Brief report

Preliminary evidence of behavioral predictors of recurrent drug-induced psychosis in methamphetamine abuse

Ruth Salo [a,b,*], Thomas E. Nordahl [a,b], Martin H. Leamon [a], Yutaka Natsuaki [b,d], Charles D. Moore [c], Christy Waters [c], Cameron S. Carter [a,b,e]

[a] *Department of Psychiatry and Behavioral Sciences, University of California, Davis, CA, USA*
[b] *Imaging Research Center, University of California, Davis, CA, USA*
[c] *Kaiser Chemical Dependence Recovery Program, Sacramento, CA, USA*
[d] *Department of Biomedical Engineering, University of California, Davis, CA, USA*
[e] *Department of Psychology, University of California, Davis, CA, USA*

Abstract

The goal of this study was to examine behavioral characteristics of currently drug-abstinent methamphetamine (MA)-dependent subjects ($n=39$) who experienced psychotic symptoms associated with MA abuse. All participants completed the Wender Utah Rating Scale (WURS), which retrospectively assesses Attention Deficit Hyperactivity Disorder-relevant childhood behaviors. The results suggest the existence of possible behavioral markers reflecting an early cognitive vulnerability to the development of frequent MA-induced psychotic symptoms as well as increased vulnerability associated with a family history of psychiatric illness.
© 2007 Elsevier Ireland Ltd. All rights reserved.

Keywords: Attention; Prefrontal cortex; Substance abuse; Psychosis

1. Introduction

In the past decade the use of the stimulant methamphetamine (MA) has increased in the general population, with worldwide abuse of amphetamines surpassing that of cocaine and opiates combined (United Nations, 2004). It is now estimated that approximately 5% of the adult population in the United States have used MA on at least

one occasion with worldwide use estimated to be 33 million users (Roehr, 2005). A subset of individuals who chronically abuse MA also develop severe recurrent psychotic symptoms commonly termed MA psychosis. These symptoms are often associated with high levels of psychiatric hospitalization and serious social dysfunction (Chen et al., 2003). The nature and severity of MA psychosis can be debilitating, often persisting long after cessation of drug use and in some cases eventually meet criteria for a primary psychotic disorder, suggesting that MA use may be a risk factor for schizophrenia in vulnerable individuals (Chen et al., 2005).

Although psychotic symptoms are well documented in a subset of MA abusers, little is known about the behavioral and neural mechanisms underlying the

* Corresponding author. Imaging Research Center and Department of Psychiatry and Behavioral Sciences, UC Davis Medical Center, 4701 X St. Sacramento, CA 95817, USA. Tel.: +1 916 734 7909; fax: +1 916 734 8750.

E-mail address: resalo@ucdavis.edu (R. Salo).

vulnerability to develop psychosis in MA users (Broome et al., 2005). The goal of the present study was to examine demographic and clinical characteristics of a sample of currently drug-abstinent MA-dependent subjects who experienced psychotic symptoms associated with MA abuse. This approach will be a first step in identifying possible behavioral predictors that may represent risk factors for developing recurrent psychotic symptoms associated with MA abuse.

2. Methods

2.1. Setting and sample

The MA-dependent group comprised 18 men and 21 women meeting criteria for lifetime MA dependence according to DSM-IV criteria. The MA abusers were recruited from substance abuse treatment centers and residential housing programs in the Sacramento area. All subjects had been drug abstinent for a minimum period of 4 weeks (range 4 weeks to 10 years) by self-report and random urine drug screens performed at referring sites. All subjects were literate and completed a standardized measure of verbal IQ (National Adult Reading Test; NART) (Nelson, 1982). The MA-dependent subjects reported symptoms associated with MA psychosis that included paranoid delusions, and visual, auditory and tactile hallucinations. Exclusionary criteria were: 1) history of neurological disorder; 2) co-existing current non-substance related Axis I disorder; 3) substance dependence (other than MA and excluding nicotine) within the past year; and 4) self-reported history of a seropositive test for HIV. All subjects signed informed consent approved by the University of California Davis Institutional Review Board and were paid a modest stipend for study participation.

2.2. Assessments

2.2.1. Semi-structured interviews

2.2.1.1. Structured Clinical Interview for DSM-IV.
All participants were interviewed by trained clinicians using the Structured Clinical Interview for DSM-IV [SCID] and a consensus diagnosis was obtained for each participant. The SCID was used as an adjunctive measurement to assess the presence and frequency of psychotic episodes associated with MA use.

2.2.1.2. Methamphetamine Experience Questionnaire.
All participants were interviewed using the Methamphetamine Experience Questionnaire (MEQ), which is an

interview based on the Cocaine Experience Questionnaire (Gelernter et al., 1994). The MEQ is designed to assess the frequency of psychotic episodes associated with MA use, conditions in which psychotic episodes occur, and the persistence of these symptoms.

Sample MEQ questions include:

1) How often have you had paranoid experiences while using methamphetamine, using a 0 to 5 scale?
2) Were you more likely to get paranoid when you used greater amounts of methamphetamine?
3) Did paranoia ever persist after you came down from methamphetamine?

2.2.2. Questionnaires

2.2.2.1. Wender Utah Rating Scale.
All participants completed the Wender Utah Rating Scale (WURS), which retrospectively assesses Attention Deficit Hyperactivity Disorder-relevant childhood behaviors and symptoms in adults (Ward et al., 1993; Wender, 1985).

2.3. Study rationale

As previous studies have reported an association between attentional dysfunction and psychosis proneness

Table 1
Demographic and clinical characteristics of 39 methamphetamine-dependent individuals

	Methamphetamine abusers with frequent psychosis (*n*=22)	Methamphetamine abusers with non-frequent psychosis (*n*=17)
Demographic variables		
Age, years, mean (SEM)	37.14 (1.8)	36.41 (2.2)
Females	11	10
Subject's education, years, mean (SEM)	12.68 (0.35)	13.0 (0.48)
Parental education, years, mean (SEM)	12.91 (0.54)	14.29 (0.98)
NART	106.05 (1.16)	106.0 (1.34)
Right-handed	22	16
Family history of psychiatric disorder	8	4
Clinical variables		
Methamphetamine use		
Duration, years, mean (SEM)	16.68 (1.82)	13.62 (1.58)
Months abstinent, mean (SEM)	18.73 (6.22)	23.29 (9.56)
Age of first use, years, mean (SEM)	17.36 (1.37)	18.0 (1.16)
Tobacco smokers	17	15