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# Hallucinogen use predicts reduced recidivism among substance-involved offenders under community corrections supervision

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## Abstract

Hallucinogen-based interventions may benefit substance use populations, but contemporary data informing the impact of hallucinogens on addictive behavior are scarce. Given that many individuals in the criminal justice system engage in problematic patterns of substance use, hallucinogen treatments also may benefit criminal justice populations. However, the relationship between hallucinogen use and criminal recidivism is unknown. In this longitudinal study, we examined the relationship between naturalistic hallucinogen use and recidivism among individuals under community corrections supervision with a history of substance involvement ( $n=25,622$ ). We found that hallucinogen use predicted a reduced likelihood of supervision failure (e.g. noncompliance with legal requirements including alcohol and other drug use) while controlling for an array of potential confounding factors (odds ratio (OR)=0.60 (0.46, 0.79)). Our results suggest that hallucinogens may promote alcohol and other drug abstinence and prosocial behavior in a population with high rates of recidivism.

## Keywords

Hallucinogen, psychedelic, psilocybin, lysergic acid diethylamide, recidivism, criminal justice, positive psychology

Hallucinogens, sometimes called psychedelics, psychotomimetics, or entheogens, are a class of psychoactive substances with low dependence potential that produce mystical-type experiences characterized by pseudo-hallucinations and feelings of bliss, unity, and transcendence of time and space (Griffiths et al., 2006; Johnson et al., 2008; Vollenweider and Kometer, 2010). Classic hallucinogens (dimethyltryptamine (DMT), lysergic acid diethylamide (LSD), mescaline, and psilocybin) primarily act as agonists of serotonin 2A (5HT<sub>2A</sub>) receptors whereas non-classic hallucinogens (e.g. ketamine, ibogaine, methylenedioxymethamphetamine (MDMA)) have other primary modes of action (Bogenschutz and Pommy, 2012; Nichols, 2004; Vollenweider and Kometer, 2010). Nevertheless, classic and some non-classic hallucinogens may share a common indirect mechanism of modulating glutamatergic neurotransmission in prefrontal-limbic circuitries (Bogenschutz and Pommy, 2012; Nichols, 2004; Vollenweider and Kometer, 2010).

Hallucinogen research flourished in Western countries from the 1950s until the early 1970s, with several investigations suggesting that hallucinogen-based treatments held promise for a number of clinical applications including anxiety disorders, end of life issues, mood disorders, and sexual dysfunction (Bogenschutz and Pommy, 2012; Johnson et al., 2008; Malleon, 1971; Nichols, 2004; Pahnke et al., 1970; Sessa, 2005; Vollenweider and Kometer, 2010). Among the most promising findings was the indication that hallucinogens may have a beneficial effect on addictive behavior. Indeed, a 2012 meta-analysis of six randomized clinical trials conducted between 1966–1970 found that a single dose of

LSD administered in the context of treatment for alcoholism reduced alcohol misuse relative to comparison conditions (odds ratio (OR)=1.96; Krebs and Johansen, 2012).

A modern understanding of classic hallucinogen effects at both the biological and psychological levels suggests the plausibility of hallucinogens as therapeutic for engendering long-term behavior change. Potential biological mechanisms of persisting therapeutic effects may include increases in glial cell line-derived neurotrophic factor (GDNF) and brain-derived neurotrophic factor (BDNF), down-regulation of 5HT<sub>2A</sub> receptors, changes in pyramidal cell dendritic spine organization (Bogenschutz and Pommy, 2012), and changes in default mode network functional connectivity (Carhart-Harris et al., 2012a), although more research is needed to determine if these effects are associated with therapeutic effects in humans. At the psychological level, research suggests that under interpersonally supportive

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and prepared conditions (Johnson et al., 2008), psilocybin can occasion high rates of primary mystical experience (also known as primary religious experience or peak experience) in hallucinogen-naïve individuals (Griffiths et al., 2006, 2008). Moreover, results suggest that these mystical-type experiences mediate long-term improvements in attitudes and behavior (Griffiths et al., 2008) and increases in personality openness (MacLean et al., 2011). Psilocybin also has been shown to increase the recall of autobiographical memories, which may contribute to therapeutic efficacy (Carhart-Harris et al., 2012b). Of course, potential therapeutic mechanisms at the biological and psychological levels may be connected.

Unfortunately, hallucinogens became associated with the countercultural revolution of the 1960s, and by the 1970s changes in the legal status of this drug class precluded its continued scientific study in the treatment of addictive behavior (or other clinical indications or basic human research), with rare exception (e.g. preliminary research conducted in the 1990s supported ibogaine as a possible treatment for drug dependence before it was halted due to toxicity concerns; Maciulaitis et al., 2008). Although hallucinogen research has experienced a renaissance in the past few years (e.g., Carhart-Harris et al., 2012b; Grob et al., 2011; Schmidt et al., 2013; Sessa, 2007, 2012), results of clinical studies in substance use populations have not yet been reported outside of three successful ketamine trials conducted by the same research team in Russia (Krupitsky et al., 1992, 2002, 2007).

Offenders may be especially likely to benefit from hallucinogen treatment because involvement in the criminal justice system often results from drug-seeking behavior and impulsive conduct exacerbated by compulsive substance use (Chandler et al., 2009), and because individuals in the criminal justice system represent a recalcitrant population with numerous comorbid psychopathologies and high rates of recidivism (Perry et al., 2006). Early researchers appreciated the potential utility of hallucinogen-based therapy in correctional settings and evaluated the impact of LSD and psilocybin interventions on criminal offenders in three studies. Tenenbaum (1961) administered multiple sessions of LSD-assisted group therapy to 10 treatment-resistant sex offenders and reported that all but one responded favorably, with noted enhancements in empathy, insight, communication, treatment engagement, and recall of memories. Arendsen-Hein (1963) provided several LSD-assisted psychotherapy sessions to 21 “criminal psychopaths” and reported similar therapeutic effects, with 14 of the participants demonstrating noticeable improvement, including abstinence from alcohol in one chronic drinker. Although major flaws in methodology preclude any conclusions, the question of hallucinogens reducing recidivism was addressed in Timothy Leary’s Concord Prison Experiment, in which 32 prisoners received psilocybin-assisted psychotherapy (Leary, 1969). A review concluded that the Leary study provided insufficient psychosocial support outside of the medication sessions, but that the other studies (Arendsen-Hein, 1963; Tenenbaum, 1961) showed promising evidence for behavior and personality change without focusing on recidivism (Doblin, 1998). Despite these promising signals of efficacy, more than 40 years have passed since the effects of hallucinogen use on criminal justice outcomes have been tested. Given recent rigorously-controlled studies in healthy normals showing long-lasting positive changes in behavior, attitudes, and personality (Griffiths et al., 2008;

MacLean et al., 2011), re-examination of hallucinogen effects on criminal recidivism is warranted.

We examined the longitudinal relations between naturalistic hallucinogen use and supervision outcome among individuals in the criminal justice system with a history of substance involvement. This observational approach allowed for greater generalizability of results to real-world circumstances as opposed to a tightly controlled randomized clinical trial (RCT; Tucker and Roth, 2006), and served as a logical precursor to RCT methodology. We hypothesized that hallucinogen use would predict reduced recidivism independent of a range of possible confounding variables.

## Method

This study was approved by the university’s institutional review committee. We evaluated data collected from 2002–2007 in the Southeastern US on 25,622 individuals charged with a felony and under community corrections supervision in Treatment Accountability for Safer Communities (TASC), a case management intervention program for individuals with a history of substance involvement (see <http://www.nationaltasc.org>). Individuals under community corrections supervision (e.g. those on probation or parole) represent 70% of the seven million Americans in the criminal justice system (Maruschak and Parks, 2012). They live in the community with family and friends, and continue to work and participate in society. They also continue to have access to alcohol and other substances. Intervention emphasized sustained alcohol and drug abstinence confirmed via random urinalysis, but otherwise was idiographic and could have included outpatient addiction counseling, residential treatment, vocational rehabilitation, anger management, or other programs deemed appropriate by caseworkers. Participants enrolled in TASC completed a structured interview at intake that assessed sociodemographic and psychosocial variables including current substance use diagnoses. The primary independent variable of interest was any hallucinogen use disorder (versus no hallucinogen use disorder), which comprised *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* diagnoses of either abuse or dependence. Although our hypothesis was that hallucinogen use would predict decreased recidivism, the disorder classification served as the independent variable because data on mere “use” were not available, and because illicit drug use was likely considered a use disorder by caseworkers. The outcome of interest was supervision failure (versus non-failure), the reasons for which could have included non-compliance with TASC requirements or another branch of the legal system, not reporting to TASC, failure to appear in court, incarceration, or death. Failure to adhere to supervision requirements usually resulted in increased sanctions including remand to jail or prison.

The sample was 71.0% male with a mean age of 31.24 years (standard deviation (SD)=10.55, range: 15–85); 59.9% were African American, 38.6% were Caucasian/white, and 1.5% belonged to other ethnoracial groups (Latino, multiracial, Asian American, or American Indian). Though hallucinogen use disorders were rare (1.0%) relative to cannabis use disorders (44.0%), cocaine use disorders (28.2%), alcohol use disorders (22.6%), opiate use disorders (15.3%), sedative/hypnotic use disorders

**Table 1.** Presenting features of those with any versus no hallucinogen use disorder.

Feature	Any hallucinogen use disorder	No hallucinogen use disorder	<i>p</i>
	Mean (SD) or %	Mean (SD) or %	
Age	26.10 (6.23)	31.29 (10.57)	<0.000001
Caucasian/white race	73.6	38.2	<0.000001
Employment status			0.0002
Unemployed	48.6	37.5	
Retired/disabled	3.9	8.5	
Employed	47.5	54.0	
Marital status			0.01
Never married	67.4	59.7	
Divorced/separated/widowed	21.7	22.9	
Married	10.9	17.4	
Living situation			0.0003
Friends/relatives	68.1	59.5	
Partner/children	18.1	26.2	
Shelter	6.3	3.3	
Alone	7.5	11.0	
Primary means of financial support			0.000001
Others	55.6	39.3	
Illegal activity	0.8	0.8	
Government aid	4.4	9.9	
Employment	39.2	49.8	
History of a violent offense	31.5	26.1	0.049
History of a substance-related offense	58.1	44.7	0.00001
Any cannabis use disorder	82.9	46.1	<0.000001
Any cocaine use disorder	66.7	29.4	<0.000001
Any alcohol use disorder	50.4	23.6	<0.000001
Any opiate use disorder	58.9	15.7	<0.000001
Any sedative/hypnotic use disorder	41.9	7.9	<0.000001
Any amphetamine use disorder	39.1	4.3	<0.000001

SD: standard deviation.

(7.8%), and amphetamine use disorders (4.5%), their prevalence in this sample was 10 times the prevalence of hallucinogen use disorders and two times the prevalence of past month hallucinogen use in the general US population (approximately 0.1% and 0.5% respectively; Substance Abuse and Mental Health Services Administration, 2012). Diagnosis did not specify the type(s) of hallucinogen(s) used; however, the predominance of hallucinogen use in the general US population is accounted for by psilocybin, MDMA, and LSD (US Department of Health and Human Services, 2013), three hallucinogens that are currently being clinically investigated for the treatment of psychological disorders (Sessa, 2012). Median time under TASC supervision was 124.23 days (range: 1.0–5139.57) and 38.4% of participants were classified as supervision failures.

## Results

To better understand the presenting features of those with any hallucinogen use disorder in the criminal justice population, we examined the relationships between any hallucinogen use disorder (versus no hallucinogen use disorder) and all available sociodemographic and psychosocial variables via analyses of variance

(for continuous variables) and chi-square tests (for categorical variables). As shown in Table 1, younger age, Caucasian/white race, current unemployment, having never been married, living with relatives/friends or in a shelter, relying on others as the primary means of financial support, having a history of a violent offense, having a history of a substance-related offense, and any cannabis, cocaine, alcohol, opiate, sedative/hypnotic, and amphetamine use disorder were associated with any hallucinogen use disorder (only one individual with any hallucinogen use disorder did not have any other substance use disorder, i.e. only one individual reported exclusive hallucinogen use). Other sociodemographic and psychosocial variables including gender, educational attainment, matriculation status, income, number of prior arrests, number of prior felonies, and number of pending offenses were not related to hallucinogen use diagnostic status. Age, race, employment status, marital status, living situation, primary means of financial support, violent offense history, substance-related offense history, and cannabis, cocaine, alcohol, opiate, sedative/hypnotic, and amphetamine use diagnostic status were thus included as covariates in a logistic regression model predicting treatment failure from any hallucinogen use disorder (all predictor variables were entered simultaneously). The results of this model,

**Table 2.** Predictors of supervision failure.

Predictor	$\beta$ (SE)	<i>p</i>	OR (95% CI)
Any hallucinogen use disorder	-0.49 (0.13)	0.0002	0.60 (0.46–0.79)
Age	-0.003 (0.002)	0.06	0.99 (0.99–1.00)
Caucasian/white race	-0.24 (0.03)	<0.000001	0.78 (0.73–0.84)
Employment status			
Unemployed (reference group)	–	–	–
Retired/disabled	-0.22 (0.08)	0.01	0.80 (0.67–0.95)
Employed	-0.37 (0.04)	<0.000001	0.68 (0.63–0.74)
Marital status			
Never married (reference group)	–	–	–
Divorced/separated/widowed	0.06 (0.04)	0.11	1.06 (0.98–1.16)
Married	-0.13 (0.04)	0.008	0.87 (0.79–0.96)
Living situation			
Friends/relatives (reference group)	–	–	–
Partner/children	-0.16 (0.04)	0.00003	0.85 (0.78–0.91)
Shelter	-0.19 (0.08)	0.02	0.82 (0.69–0.97)
Alone	-0.29 (0.05)	<0.000001	0.74 (0.67–0.82)
Primary means of financial support			
Others (reference group)	–	–	–
Illegal activity	0.26 (0.15)	0.09	1.30 (0.95–1.76)
Government aid	-0.21 (0.08)	0.007	0.80 (0.68–0.94)
Employment	-0.07 (0.04)	0.07	0.92 (0.85–1.00)
History of a violent offense	0.04 (0.03)	0.16	1.05 (0.98–1.12)
History of a substance-related offense	0.04 (0.03)	0.12	1.04 (0.98–1.11)
Any cannabis use disorder	0.52 (0.03)	<0.000001	1.68 (1.58–1.79)
Any cocaine use disorder	0.80 (0.03)	<0.000001	2.24 (2.10–2.40)
Any alcohol use disorder	0.10 (0.03)	0.002	1.11 (1.03–1.19)
Any opiate use disorder	0.34 (0.04)	<0.000001	1.41 (1.30–1.54)
Any sedative/hypnotic use disorder	-0.09 (0.05)	0.09	0.91 (0.81–1.01)
Any amphetamine use disorder	0.28 (0.06)	0.00002	1.33 (1.16–1.52)

CI: Confidence interval; OR: odds ratio; SE: standard error. All predictor variables were entered simultaneously into a logistic regression model predicting supervision failure vs non-failure (coded 1 and 0, respectively).

displayed in Table 2, indicate that any hallucinogen use disorder was associated with a *decreased* probability of supervision failure. This stands in contrast to any cannabis, cocaine, alcohol, opiate, and amphetamine use disorder, each of which was associated with an *increased* probability of supervision failure (any sedative/hypnotic use disorder was not related to treatment outcome). Additional predictors of supervision failure included younger age, non-Caucasian/white race, having never been married, current unemployment, living with relatives/friends, and relying on others as the primary means of financial support. Any hallucinogen use disorder was the third strongest predictor of supervision outcome among all predictors, trailing only any cocaine use disorder and any cannabis use disorder (both predicting failure).

## Discussion

Our results show that hallucinogen use is prospectively associated with a reduced likelihood of recidivism in a large sample of individuals under community corrections supervision with a history of drug involvement. These findings contribute to the small but growing contemporary literature suggesting that hallucinogen-based interventions may be effective in the treatment of addictions and are the first in over 40 years to suggest that hallucinogen

interventions may hold promise in the criminal justice system. If the association with decreased recidivism is a direct causal effect of hallucinogen use, the potential biological and psychological mechanisms discussed in the introduction may be at play. Of course, as an observational study, we cannot rule out that a common predisposition may have led individuals to both use hallucinogens and to have lower recidivism rates. However, controlling for sociodemographic and psychosocial variables in the regression minimizes, but does not eliminate, this possibility. Moreover, this observational study did not standardize the type, dose, frequency, or duration of hallucinogen use. This leaves open the question of dosing parameters in potential treatment applications. Moreover, the effect of hallucinogens on a wider range of individuals could not be determined. Indeed, it could be the case that self-selected hallucinogen users are those who are most likely to benefit from these substances. The current findings should not at all be interpreted as advocating for recreational hallucinogen use. Nevertheless, they demonstrate that, in a real-world, substance-related intervention setting, hallucinogen use is associated with a lower probability of poor outcome.

While the naturalistic nature of our research prevents an unequivocal interpretation of its results, when considered in light of outcomes from older studies (Arendsen-Hein, 1963; Doblin,

1998; Leary, 1969; Tenenbaum, 1961), it seems appropriate to encourage RCTs of hallucinogen-based therapies among those in the criminal justice system, who are among the most disadvantaged populations in need of effective interventions worldwide (Perry et al., 2006). The impact of hallucinogens on criminal justice and substance use outcomes could very well be potentiated if administered in controlled settings and under the supervision of a qualified therapist, rather than ad libitum, as was the case with individuals in the present research. Investigating the mechanisms that explain how and why hallucinogens affect behavior (e.g. changes in personality characteristics; MacLean et al., 2011) is an important avenue of future research that can aid in maximizing the effectiveness of hallucinogen-based treatments.

In summary, our results provide a notable exception to the robust positive link between substance use and criminal behavior. They add to both the older and emerging body of data indicating beneficial effects of hallucinogen interventions, and run counter to the legal classification as well as popular perception of hallucinogens as categorically harmful substances with no therapeutic potential. We believe this calls for the continued scientific investigation of this unique class of substances.

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### Conflict of interest

The authors declare no conflict of interest.

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