Primary and substance-induced psychotic disorders in methamphetamine users

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Short Title: Psychotic disorders in methamphetamine users

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Abstract

This study investigates the rates of primary psychotic disorders (PPD) and substance-induced psychotic disorders (SIPDs) in methamphetamine (MA) users accessing needle and syringe programs (NSPs). The aim was to determine if there are systematic differences in the characteristics of MA users with PPDs and SIPDs compared to those with no psychotic disorder. Participants were 198 MA users reporting use in the previous month. Diagnosis was determined using the Psychiatric Research Interview for DSM-IV Substance and Mental Disorders (PRISM-IV). Current psychiatric symptoms and substance use were also measured. Just over half ($n=101$) of participants met DSM-IV criteria for a lifetime psychotic disorder, including 81 (80%) with a SIPD and 20 (20%) with a PPD. Those with a younger age of onset of weekly MA use were at increased risk of a lifetime SIPD. A current psychotic disorder was found in 62 (39%), comprising 49 SIPDs (79%) and 13 PPDs (21%). MA users with a current PPD were more likely to have received psychiatric treatment in the past month than those with a current SIPD, despite a similar level of psychotic symptom severity. A high proportion of MA users accessing NSPs have psychotic disorders, the majority of which are substance-induced.

Key words: methamphetamine, psychosis, substance-induced, drug use disorder, diagnosis

1.0 Introduction

The relationship between methamphetamine (MA) use and psychotic phenomenon is well established. These symptoms typically involve persecutory delusions and hallucinations, which usually remit following cessation of MA use (Ali et al., 2010). Cross-sectional studies have shown a link between recreational and regular MA use and psychotic symptoms, particularly among individuals with MA dependence (Hall et al., 1996; McKetin et al., 2008; McKetin et al., 2010). A 3-year prospective study of a treated sample of individuals with MA dependence found a five-fold increase in the risk of the presence of psychotic symptoms during MA use relative to abstinence (McKetin et al., 2013). Evidence for a dose-dependent relationship between days MA use and the presence of psychotic symptoms was also found.

The Fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines a substance-induced psychotic disorder (SIPD) as the development of prominent delusions and/or hallucinations during or within a month of intoxication or withdrawal from psychotomimetic drugs such as MA and cannabis. These are distinct from primary psychotic disorders (PPDs) among substance users in which the psychotic symptoms (i) preceded the onset of substance use; (ii) persisted substantially after the cessation of severe intoxication or acute withdrawal; (iii) are substantially in excess of what would be expected given the type, amount or duration of substance use; or (iv) there is a history of psychotic episodes that occurred independent of substance use (American Psychiatric Association, 2013).

A growing number of studies have examined the rates of psychotic disorders among MA users. A Norwegian study of 285 MA users admitted to two psychiatric hospitals, reported 9 (26%) out of 38 patients with a positive MA drug screen had a current MA induced psychotic disorder, with 55% of all diagnoses confirmed on the Mini-International Neuropsychiatric Interview (MINI) (Medhus et al., 2013). A study of 449 MA psychosis

patients who were admitted to a psychiatric hospital in Thailand between 2000 and 2001 found 16% had a current psychotic disorder on the MINI at 6- to 7-year follow-up (Kittirattanapaiboon et al., 2010).

Only two studies have compared MA users with and without psychotic disorders. Chen et al. (2003) compared MA users ($n=445$; Taiwanese psychiatric hospital and detention centres) with a lifetime diagnosis of a MA-induced psychotic disorder ($n=174$; 39%; using the Diagnostic Interview for Genetic Studies) with those without ($n=261$; 59%). A younger age of first MA use, use of larger amounts of MA, the presence of schizoid/schizotypal personality traits and major depressive depression, alcohol dependence and antisocial personality disorder were associated with an increased risk of a lifetime MA-induced psychotic disorder. Those with a MA-induced psychotic disorder were also five times more likely to have a family history of schizophrenia than those without psychosis (Chen et al., 2005). Glasner-Edwards et al. (2008) examined the outcomes of a treated sample of MA-dependent individuals ($n=526$) with ($n=68$; 13%) and without ($n=458$; 86%) a lifetime history of a psychotic disorder diagnosed at 3-year follow-up on the MINI. The presence of a psychotic disorder impacted on psychiatric but not substance use outcomes, including the frequency of MA use. Those with a lifetime history of psychotic disorder had an elevated risk and frequency of psychiatric hospitalizations, lifetime suicide attempts, more severe psychiatric symptoms and poorer medical, legal and employment outcomes at 3-year follow-up.

It is difficult to draw conclusions about the rates or distinguishing features of psychotic disorders among MA users due to methodological differences in the research conducted to date. Research has varied in the MA inclusion criteria used, ranging from MA users (Chen et al., 2003) to individuals with a positive urine screen for MA (Medhus et al., 2013), MA dependence (Glasner-Edwards et al., 2008; Salo et al., 2011) or MA psychosis

only (Kittirattanapaiboon et al., 2010). MA users have also been recruited from a variety of settings including psychiatric hospitals (Chen et al., 2003; Kittirattanapaiboon et al., 2010; Medhus et al., 2013), detention centers (Chen et al., 2003) and treatment settings for MA dependence (Glasner-Edwards et al., 2008). There are also variations in whether lifetime or current psychotic disorders (Glasner-Edwards et al., 2008; Kittirattanapaiboon et al., 2010) versus MA induced psychotic disorders (Chen et al., 2003; Medhus et al., 2013) were reported as well as the timing of diagnostic assessments. All but one study used brief structured clinical interviews that do not differentiate between primary and substance-induced psychotic disorders (Chen et al., 2003; Glasner-Edwards et al., 2008; Kittirattanapaiboon et al., 2010; Medhus et al., 2013), despite the psychotomimetic effects of MA (McKetin et al., 2013).

The only study which used the Structured Clinical Interview for DSM-IV (SCID) to differentiate primary from substance-induced psychotic disorders among a community sample of MA-dependent adults ($n=189$) found 24% ($n=45$) had a lifetime substance-induced psychotic disorder (SIPD) and 5% ($n=9$) had a lifetime primary psychotic disorder (PPD) (Salo et al., 2011). Research is yet to determine what proportion of MA users meet lifetime or current diagnostic criteria for a PPD or SIPD, or to compare the characteristics, course and outcomes in these diagnostic groups.

This study (i) examines rates of DSM-IV lifetime and current SIPD and PPD psychotic disorders in a community sample of MA users using the Psychiatric Research Interview for DSM-IV Substance and Mental disorders (PRISM-IV), a well-validated structured clinical interview developed to differentiate primary from substance-induced psychosis disorders. This study also (ii) compares MA users with lifetime SIPD, PPDs and no psychotic disorder on demographic and lifetime clinical and substance use variables, (iii) identifies which of these variables increase the risk of a lifetime SIPD and PPD relative to no

psychotic disorder, and (iv) compares MA users with a current PPD and SIPD on demographic and recent clinical and substance use variables.

2.0 Methods

2.1. *Participants and procedure*

Current MA users ($n=198$) were recruited from inner-city needle syringe programs (NSPs) in three Australian cities, which provide free needles and syringes. The sample consisted of 120 males (61%) and 78 (39%) females, with an average age of 31.65 (SD=8.18) years..

Participants were required to have used MA in the previous month and to identify MA as their primary drug of choice. The majority (91%, $n=172/198$) of participants had injected MA in their lifetime and 84% ($n=136/177$) reported current injecting MA use at 1-month follow-up. This is the most common method of MA use in Australia, with over two-thirds of treatment-seeking MA users reporting injecting use (McKetin et al., 2012).

Following collection of injecting materials, NSP clients were routinely asked their age, drug of choice and postcode. Those who indicated MA was their primary drug were invited to participate in a participating in a 12-month prospective study examining the relationship between MA and psychotic symptoms. Baseline interviews were conducted in interview rooms at the NSP or in a location convenient to the participant. The interviews were administered by researchers with postgraduate qualifications in psychology. The diagnostic interview was delayed if the participant had used MA in the past 24 h to ensure the reliability of the interview was not affected by acute MA intoxication. The TLFB was used to verify the most recent occasion of MA use. The study received approval from participating Ethics Committees. Participants received AUD\$10 as compensation for their time.

2.2. *Measures*

2.2.1. Structured clinical diagnostic interview

Sections 2 and 8 of the PRISM-IV Version 6 were administered to provide lifetime and current DSM-IV diagnoses of SIPD and PPD (Hasin et al., 1996). The PRISM achieves this by i) obtaining a lifetime and recent (past 12 months) time line of the onset and patterns (chronic intoxication/binge use; abstinence/minimal use) of substance use, ii) determining the temporal relationship of psychotic symptoms and substance use, and iii) providing detailed guidelines for differentiating primary disorders from SIPD and from the expected effects of intoxication and withdrawal. The PRISM also requires a 1-month active phase of two (or more) psychotic symptoms for a diagnosis of a PPD or a SIPD to be made. For a SIPD this active phase must occur entirely during a period of heavy substance use or within the first 4 weeks after cessation of use. The psychotic symptoms must also be greater than the expected effects of substance intoxication and/or withdrawal. A PPD is differentiated from a SIPD by the presence of an active phase that (i) begins 2 weeks before heavy substance use or persists for more than a month after abstinence or occasional substance use (when the expected effects of intoxication or withdrawal could not have occurred).

The PRISM reliably differentiates between PPD and SIPD ($\kappa=0.70-0.83$) with a high level of test-retest reliability (Torrens et al., 2004). PRISM diagnoses for SIPD and schizophrenia have significantly better concordance with diagnoses derived by mental health professionals using longitudinal, expert, all data (LEAD) criteria and than the SCID (Torrens et al., 2004). To reduce the length of the assessment session, the major depressive and manic episode modules of the MINI (Lecrubier et al., 1997) were administered, rather than the equivalent PRISM modules. The researchers were trained in the use of the PRISM by LH, an accredited user.

2.2.2. Substance use

The frequency of drug and alcohol use in the past 4 weeks was assessed using the calendar-based Timeline Follow Back method (TLFB; Fals Stewart et al., 2000). The TLFB has good test-retest reliability ($r \geq 0.79$) as well as convergent and divergent validity with other measures of substance use. The severity of MA, cannabis, heroin and alcohol dependence in the past year was assessed using the Severity of Dependence Scale (SDS; Gossop et al., 1995). The SDS is a well-validated measure of the severity of dependence that can be applied across various drug types (Gossop et al., 1995). It includes five items rated on a 4-point Likert scale, yielding a score from 0 to 15, with higher scores reflecting more severe dependence. Cut-off scores of ≥ 4 and ≥ 3 are equivalent to DSM-IV diagnoses of MA and cannabis dependence, respectively (Topp and Mattick, 1997; Swift et al., 1998). Information on the age of onset (lifetime and regular (weekly) of alcohol and drug use was collected from the PRISM.

2.2.3. Clinical measures

The 24-item Brief Psychiatric Rating Scale (BPRS; Lukoff et al., 1986) is a clinician-rated measure of the severity of positive, negative, manic-excitement and depression/anxiety symptoms in the last month, rated on a 7-point scale from 1 (not present) to 7 (extremely severe) scale. This measure has well-established reliability and validity in first episode psychosis and provides a measure of four subscales (positive, negative, manic-excitement, depression-anxiety symptoms) (Ventura et al., 2000). The principal researchers (L.H., S.D., R.M.) attended a BPRS training workshop provided by Professor Peter Ventura. They subsequently trained and supervised the research staff to ensure ongoing reliability. Out of the 2,019 interviews conducted during the 12-month study, 142 (7.03%) were rated for inter-rater reliability purposes. The intraclass correlation coefficient for the total BPRS score was 0.97. Information on the patient's personal and family history of schizophrenia and other

mental health disorders was obtained by asking if they or an immediate member of their family had a diagnosis of the following: schizophrenia, SIPD, bipolar disorder, anxiety or depression.

2.3. Analysis

MA users with a *lifetime* DSM-IV PPD, SIPD or no psychotic disorder were first compared on demographic and lifetime substance use and clinical variables, using Chi square tests for categorical data and analyses of variance (ANOVAs) for continuous data. A multinomial logistic regression analysis was then conducted to identify which of the potential predictors identified in the previous analyses differentiated MA users with *lifetime* SIPD and PPDs from those with no psychotic disorder. Age and gender were included in this analysis to control for key demographic characteristics. Family history of psychosis was also included as it has been associated with psychosis among MA users (Chen et al., 2003). Other clinical variables (e.g., personal psychiatric history) were not included in this analysis, given the adverse impact of zero or small cell sizes in the no psychotic disorder group on parameter estimates in the logistic models (Hosmer and Lemeshow 2005). A sub-analysis was conducted to compare MA users with a *current* PPD versus SIPD on demographic and recent substance use and clinical variables. All analyses used SPSS Version 22.0 software (SPSS Inc, Chicago, Ill) and statistical significance was determined using the 0.05 level and 2-tailed tests of significance.

3.0 Results

3.1. Rates of psychotic disorders in MA users

Fig. 1 displays the rates of DSM-IV psychotic disorders relative to no psychotic disorder (no lifetime history of any psychotic disorder), and lifetime and current PPDs and SIPDs diagnosed using the PRISM. Just over 50% ($n=101$) of the sample had a lifetime or current

psychotic disorder, including 81 (80%) with a lifetime or current SIPD and 20 (20%) with a lifetime or current PPD. A higher proportion of current and lifetime psychotic disorders were substance-induced rather than primary.

Insert Figure 1 about here

3.2. Comparisons of MA users with a lifetime SIPD, PPD and no psychotic disorder on demographic and lifetime substance use and clinical variables.

There were no significant between-group differences on any demographic variable (see Table 1). Participants with a PPD were most likely to have been diagnosed with schizophrenia ($\chi^2[2, n=197]=46.66, p<0.001$) or bipolar disorder ($\chi^2[2, n=197]=9.64, p=0.008$) in their lifetime (see Table 2). They had also presented to emergency departments or psychiatric hospitals on more occasions ($F(2, 144)=11.16, p<0.001$) than either the SIPD or no psychotic disorder group, and were more likely to have taken psychiatric medication in their lifetime ($\chi^2[2, n=196]=15.46, p<0.001$). Significant between-group differences in the age of onset of first ($F(2, 197)=3.58, p=0.030$) and regular (weekly) ($F(2, 191)=5.81, p=0.004$) MA use were found (see Table 2). Post hoc tests indicated that participants with a lifetime SIPD had significantly younger age of onset of first and regular MA use than those without a psychotic disorder. There was no difference in the age of onset of MA use between the PPD and SIPD groups.

Insert Tables 1 & 2 about here

3.3. *Prediction of lifetime SIPD and PPDs relative to no psychotic disorder among MA users*

A multinomial logistic regression with simultaneous entry was conducted to determine which demographic and substance use variables differentiated MA users with a *lifetime* SIPD or PPD from those with no history of a psychotic disorder (Table 3). Since age of onset of regular MA use was the only substance use variable that differentiated between these diagnostic groups, it was the only other predictor entered into the equation along with age, gender and family history of schizophrenia (Table 3). The age when regular MA use started differentiated SIPD participants from those with no psychotic disorder, accounting for 8.8% (Nagelkerke *R* squared) of the variance in diagnostic status, with 52.7% diagnostic accuracy. Each one-year delay in the age of onset of weekly MA use decreased the odds of a SIPD by 0.94. No predictors differentiated participants with a PPD from those without psychotic disorder.

Insert Table 3 about here

3.4. *Comparison of MA users with a current SIPD and PPD on demographic and recent substance use and clinical variables.*

Participants with a current SIPD and PPD did not differ on any demographic variable (see Table 1). Participants with a current PPD were most likely to have presented to an emergency department or psychiatric hospital ($\chi^2[1, n=59]=9.07, p=0.003$) and to have taken psychiatric medication in the past month ($\chi^2[1, n=60]=7.12, p=0.008$), including antipsychotics ($\chi^2[1, n=61]=6.23, p=0.013$) (see Table 4). No significant between-group differences were found on the BPRS positive, negative, manic-excitement or depression-anxiety subscales or

the total score. The current SIPD and PPD groups did not differ on the frequency of MA, cannabis, alcohol or heroin use in the past 30 or 7 days. Sixty-three percent ($n=39$) MA users with a current psychotic disorder had MA dependence on the SDS. The same proportion had cannabis dependence ($n=39$), and 40% ($n=25$) had both MA and cannabis dependence. No significant differences in the rates of MA, cannabis or MA/cannabis dependence combined were found between the SIPD and PPD groups.

Insert Table 4 about here

4.0 Discussion

This is the first study to examine rates of lifetime and current SIPD and PPD disorders in a large sample of MA users, using a structured clinical interview designed to differentiate between these disorders (the PRISM). Just over half ($n=102$; 51%) of this sample of MA users accessing NSPs had a DSM-IV lifetime psychotic disorder, the majority of which were substance-induced (80%). Only 10% of the sample had PPDs. This rate of lifetime psychotic disorders is higher than those reported in previous research among MA users admitted to psychiatric hospitals (16-26%) (Chen et al., 2003; Medhus et al., 2013) and MA-dependent adults (27%) (Salo et al., 2011). This may reflect the fact that the current sample were injecting MA users, using a more potent method of MA administration that is associated with more frequent MA use (Hall and Hando, 1994) and increased risk of psychotic symptoms (McKetin et al., 2013). Nevertheless, a similar proportion of SIPDs (83%) relative to PPDs (17%) were found in the only other study which has differentiated primary from substance-induced psychotic disorders (using the SCID) among MA-dependent adults (Salo et al., 2011). This highlights the importance of differentiating SIPDs from PPDs in MA users and

suggests previous research may have underestimated the rates of psychotic disorders in MA users. Prospective research is required to examine the course and stability of PPD and SIPDs in MA users, as MA users with a SIPD may develop a PPD, and those with a PPD may develop a SIPD or have another PPD over time.

Increased risk of a lifetime SIPD relative to no psychotic disorder was associated with a younger age of onset of regular MA use but not a family history of schizophrenia in the logistic regression. Each 1-year delay in the onset of regular (weekly) MA use decreased the risk of a lifetime SIPD by a factor of 0.94. This is partially consistent with Chen's (2003) finding that age of first MA use and a family history of schizophrenia predicted lifetime MA-induced psychosis. The use of the DIGS as a diagnostic measure and exclusion of MA users with a history of psychosis in the Chen study may have contributed to this variation in findings. Neither the age of onset of regular MA use nor a family history of schizophrenia differentiated MA users with a lifetime PPD from those without a psychotic disorder. However, the exclusion of MA users personal psychiatric history from this analysis would have contributed to these results. MA users with a lifetime PPD were more likely to have a history of schizophrenia/bipolar disorder and received psychiatric treatment than those with no psychotic disorders in the group comparisons.

MA users with current SIPDs and PPDs were then compared. No significant differences in recent substance use or psychiatric symptom severity were found. This may be associated with the small number of MA users with a current PPD ($n=13$) in the sample. Nevertheless, the frequency of recent MA use was almost 50% higher in the SIPD group. Previous research comparing first episode psychosis samples with SIPD and PPDs has reported more frequent substance use in the SIPD group (Caton et al., 2005; Fraser et al., 2012), but further research among MA users is needed. Those with a current PPD were more likely to have accessed psychiatric treatment (including antipsychotic medication) in the past

month than those with a current SIPD. This indicates MA users with current SIPD were unlikely to seek or receive psychiatric treatment despite the presence of marked psychiatric symptoms comparable to those with a PPD, as no differences in psychiatric symptom severity between the two groups were found. Whether this is due to the PPD group being more likely to seek or receive treatment, or the SIPD group being less likely to seek treatment because they consider their symptoms to be substance-induced is unknown.

The cross-sectional nature of this study limits the conclusions that can be made regarding the impact of MA and other substance use on the onset, course or stability of diagnoses of SIPD and PPDs over time. While the sample size of MA users was large, it is not representative of MA users as participants were recruited from an NSP and had high rates of injecting MA use. Further research examining the rates and characteristics of SIPD and PPDs among MA users using other routes of MA use, from the community and treatment-based services is warranted. Although the SIPD/PPD groups did not differ on the SDS in the severity of MA dependence, future research is required to determine the impact of the presence of DSM-5 MA dependence on the rates and characteristics of these disorders in MA users. The use of the PRISM, a highly reliable and valid diagnostic interview for differentiating SIPD from PPD in substance users, is a major strength of the study. For a diagnosis of a PPD or a SIPD to be made, MA users were required to have an active phase of two (or more) psychotic symptoms present for at least a month, which were more severe than the expected effects of substance intoxication and/or withdrawal. No significant differences in BPRS symptoms or the frequency of MA, alcohol or other illicit drugs used in the 7 days before the interview were found between the SIPD and PPD groups. Participants were required to abstain from MA use in the 24 h before the PRISM interview, to ensure the reliability of the interview was not affected by acute MA intoxication. Together, these findings indicate that current results are unlikely to be due to the psychotomimetic effects of

MA intoxication or withdrawal. Finally, while a small proportion of MA users had a lifetime ($n=20$) and current PPD ($n=13$), the overall sample size was adequate for the analyses conducted (Hosmer and Lemeshow 2005).

Results indicating that almost a third of MA users accessing NSPs had a current psychotic disorder are alarming, as these services are not adequately equipped to manage individuals with acute psychotic disorders. There is an urgent need for NSPs to screen for psychotic symptoms in MA users, and work closely with addiction services and mental health services to ensure these have access to appropriate clinical care and treatment (Colfax et al., 2010). It is imperative that MA users with PPD are actively engaged in such care, due to the risk of relapse and other poor outcomes. The high rates of untreated SIPD among MA users, highlights the need for effective public health campaigns and early intervention programs highlighting the risks of psychotic symptoms and disorders in MA users.

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- 51% of MA users had a lifetime or current psychotic disorder
- Almost a third (31%) of MA users had a current psychotic disorder
- 80% of both lifetime and current psychotic disorders were substance induced
- A younger age of onset of weekly MA use increased risk of a lifetime SIPD
- MA users with a current SIPD or PPD did not differ on substance use or psychotic symptoms severity
- Despite this, those with a current PPD were more likely to have accessed psychiatric treatment
- These results highlight the importance of differentiating SIPDs from PPDs in MA users

Figure 1: Rates of current and lifetime psychotic disorders in MA users

Table 1. Comparisons of MA users with *lifetime* SIPD, PPD and no psychotic disorders and *current* SIPD versus PPDs on demographic variables.

Variable	<i>Lifetime</i> SIPD, PPD versus no psychotic disorder				<i>Current</i> SIPD versus PPD		
	No psychotic disorder (n=97)	PPD (n=20)	SIPD (n=81)	<i>p</i>	PPD (n=13)	SIPD (n=49)	<i>p</i>
Gender, <i>n</i> (%)							
Male	55 (57)	12 (60)	53 (65)		9 (69)	34 (69)	
Female	41 (42)	8 (40)	28 (35)	.540	4 (31)	15 (31)	.991
Age, M (SD)	32.95 (8.80)	30.25 (8.75)	30.44 (7.05)	.092	30.54 (8.97)	30.36 (6.99)	.941
Rel'ship, <i>n</i> (%)							
Single	78 (80)	17 (85)	56 (69)		11 (85)	34 (69)	
Partner	18 (19)	3 (15)	25 (31)	.107	2 (15)	15 (31)	.274
Education ≤ Year 12	55 (57)	11 (55)	41 (51)	.626	7 (54)	25 (51)	.856
Unemployed	56 (58)	9 (45)	44 (54)	.572	7 (54)	28 (57)	.831
Homeless	2 (2)	0	4 (5)	.379	0	4 (8)	.287
Living							
Alone	14 (14)	2 (10)	14 (17)		0	8 (16)	
Others	83 (86)	18 (90)	67 (83)	.691	13 (100)	41 (84)	.119
Ethnicity							
Caucasian	84 (87)	15 (75)	66 (81)		9 (69)	41 (84)	
Aboriginal	5 (5)	2 (10)	4 (5)		2 (15)	3 (6)	
Other	8 (8)	3 (15)	11 (14)	.635	2 (15)	5 (10)	.449

Note: Rel'ship: Relationships

Table 2. Comparisons of MA users with *lifetime* SIPD, PPD and no psychotic disorder on lifetime substance use and clinical variables

Variable	No psychotic disorder (n =97)	PPD (n=20)	SIPD (n=81)	p
Substance use, M (SD)				
Age of first use				
MA	20.75 (7.45)	18.70 (4.80)	18.33 (4.63)	.030
Alcohol	14.16 (3.60)	12.91 (2.64)	13.38 (2.63)	.135
Cannabis	15.44 (4.88)	13.87 (2.16)	14.43 (2.53)	.112
Age of onset weekly use				
MA	24.03 (8.32)	23.15 (5.69)	20.26 (6.37)	.004
Alcohol	16.72 (3.68)	16.11 (2.97)	16.67 (5.18)	.857
Cannabis	16.88 (6.13)	16.60 (4.66)	15.59 (3.94)	.294
Family history, n (%)				
Schizophrenia	12 (12)	3 (23)	10 (20)	.291
Bipolar	7 (7)	1 (8)	6 (12)	.506
Depression	31 (32)	4 (31)	15 (31)	.979
Anxiety	12 (12)	2 (15)	13 (27)	.057
Psychiatric history*, n (%)				
Schizophrenia	0	8 (40)	4 (5)	< .001
Bipolar	5 (5)	5 (25)	5 (6)	.008
Depression	34 (35)	9 (45)	31 (39)	.667
Anxiety	12 (12)	3 (15)	14 (18)	.631
SIPD	3 (3)	1 (5)	8 (10)	.157
Hospital admissions, M (SD)				
Total number	.26 (1.27)	2.71 (4.78)	.41 (.96)	< .001
Psychiatric medication, n (%)				
Any in lifetime	45 (46)	18 (95)	47 (59)	< .001
Antipsychotic	3 (3)	2 (10)	6 (7)	.301

Note: Psychiatric history*: based on patient self report

Table 3. Multivariate prediction of *lifetime* PPD and SIPD among MA users relative to no psychotic disorder, by selected demographic and substance use variables

Variables	PPD (n=20) c.f. no psychotic disorder			SIPD (n=81) c.f. no psychotic disorder		
	B (S.E)	OR (95% CI)	<i>p</i>	B (S.E)	OR (95% CI)	<i>p</i>
Age	-.05 (.04)	.96 (.88-1.04)	.28	-.02 (.02)	.98 (.94-1.03)	.48
Male gender	.27 (.53)	1.30 (.46-3.69)	.62	.38 (.34)	1.46 (.75-2.84)	.27
Family history of schizophrenia	-.60 (.66)	.55 (.15-2.02)	.37	-.60(.44)	.55 (.23-1.31)	.17
Age onset regular MA use	.03(.05)	1.03(.94-1.12)	.55	-.06(.03)	.94 (.89-.99)	.04

Note: Reference group: No psychotic disorder

Table 4. Comparison of MA users with *current* SIPD and PPD on current clinical and substance use variables

Variable M(SD)	PPD (n=13)	SIPD (n=49)	<i>p</i>
Meds (past month), <i>n</i> (%)			
Any	8 (62)	11 (22)	.008
Antipsychotics	4 (31)	3 (6)	.013
Hospital admission, <i>n</i> (%)			
Past month	4 (31)	2 (4)	.003
BPRS, M (SD)			
Positive (5-35)	9.92 (4.77)	8.58 (3.71)	.282
Negative (4-28)	6.23 (2.31)	5.91 (1.94)	.618
Mania (6-42)	10.00 (3.72)	11.25 (5.62)	.471
Depression-anxiety (4-28)	12.08 (5.66)	11.88 (4.37)	.891
Total score	43.33 (9.55)	45.23 (13.38)	.648
TLFB – 30 days, M (SD)			
MA	8.39 (8.81)	12.38 (10.06)	.199
Alcohol	5.92 (6.47)	8.43 (9.30)	.364
Drinks/day	4.27 (4.05)	8.51 (15.11)	.323
Cannabis	12.39 (12.12)	16.54 (13.76)	.299
Heroin	.08 (.28)	.71 (4.36)	.606
TLFB – 7 days, M (SD)			
MA	1.85 (2.23)	2.90 (2.50)	.176
Alcohol	1.62 (1.66)	1.92 (2.12)	.638
Cannabis	3.23 (2.80)	3.96 (3.24)	.431
Heroin	.08 (.28)	.15 (1.01)	.810
SDS, Total score, M (SD)			
MA	5.00 (4.74)	6.47 (4.22)	.284
Alcohol	1.53 (2.67)	4.11 (.60)	.185
Cannabis	4.08 (4.08)	4.87 (4.35)	.557
Heroin	.15 (.55)	0	.337
SDS Dependence, <i>n</i> (%)			
MA	6 (46)	33 (67)	.160
Cannabis	7 (54)	32 (54)	.447
MA & cannabis	3 (33)	22 (45)	.154

Notes: Meds: medication; BPRS: Brief Psychiatric Rating Scale; TLFB: Timeline follow back; SDS: Severity of Dependence Scale

Primary and substance-induced psychotic disorders in methamphetamine users

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