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ARTICLE

Psychotic symptoms in methamphetamine psychotic in-patients

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Abstract

The present study was aimed at exploring the prevalence and factor structure of methamphetamine (MA) psychotic symptoms. The data were obtained from a cross-country evaluation of substance use, health, and treatment in MA psychotic in-patients. The prevalence rates of lifetime and current psychotic symptoms were determined by using Mini-International Neurospychiatric Interview-Plus, Module M. The Manchester scale was used to assess the severity of psychotic symptoms during the week prior to assessment. All eight items of the Manchester scale were subjected to principal-component analysis, eigenvalue one test, and varimax rotation. The data of 168 patients (127 male and 41 female) included in the analyses were obtained from Australia, Japan, the Philippines and Thailand. Persecutory delusion was the most common lifetime psychotic symptom found in 130 participants (77.4%), followed by auditory hallucinations, strange or unusual beliefs, and thought reading. Auditory hallucinations were the most common current symptom found in 75 participants (44.6%), followed by strange or unusual beliefs and visual hallucinations. Current negative symptoms were also found in 36 patients (21.4%). Apart from a factor of anxiety and depression, the results yielded a two-factor model of MA psychotic symptoms, which were negative and positive/disorganized syndromes. The negative syndrome comprised poverty of speech, psychomotor retardation, and flattened/incongruous affects. The positive syndrome consisted of delusions, hallucinations, and incoherent speech. Both positive/disorganized and negative syndromes should be taken into account in assessing MA psychotic symptoms. The clinical findings do not support the shortcomings of amphetamine-induced psychosis in modelling the negative symptoms of schizophrenia.

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Key words: Amphetamines, factor analysis, methamphetamine, methamphetamine-induced psychotic disorder, psychotic symptoms.

Introduction

Methamphetamine (MA) psychosis or MA-induced psychotic disorder is perhaps one of the most widely known phenomena associated with chronic, high-dose, and/or continuous use of MA (Bell, 1973; Griffith et al., 1972; Hall et al., 1996). It is commonly described as closely simulating paranoid schizophrenia (Bell, 1965; Snyder, 1973). Moreover, both psychotic disorders usually respond to antipsychotic medications, which have dopaminergic antagonist properties (Angrist et al., 1974). The resemblance in many aspects between an amphetamine psychosis and schizophrenia has made this compound a primary psychotomimetic model agent in schizophrenia research.

As MA is widely used, MA psychosis is a common psychiatric problem in many parts of the world. The results of a recent survey have shown that the number of amphetamine-type stimulant users, in particular MA users, has surpassed those of opiate and cocaine users combined (United Nations Office for Drug Control and Crime Prevention, 2000). This leads to

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markedly increased proportions of MA psychotic patients in many mental health settings.

Although clinical evidence is needed to serve MA psychotic patients, few studies have been carried out in this area. In many respects, symptoms studies may be a priority because the results can be used as basic knowledge for further studies of MA psychosis, e.g. aetiology, course, prognosis, and treatment. In addition, the results of such studies could be used to ascertain the shortcomings of amphetamine-induced psychosis in modelling the negative (psychotic) or deficit symptoms of schizophrenia that have been discussed over the past decades (Javitt and Zukin, 1991; Sams-Dodd, 1995).

In MA psychosis, negative symptoms are much less commonly reported compared to positive (psychotic) symptoms. While most studies found high prevalence of delusions and hallucinations (Ellinwood, 1967; Kalant, 1966; Sato, 1992), very few of them mentioned negative symptoms, e.g. poverty of speech, psychomotor retardation, and a flattened affect. Although these studies closely examined the patients, one limitation of them appears to be the unsystematic evaluation of psychotic symptoms. Further, most studies were carried out before the concept of negative symptoms was widely accepted.

Previous findings of MA psychotic symptoms appear to be dissimilar to those of functional psychotic symptoms. While negative symptoms are rarely reported in MA psychosis, both positive and negative symptoms are found in functional psychoses (McIntosh et al., 2001; Ratakonda et al., 1998). Whether the prevalence of MA negative symptoms is actually low needs investigation. As the existence of negative syndrome in MA psychosis is not yet known, this evidence has implications not only for clinical practice but also for research, such as choosing appropriate outcomes and measures for MA psychotic patients. In addition, if negative symptoms are not an important part of MA psychosis, MA psychotic symptoms may be different from schizophrenic psychotic symptoms, and amphetamine-induced psychosis should not be used as a model of schizophrenia.

Other than the prevalence of psychiatric symptoms, factor analysis is another approach of symptoms study. This statistical technique can be used to determine which symptoms items are combined to generate a given factor or syndrome, as well as the clinical heterogeneity of mental disorders. The past decades have witnessed the benefits of using factor analytic studies in many psychiatric disorders, in particular, schizophrenia. Up to eight factor dimensions have been found to explain the psychopathology of schizophrenia (Peralta and Cuesta, 2001). The use of multifactor models has led to the findings of two or more underlying pathological processes and treatment response patterns in schizophrenic patients (Buchanan and Carpenter, 1994). In other functional psychotic and mood disorders, a three- or four-factor model has been found (McIntosh et al., 2001; Ratakonda et al., 1998). Although these studies were carried out in patients with functional psychoses, a negative syndrome was commonly found. To our knowledge, no factor analytical study of MA psychotic symptoms has previously been undertaken. We, therefore, propose to explore the factor structure, as well as the prevalence, of MA psychotic symptoms.

Methods

The data included in this study were obtained from a strand of the World Health Organization Amphetamine-Type Stimulant (ATS) Project related to a cross-country evaluation of MA psychosis. This strand was concurrently carried out in in-patient psychiatric units of several hospitals in Australia, Japan, the Philippines and Thailand. The study protocol was approved by the Ethics Committee of each participating hospital or institution. Written informed consent was obtained from each participant after the procedure had been fully explained.

The inclusion criteria for a participant were: (i) methamphetamine use during the week prior to the admission; (ii) evidence of substance-induced psychotic disorder; and (iii) the ability to understand the purpose of the study and complete study interviewing materials. The exclusion criteria were: (i) prior history of psychotic disorders not caused by substance use; (ii) risk of violence to clinical staff; (iii) severe risk of self-harm; and (iv) impaired sensorium. All patients were interviewed by trained psychiatrists within 3–7 d of admission.

Data relevant to substance use, health, and treatment were collected, but only those related to psychotic symptoms are presented here. The presence of lifetime and current psychotic symptoms was assessed by using the Mini-International Neuropsychiatric Interview-Plus (MINI-Plus), Module M. The MINI-Plus is a more detailed version of the MINI, a structured clinical interview for psychiatric diagnosis (Sheehan et al., 1998). Its reliability and validity have been tested and are comparable to the Structured Clinical Interview for Diagnostic and Statistical Manual (DSM)-III-R patient version diagnoses (SCID-P) and the Composite International Diagnostic

Table 1. The main characteristics of the patients in which their data were included in the factor analysis

Characteristics	Total ($n=168$)	Australia ($n=32$)	Japan ($n=36$)	The Philippines ($n=50$)	Thailand ($n=50$)	Significant difference
No. of males (%)	127 (75.6)	25 (78.1)	22 (61.1)	39 (78.0)	41 (82.0)	$\chi^2=5.47$, d.f. $=3$, $p=0.14$
Mean age (S.D.)	27.11 (7.62)	26.34 (6.02)	31.86 (9.79)	25.96 (5.60)	25.34 (7.33)	$F=6.67$, d.f. $=3$, $p<0.001$[a]
Mean age at first methamphetamine use (S.D.)	19.73 (5.93)	18.03 (5.43)	19.75 (5.26)	20.74 (5.99)	19.78 (6.55)	$F=1.37$, d.f. $=3$, $p=0.26$
Mean age when first having psychotic symptoms (S.D.)	24.95 (9.10)	25.47 (15.14)	26.15 (7.94)	24.64 (5.93)	24.10 (7.39)	$F=0.39$, d.f. $=3$, $p=0.76$

[a] Japanese participants were significantly older than participants in the other three countries ($p<0.05$ by Tukey HSD post-hoc comparisons after one-way ANOVA).

Interview for ICD-10 (CIDI). Superior to the MINI, SCID-III-R and CIDI, the MINI-Plus has specific items for the diagnosis of drug-induced mental disorders, e.g. drug-induced psychotic disorder.

The prevalence rates of lifetime and current persecutory delusion, thought reading, thought insertion, delusion of reference, strange or unusual beliefs, auditory hallucinations, and visual hallucinations were rated by the patients' responses ('yes' or 'no') to the MINI-Plus questions. Although the MINI-Plus separates bizarre and non-bizarre delusions, both were combined as were the presence of delusions. Disorganized speech, disorganized or catatonic behaviour, and negative symptoms were assessed on the basis of the patient's behaviour observed during the interview.

The Manchester scale was used to rate the severity of these symptoms during the week prior to assessment (Krawiecka et al., 1977). This scale was chosen because it is brief but covers a number of positive, disorganized, and negative symptoms found in most psychotic disorders.

The prevalence rate of each psychotic symptom was determined by its frequency obtained by the use of MINI-Plus, Module M. The Manchester scale scores were included in the factor analysis. All eight items of the scale were subjected to principal-component analysis for identifying the distinct factors. Eigenvalue one test was applied to keep or discard factors. Finally, varimax rotation was performed to elicit the factor components.

Results

A total of 181 patients participated in the study. The Manchester scale was not applied in 13 patients. Therefore, the data of 168 patients (127 male and 41 female) were included in subsequent analyses. The data of 32, 24, 50 and 50 patients were obtained from the participating sites in Australia, Japan, the Philippines and Thailand respectively. Most main characteristics of the patients included in present study are not significantly different across the countries (see Table 1). By the use of Tukey HSD post-hoc comparisons after one-way ANOVA, Japanese participants were found to be older than those participating in the other three countries ($F=6.67$, d.f. $=3$, $p<0.001$).

During the 3 months preceding admission, 103, 55, 27 and 18 patients smoked, injected, swallowed, and sniffed MA, respectively (some had more than one route of administration). During the week prior to admission, 26, 2, 2 and 1 patients also used marijuana, ecstasy, inhalant, and morphine respectively. Of the 26 patients who used marijuana, 6 patients also concurrently used cocaine, benzodiazepines, ecstasy, or heroin. Most patients were treated with conventional or atypical antipsychotic medications.

Table 2 shows the prevalence rates of lifetime and current psychotic symptoms elicited by the use of MINI-Plus, Module M. In lifetime, persecutory delusion was the most common symptom found in 130 participants (77.4%). Other common symptoms in lifetime were auditory hallucinations, strange or unusual beliefs, and thought reading. Auditory hallucinations were the most common current symptom found in 75 participants (44.6%). Current symptoms frequently found were strange or unusual beliefs and visual hallucinations. Current negative symptoms were also found in 36 patients (21.4%).

Delusions and hallucinations were the two most severe symptoms during the week prior to assessment

Table 2. Prevalence of lifetime and current psychotic symptoms elicited by the use of MINI, Module M ($n = 168$)

Psychotic symptom	No. of patients having symptoms (%)	
	Lifetime	Current
Persecutory delusion	130 (77.4)	35 (20.8)
Auditory hallucinations	122 (72.6)	75 (44.6)
Strange or unusual beliefs	98 (58.3)	39 (23.2)
Thought reading	89 (53.0)	27 (16.1)
Visual hallucinations	64 (38.1)	38 (22.6)
Delusion of reference	64 (38.1)	20 (11.9)
Thought insertion or made act	56 (33.3)	18 (10.7)
Negative psychotic symptoms[a]		36 (21.4)
Disorganized speech[a]		19 (11.3)
Disorganized or catatonic behaviour[a]		14 (8.3)

[a] Assessed on the basis of patient's behaviour observed during the interview only.

(see Table 3). With principal-component analysis of the Manchester scale individual items produced three factors with an eigenvalue greater than 1. Varimax rotation of the principal-component analysis yielded a three-factor model of the Manchester scale, accounting for 69.40% of the variance. The first factor, which accounted for 26.64% of the variance, comprised poverty of speech, psychomotor retardation, and flattened/incongruous affects. Because the first syndrome is comparable to schizophrenic negative syndrome, it should be called 'negative factor or syndrome'. The second factor, which accounted for 23.95% of the variance, consisted of delusions, hallucinations, and incoherent speech. Because this second syndrome is similar to both positive and disorganized factors of schizophrenic psychotic symptoms, it should be called 'positive/disorganized factor or syndrome'. Anxiety and depression constituted an independent factor, which accounted for 18.81% of the variance.

Discussion

Although negative symptoms were not as severe as positive symptoms, they could be found in at least 20% of the patients. The high prevalence of negative symptoms in this study may be explained by two reasons. First, by the use of a structured clinical interview, the interviewers were obligated to observe negative symptoms. Secondly, wide recognition of positive and negative symptoms over the past few decades may increase the interviewers' awareness of both positive and negative symptoms in this study.

The prevalence of current positive symptoms in this study is relatively lower than that in previous studies. While only 44.6 and 22.8% of the patients in this study currently had auditory hallucinations and persecutory delusions respectively, at least 75% of MA psychotic patients in a previous study had the same symptoms (Sato, 1992). Although the different methods of symptoms assessment may be a cause of the discrepancies, the exclusion of patients with moderate to severe violent behaviour from this study may lead to the low prevalence of positive symptoms. In addition, as positive psychotic symptoms can be resolved rapidly after a few days of MA cessation and/or antipsychotic treatment, the opportunity to assess the patients after many days of admission (up to 7 d in this study) may lead to the finding of low prevalence of positive symptoms. This possibility is also supported by the findings that, in this study, the lifetime prevalence of these symptoms was much higher than the current one.

Negative and positive/disorganized syndromes form a two-factor dimensional model of MA psychotic symptoms. The negative syndrome comprised poverty of speech, psychomotor retardation, and flattened/incongruous affects. The positive/disorganized syndrome consists of delusions, hallucinations, and incoherent speech. Although anxiety and depression formed another factor, they are not psychotic symptoms. In addition, the findings show that they can be separated from the first two psychotic factors.

Although the factor structures of MA and schizophrenic psychotic symptoms have some similarities, they are not identical. Two previous studies using the Manchester scale have found a three-factor model of schizophrenic psychotic symptoms (Johnstone and Frith, 1996; Tabares et al., 2000). By separating the item of flattened/incongruous affects into two, Johnstone and Frith (1996) found a disorganized factor comprising incoherent speech and an incongruous affect. The negative factor in that study consisted of poverty of speech, psychomotor retardation, and a flattened affect. Tabares et al. (2000) found a negative factor consisting of poverty of speech and psychomotor retardation. Flattened/incongruous affects and incoherent speech formed a disorganized factor. Although it is not clear why the present study finds only two factors, the item of flattened/incongruous affects may play a role. Among all items of the Manchester scale, this is the item with the lowest inter-rater reliability (Krawiecka et al., 1977). This may be caused by the fact that this item inappropriately combines two different

Table 3. Mean (S.D.) and factor analysis of 8-item Manchester scale[a]

Item	Mean (S.D.)	Factor 1	Factor 2	Factor 3
Negative factor				
Poverty of speech or mute	0.71 (0.92)	**0.86**	0.07	0.02
Psychomotor retardation	0.78 (0.83)	**0.83**	0.04	0.25
Flattened/incongruous affect	1.16 (1.01)	**0.75**	0.28	0.03
Positive/disorganized factor				
Coherently expressed delusions	2.14 (1.24)	0.08	**0.82**	0.13
Hallucinations	2.02 (1.35)	0.07	**0.79**	0.17
Incoherent and irrelevant speech	1.11 (1.10)	0.32	**0.67**	−0.29
General psychopathology factor				
Depression	1.14 (1.04)	0.19	−0.11	**0.85**
Anxiety	1.68 (1.01)	0.05	0.27	**0.76**
Eigenvalue		2.13	1.92	1.51
Per cent variance[b]		26.64	23.95	18.81

[a] Highest factor loading for each rating is in bold.
[b] Total = 69.40.

symptoms, which leads to various degrees of concern of the symptoms. The loading of this item therefore varies from study to study. Other than being a measuring problem, it is possible that the smaller number of factors found in this study reflects the less clinical heterogeneity of MA psychosis.

A number of clinical studies have shown that amphetamine and phencyclidine can induce a psychosis that resembles schizophrenia. Although amphetamine has long been used as a model of schizophrenia, phencyclidine has been given an increasing amount of attention recently. This shifting may be caused by the fact that phencyclidine can produce a psychotic reaction in humans that closely resembles an acute episode of schizophrenia (Steinpresis, 1996). In addition, phencyclidine but not amphetamine can induce social withdrawal, which is a negative symptom of schizophrenia (Sams-Dodd, 1998). According to these findings, amphetamine-induced psychosis may not be an appropriate model of schizophrenia. However, the clinical findings of this study do not support the shortcomings of amphetamine-induced psychosis in modelling the negative symptoms of schizophrenia.

There are some limitations of this study. First, the eight items of the Manchester scale used in the present study do not cover some psychotic symptoms (e.g. disorganized behaviour and loss of drive), which might lead to the findings of a small factor number. Secondly, as mentioned above, the incorporation of flattened/incongruous affects into a single item might distort the factor structure. Thirdly, the negative symptoms found in this study may be indistinguishable from drug-induced movement disorders because most patients were treated with antipsychotic medications during the assessment. In addition, because all patients had to stop using amphetamine after admission, the effect of amphetamine withdrawal may also mimic negative symptoms. Fourthly, to increase the accuracy of diagnosis, this study excluded MA psychotic patients who had stopped using MA for more than 1 wk. Hence, the factor analysis described in this study may only represent one form of expression of MA psychosis. Last, as a cross-cultural study, the translation of the MINI-Plus, Module M and the Manchester scale may decrease their reliability and validity. However, a benefit of this sort of study is the wider perspective of symptoms study. To our knowledge, this is the first study of its kind in which Asian and Caucasian patients with MA psychosis took part in the same study.

In conclusion, similar to schizophrenia and other functional psychoses, the findings of moderately high prevalence of negative symptoms and the existence of negative syndrome in MA psychosis suggest that both positive/disorganized and negative syndromes should be taken into account in assessing MA psychotic symptoms. Whether both syndromes have different underlying pathological processes and treatment responses remains to be seen. The clinical findings of this study do not support the shortcomings of amphetamine-induced psychosis in modelling the negative symptoms of schizophrenia.

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