% | 12.74 | .002 | .082 | .054 | .002* |
| Ever spent time in jail (%) | 89.0% | 89.1% | 91.7% | .82 | .664 | – | – | – |
| Previous treatment for SUDs (%) | 84.9% | 71.7% | 65.6% | 11.41 | .003 | .081 | .001** | .398 |
| Previous treatment for psychiatric disorders (%) | 89.2% | 87.0% | 48.2% | 64.38 | <.001 | .711 | <.001** | <.001** |
| Med for psychiatric disorders | 91.8% | 89.1% | 43.5% | 87.94 | <.001 | .627 | <.001** | <.001** |

1. Chi-square test for the 2 × 3 contingency table, or *F*-test from ANOVA (for continuous variables).

* $p < 0.05$.

** $p \leq .001$.

**Table 2**

Prevalence (%) of Substance dependence and multiple drug addiction by psychotic symptom status and the odds ratios.

| Group substance use disorder ($N \leq 685$) | Current psychotic symptom (75) | Past not current psychotic (46) | Never had psychotic symptom (564) | $\chi^2$ [a]/$F$ | Odds ratio [b]/$F$ | | |
|---|---|---|---|---|---|---|---|
| | | | | | Current Sx vs. never | PastSx vs. never | CurrentSx. vs. PastSx |
| Lifetime alcohol | 56.0% | 41.3% | 37.9% | 9.40* | 1.89* | 1.16 | 1.63 |
| Current alcohol | 29.3% | 11.1% | 22.2% | 5.40 | 1.31 | .48 | 2.74 |
| Lifetime cannabis | 29.3% | 17.4% | 25.0% | 2.17 | 1.71 | .59 | 2.89* |
| Current cannabis | 10.7% | 4.5% | 7.8% | 1.47 | 2.05 | .59 | 3.43 |
| Lifetime opioid | 28.0% | 39.1% | 30.6% | 1.79 | .82 | 1.59 | .51 |
| Current opioid | 13.3% | 13.6% | 17.1% | .95 | .66 | .86 | .77 |
| Lifetime cocaine | 66.7% | 58.7% | 51.1% | 7.05* | 1.65 | 1.31 | 1.55 |
| Current cocaine | 38.7% | 29.5% | 29.2% | 2.83 | 1.22 | .97 | 1.27 |
| Lifetime amphetamine | 8.0% | 4.3% | 2.3% | 7.50* | 4.31* | 2.74 | 1.57 |
| Current amphetamine | 1.3% | NA[c] | .2% | 2.82 | NA[c] | NA[c] | NA[c] |
| Lifetime Hal/PCP | 24.0% | 19.0% | 19.6% | 1.03 | 1.81 | .95 | 1.90 |
| Current Hal/PCP | 6.7% | 4.5% | 8.4% | .99 | 1.11 | .47 | 2.35 |
| Lifetime any dependence | 88.9% | 87.2% | 89.0% | .98 | 1.20 | .91 | 1.32 |
| Current any dependence | 88.0% | 88.0% | 89.1% | .92 | 1.08 | .76 | 1.42 |
| No history of dependence | 11.1% | 12.8% | 11.0% | .98 | .72 | 1.10 | .65 |
| No current dependence | 12.0% | 12.0% | 10.9% | .93 | .93 | 1.32 | .65 |
| Lifetime # of dependences | 1.88 (1.24) | 1.69 (1.09) | 1.42 (1.07) | 6.72** | 11.69** | 2.80 | .71 |
| Current # of dependences | .90 (.961) | .63 (.718) | .77 (.841) | 1.48 | 1.59 | 1.10 | .11 |

[a] Chi-square test from the 2 × 3 contingency table, or $F$-test from ANOVA (for continuous variables).

[b] Logistic Regression of drug dependence is applied to each substance with control based on significant bivariate relationships.

[c] Sedative dependence, current amphetamine dependence (for Past Sx), and poly drug dependence were assessed but analyses are not listed due to small sample size.

* $p < 0.05$.

** $p \leq .001$.

## Table 3

Prevalence (%) of current psychiatric co-morbidity by psychotic symptom status and the odds ratios.

| Group substance use disorder ($N \leq 685$) | Current psychotic symptom (75) | Past not current psychotic (46) | Never had psychotic symptom (564) | $\chi^2$ [a]/$F$ | Odds ratio/$F$ | | |
|---|---|---|---|---|---|---|---|
| | | | | | Current Sx vs. never | Past Sx vs. never | Current Sx vs. Past Sx. |
| **Any mood disorder** | 52.7% | 26.1% | 23.1% | 29.33** | 3.36** | 1.20 | 2.81* |
| Major depressive disorder | 39.2% | 17.4% | 19.2% | 16.02** | 2.20* | .93 | 2.36 |
| Bipolar disorder | 13.5% | 8.7% | 3.4% | 16.27* | 4.48** | 2.73* | 1.64 |
| **Any anxiety disorder** | 50.0% | 21.6% | 25.1% | 18.10** | 3.33** | .86 | 3.85* |
| Panic disorder | 5.5% | 4.3% | 2.2% | 5.56 | 2.66* | 1.20 | 2.21 |
| Social phobia | 9.6% | 4.3% | 2.8% | 8.369* | 4.69* | 1.65 | 2.90 |
| Specific phobia | 10.3% | 2.8% | 3.1% | 7.433* | 3.10* | .85 | 3.65 |
| OCD | 5.5% | 2.2% | .5% | 14.07** | 16.48** | 6.58 | 2.50 |
| PTSD | 27.8% | 4.3% | 8.5% | 27.77** | 3.96** | .476 | 8.30* |
| GAD | 11.0% | 8.7% | 6.6% | 2.03 | 1.75 | 1.35 | 1.29 |
| Borderline personality disorder | 40.3% | 27.3% | 12.1% | 41.63** | 4.87** | 2.53* | 1.71 |
| Antisocial personality disorder | 44.8% | 51.2% | 36.8% | 4.58 | 1.31 | 1.71 | .77 |
| Any current psychiatric disorder other than psychotic | 91.2% | 75.6% | 63.4% | 22.53** | 5.81** | 1.70 | 3.40* |
| Mean # of current psychiatric disorders other than psychotic | 1.25 (1.10) | .58 (.91) | .48 (.77) | 22.38 | 45.49** | .48 | 9.52* |

Abbreviation: OCD, Obsessive Compulsive Disorder; PTSD, Post-traumatic Stress Disorder; GAD, Generalized Anxiety Disorder.

[a] Chi-square test from the 2 × 3 contingency table, or $F$-test from ANOVA (for continuous variables).

[b] Logistic regression of psychiatric disorder is applied to each disorder with control based on significant bivariate relationships.

* $p < 0.05$.

** $p \leq .001$.