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Transient Cocaine-Associated Behavioral Symptoms Rated with a New Instrument, the Scale for Assessment of Positive Symptoms for Cocaine-Induced Psychosis (SAPS-CIP)

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Abstract

Chronic use of cocaine is associated with a variety of behavioral symptoms. The current report describes the assessment of cocaine-related behavioral symptoms (CRB) using the Scale for Assessment of Positive Symptoms of Cocaine-Induced Psychosis (SAPS-CIP). The CRB section, one of the three domains in the SAPS-CIP, consists of sub-domains, including Aggressive/Agitated Behavior, Repetitive/Stereotyped Behavior, Unusual Social or Sexual Behavior. Severity scores are assigned according to operational criteria, and range from 0 (not present) to 5 (severe). We interviewed 261 unrelated cocaine-abusing adults using the SAPS-CIP, and 243 of them met criteria for inclusion in the study. The proportion of subjects endorsing different classes of CRBs varied across categories, with 109 of 243 (44.9%) subjects reporting aggressive and agitated behaviors, 180 subjects (74.1%) repetitive/stereotyped behaviors, and 192 (79.0%) unusual social/sexual behaviors. A substantial minority of the subjects (10.3-25.1%) reported that they experienced marked-to-severe behavioral symptoms associated with cocaine use. The proportions of subjects endorsing CRB did not differ by ethnic/racial group or by sex. Correlations among the different domains of CRB were strong, but behaviors rated in the CRB section were less well correlated with psychotic symptoms, which were rated in the hallucination and delusion sections of the instrument. A variety of CRBs are common in cocaine-dependent subjects, and many of these are highly intercorrelated. CRBs also correlate with hallucinations and delusions induced by cocaine, but to a lesser degree. Our findings suggest that there may be some common vulnerability factors that contribute to both cocaine-induced psychosis and CRBs.

Cocaine use and intoxication are associated with various psychiatric, behavioral and physical symptoms, including cocaine-induced psychosis (CIP), a group of transient psychotic symptoms, such as paranoia and hallucinations,¹⁻³ violence and aggression,⁴⁻¹⁰ repetitive or

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stereotyped simple behaviors such as picking at clothing, repetitive complex behaviors such as drawing and writing,¹¹⁻¹³ and altered sexual behavior.¹⁴⁻¹⁸

Cocaine-related behaviors (CRBs) constitute an important topic for detailed study, because they impact the public health in important ways. For example, abundant data from epidemiological and survey studies suggest that cocaine use promotes high-risk sexual behaviors such as promiscuity and diminished use of condoms,¹⁴⁻¹⁸ which in turn impact the risk for HIV and other sexually transmitted diseases. Similarly, cocaine-related violence is an important cause of mortality and injury.¹⁹ Understanding CRBs also has the potential to elucidate the impact of cocaine on human brain function, both chronically and acutely. Finally, identification of specific CRBs may define behavioral endophenotypes that are more amenable to genetic analysis than highly complex constructs such as the diagnosis of cocaine dependence *per se*.

Although CRBs are certainly known to clinicians and researchers,²⁰⁻²² they have not been quantified using operational methods in non-emergency settings and most previous reports were based on small samples.²¹⁻²³ Clinical studies have reported that chronic use of stimulants, including cocaine results in stereotyped or compulsive behaviors. In some cases, subjects report simple stereotyped behavior, such as repetitive tapping or picking at a piece of clothing, which seems reminiscent of stimulant-induced stereotypy in rodents.^{24, 25} Alternatively, CRBs can be more complex, and can include repetitious examining, searching and sorting behaviors, which have been labeled by cocaine abusers as “punding,” “hung-up activity” and “knick-knacking.”^{20, 26} Rosse et al.^{21, 22} described compulsive foraging behavior associated with intense cocaine craving, often following exhaustion of one’s supply of crack cocaine. Also referred to as “chasing ghosts” or “geeking” by patients, this behavior involves searching, often intensively, for pieces of crack cocaine that the individual believes may have fallen to the floor. This behavior may include repeated examination of the floor, carpet or furniture, as well as repeated checking of pockets and even shoes and socks. A careful examination is made of anything that may resemble crack cocaine, including pebbles, candle wax, food crumbs, plaster, paint chips, etc. Although this behavior may be described by cocaine abusers as bizarre, amusing, and even annoying when observed in others, it may be difficult for them to resist the impulse to perform these behaviors themselves. Rosse et al.²² examined compulsive foraging behavior in 41 cocaine-dependent patients and found it to be more than simply a consequence of intense cocaine craving, suggesting that such behavior represents a “pure” form of compulsive behavior. It appears in the context of heavy cocaine use and lasts at most a few hours but does not involve other compulsive acts such as hand washing. Evidence from the Epidemiologic Catchment Area Survey²⁷ suggests that cocaine-abusing patients are at increased risk prospectively to develop obsessive-compulsive disorder, although the evidence in support of such a link is tenuous.²¹ We found that 180 subjects (74.1%) had repetitive/stereotyped behaviors and 61 subjects (25.1%) experienced marked-to-severe symptoms of this type during cocaine use. Although our sample was a clinical one with multiple co-morbid substance abuse/dependence diagnoses, the percentage of repetitive/stereotyped behaviors reported by other groups of cocaine users is still surprisingly high.^{20, 22, 26}

To date, studies of CRB have focused on the description of common behaviors such as compulsive foraging, or “geeking”^{8, 21, 22} or the link between behaviors and cocaine use.²⁸ These studies include chart reviews,^{4, 6} and interview-based retrospective assessments of CRB experiences.^{7, 9, 29} The current analysis focuses on the phenomenology of CRBs and its relationship with CIP and the severity of cocaine use. We specifically examined the frequency and severity of different behavioral symptoms and their relationship with CIP. The current study differs from those previously published in that we assessed all subjects using the Semi-Structured Assessment for Drug Dependence and Alcoholism [SSADDA],³⁰ a semi-structured

interview to enhance the systematic assessment of both the diagnosis of cocaine dependence and the relations among different domains of cocaine-related symptoms.

Methods

1. Subjects and assessments

Unrelated subjects were recruited through clinical referral, advertising, and word-of-mouth as previously described.³ Subjects meeting DSM-IV criteria for cocaine dependence were included in the analysis (255 subjects of 261 who passed our phone screening). Subjects meeting DSM-IV criteria for schizophrenia, schizoaffective disorder, bipolar disorder, major depression with psychotic features, or those with histories of seizure disorders (except cocaine-induced seizures), or severe medical illness including a history of AIDS (but not merely of HIV+ status), were excluded. All subjects were assessed with the Cocaine Experience Questionnaire (CEQ),¹ followed by a new quantitative instrument for assessing cocaine-induced psychotic symptoms and behaviors, the Scale for Assessment of Positive Symptoms for Cocaine-induced Psychosis (SAPS-CIP).³ Substance use diagnoses were established with the Semi-Structured Assessment of Drug Dependence and Alcoholism (SSADDA) 30-31. For the analyses reported in this manuscript, subjects were assigned to CIP(+) or CIP(-) groups based on the questions of the CEQ, those who endorsed cocaine-induced paranoia on the CEQ were assigned as CEQ(+), those who denied it were CEQ(-).³ Briefly, the CEQ is a questionnaire that focuses on the occurrence of paranoia in the context of cocaine use. The sequence of assessments in the version of the CEQ used in this study has been described previously.³

SAPS-CIP was modified from the Scale for the Assessment of Positive Symptoms (SAPS).³² In order to capture the behavioral symptoms of cocaine users, the Bizarre Behavior section of the original SAPS was extensively modified and renamed, "Cocaine-related Behavior" (CRB). Its major sections include Aggressive and Agitated Behavior, Repetitive and Stereotyped Behavior, Unusual Social or Sexual Behavior. The administration and scoring procedures for the SAPS-CIP were detailed in Cubells et al.³ Briefly, the operational criteria for rating the severity of symptoms are: 0 = complete absence of symptoms; 2 = definite presence but mild; 3 = moderate; 4 = marked; 5 = severe. As an additional aid to scoring, each section also includes specific behavioral or subjective items the interviewer rates according to the following descriptors: Not Present; Borderline (presence cannot be established with certainty); and Definite.

2. Data Analysis

Descriptive statistics and statistical tests were computed in SPSS, Version 15.0 for Windows. Counts were analyzed using contingency tables and chi-square tests. For ordinal data, we compared means using nonparametric statistics (Mann-Whitney U test and Kruskal-Wallis ANOVA by ranks, as appropriate). Pearson correlation was performed with different comorbid diagnoses (0=no, 1=yes) and CIP status (+/-).

Results

1. Sample characteristics

A total of 261 subjects were interviewed. Six subjects were excluded due to a history of a psychotic disorder, and an additional 12 did not meet DSM-IV criteria for cocaine dependence. The eligible sample (N = 243) was predominantly African-American (AA, N=127, 52%). The second largest group was European-Americans (EA, N=90, 37%), followed by Hispanics (N=17, 7%) and other ethnic/racial groups (N=9, 4%). The mean age was 39.5 years (SD =

7.3). The majority of subjects were male (58.8%). There were no significant differences in age or years of education by sex (t-test: p-values >.20).

2. Overview of CRBs among 243 cocaine-dependent individuals

The proportion of subjects endorsing CRBs on the SAPS-CIP varied across type of behavior, with 109 subjects (44.9%) reporting aggressive and agitated behaviors, 180 subjects (74.1%) repetitive/stereotyped behaviors, and 192 (79.0%) unusual social/sexual behaviors. Approximately 10-25% of subjects reported that they experienced marked-to-severe behavioral symptoms associated with cocaine use (Table 1). The proportion of subjects endorsing CRBs did not differ by ethnic/racial group or sex (both $p > 0.05$).

We counted the number of reported symptoms (regardless of severity) across all behavioral domains for each respondent and found that the numbers of symptoms were approximately normally distributed (skewness = 0.035). Similar patterns were found for the severity of symptoms in the domains of repetitive/stereotyped and unusual social/sexual behavior, but the severity of aggressive/agitated symptoms showed a proportion of zero values.

3. Cocaine-related behaviors (CRBs)

1) Aggressive/agitated symptoms: Most cocaine-related aggressive and agitated behaviors (70.6%) were of mild-to-moderate severity with the remainder of subjects reporting marked-to-severe behaviors. In response to the question: "When you are using cocaine, do you become overly aggressive or agitated. Do you start fights or arguments with friends or with other people?", 19 of 243 (7.8%) of subjects were scored as "definite" for the use of weapons, including knives (N=9), guns (N=7), and other; and 9 were scored as "borderline," meaning that they once or sometimes used weapons. The proportion of subjects endorsing using weapons did not differ by sex (Pearson $\chi^2(1) = 3.143$, NS). Table 2 summarizes the distribution of individual symptoms of aggressive/agitated behaviors in this sample of cocaine-dependent individuals.

Both the presence and the severity of aggressive/agitated behaviors were associated with the presence of CIP as determined by the CEQ. Of 181 CIP(+) subjects, 94 (51.9%) reported definite aggressive/agitated behaviors, whereas only 15 of 62 CIP(-) subjects (22.5%) had such symptoms. The difference in proportions of CIP(+) and CIP(-) subjects reporting cocaine-induced aggressive/agitated behavior was significant (Pearson $\chi^2(5) = 19.23$, $p = .002$). A similar pattern was observed for each item in the aggressive/agitated domain. For example, 18 (9.9%) and 9 (5.0%) of 181 CIP(+) subjects reported "definite" and "borderline" use of weapons, respectively, whereas only 1 (1.6%) of 62 CIP(-) subjects did so.

2) Repetitive/stereotyped behaviors: About three-quarters (74.1%) of subjects reported repetitive/stereotyped behaviors during cocaine intoxication. The most common symptoms included compulsive foraging (42.8% with definite symptoms), repetitive movement/action (63.0%), ritualistic activities (4.5%), and other symptoms (15.6%, often related to repetitive checking, cleaning, peeking out of windows, etc.).

3) Unusual social/sexual behaviors: Most subjects (79%) reported that they had unusual social and/or sexual behaviors associated with cocaine use, including social behavioral change (65.4% with definite symptoms), and changes in sexual desire or activities (63.8%). The common social behavioral changes included becoming quieter (N=47), more talkative (N=21), or socially withdrawn or isolated (N=13).

4) Correlation of different behavioral symptoms with psychotic symptoms: Correlation analysis showed that the four types of CRBs were significantly intercorrelated (See Table 3, all $p < .0001$; Bonferroni corrected $\alpha = 0.01$). We also found significant correlations between

aggressive/agitated behaviors and the global scores for persecutory delusions and ideas of reference (both $p < 0.001$).

4. Relationship of overall CRB severity to lifetime level of cocaine use, co-morbid substance dependence

To examine the relationship between the amount of cocaine used and CRBs, we correlated several measures of cocaine-use severity from the SSADDA with total scores for CRBs. The following measures of severity were examined: (1) number of days, in the past 30 days, during which the subject used cocaine; (2) years of regular use in the subject's lifetime, with regular use defined as at least three times per week for six months or more; (3) number of episodes of cocaine use in which the subject had engaged during his or her life; (4) amount of cocaine used per episode during the subject's periods of heaviest use. The subject was asked to estimate amounts of cocaine used in dollars, grams of powder, and in "rocks" of crack. The only measure of severity that correlated significantly with CRBs total scores were the estimated total number of episodes of lifetime use ($r = .236$, $p = .001$, significant at a Bonferroni-corrected $\alpha = .006$, for eight tests).

As previously reported,^{3,33,34} co-morbid substance dependence was very common in this population, with almost three-quarters of subjects dependent on nicotine, and approximately half dependent on alcohol. A large proportion (41%) of participants were opioid dependent. Table 4 shows the different CRBs total scores and the numbers of symptoms for subjects with or without a specific co-morbid substance dependence diagnosis (*DSM-IV*). In general, the numbers and severity of symptoms among those with comorbid substance dependence were greater than those not meeting diagnosis criteria for such a disorder, though for opioid dependence the differences did not reach statistical significance. Comparing the number of co-morbid substance dependence diagnoses (other than cocaine dependence) showed that more than two thirds of subjects (i.e., 170/243, 69.9%) met criteria for at least two additional *DSM-IV* substance dependence diagnoses.

Based on previous reports that alcohol use exacerbates cocaine-related violence, we specifically examined the relationships between comorbid alcohol dependence and CRBs, especially aggressive/agitated ones. Subjects with comorbid alcohol dependence had significantly higher scores on behavioral symptom counts than individuals who did not meet criteria for alcohol dependence (global rating of behavioral symptoms: 3.10 ± 1.10 vs. 2.63 ± 1.17 , $p = 0.003$); a similar pattern was found for aggressive/agitated behaviors (1.80 ± 1.66 vs. 1.09 ± 1.46 , $p = 0.001$).

Discussion

The current study describes the phenomenology and severity of retrospectively assessed CRBs using a new semi-structured interview (the SAPS-CIP). Consistent with prior descriptive reports,⁴⁻¹⁸ a variety of specific behavioral patterns were commonly reported by cocaine dependent subjects as being associated with cocaine intoxication. Our data also suggest that the severity of CRBs reported by chronic users of cocaine varies substantially among individuals. Thus, for subjects scoring more than 0 on the SAPS-CIP, there was an approximately normal distribution of severity rankings, at least for the more common types of CRBs. Of note, due to the difficulty of assessing dose of cocaine retrospectively, it is not possible to address directly the possibility that the severity of CRBs reflected the dose of cocaine. However, a laboratory study of CIP35 showed suspiciousness during cocaine infusions to be independent of the blood level of cocaine, suggesting that at least some CRBs may partially reflect inter-individual variation in the brain's sensitivity to cocaine.

The high degree of correlation between CRBs scores and both delusions and hallucinations suggests that CRBs often occur as part of a more complex cocaine-induced behavioral syndrome. Although this hypothesis requires confirmation, the data reported previously by us³ suggested that different cocaine-induced psychotic symptoms also tend to co-vary in severity.

Aggressive behavior and violence have been reported to associate with cocaine (especially crack) intoxication,^{6,7,29,36-39} although such a view is not universally accepted.⁴⁰ Cocaine-related violence may range from minor arguments to major acts of violence, including murder and rape. Specifically, Miller et al.²⁹ found the following behaviors to be associated with addictive cocaine use: suspiciousness and/or paranoia (84%), anger (42%), violent crimes (42%), violence (32%) and increased perceived physical strength (32%). Among the types of violent crimes associated with addictive cocaine use were: verbal arguments (33%), violent arguments (25%), physical fights (23%), armed robbery (22%), robbery (14%), spousal abuse (7%), attempted murder (1%), child abuse (1%), rape (1%) and murder (1%). Finally, the temporal relationship between last cocaine use and the commission of a violent act ranged from immediate (13%) to a few hours later (17%), to days later during acute withdrawal (19%). Manschreck et al.⁴¹ found that violent behavior before and during hospitalization was concentrated among psychotic patients, with violence playing a role in over half of the admissions for the group. We found that 109 of 243 subjects (44.9%) reported aggressive and agitated behaviors during the period of cocaine intoxication. Common aggressive/agitated behaviors included arguing (42.4%), yelling (15.6%), physical assault (12.8%) and the use of weapons (7.8%). Although more than a quarter (77 of 243) of cocaine-related aggressive and agitated behaviors were mild-to-moderate in severity, it is noteworthy that 32 subjects (13.2%) reported marked-to-severe symptoms, which were defined operationally as highly dangerous behaviors such as the use of weapons. The most dangerous levels of aggressive/agitated behavior, such as the use of deadly weapons, occurred almost exclusively in subjects who also endorsed CIP. Although not captured in our quantitative data, discussions with subjects suggested that in most cases, when CIP resolved, so did aggression and agitation.

The association observed here between violent behavior and the presence and severity of CIP suggests several points that may be useful for clinicians, especially in emergency settings where acutely intoxicated patients are most likely to be encountered. First, the presence of psychosis, which most often takes the form of paranoid delusions and visual or auditory hallucinations³ should alert the care team to the potential for violence in acutely intoxicated patients. During the assessment of patients in settings where intoxication is less likely, it makes sense to inquire regarding a history of CIP, and for cocaine-related aggressive behavior. Such assessment could be done, for example, by excerpting relevant sections of the SAPS-CIP for use by intake staff (the SAPS-CIP is freely available from the authors on request).

The majority of subjects in this study were poly-drug users, with cocaine as their primary (i.e., preferred) drug of abuse. Other comorbid substances of abuse might affect the incidence and or severity of CRBs, thus making the relationship between CRBs with cocaine use more complicated. For example, subjects with alcohol dependence had significantly higher overall behavioral symptom counts, especially aggression/agitation. Among others, the relationship between co-morbid substance use (especially alcohol) and cocaine-related violence has been a topic of interest.⁴² Some evidence suggests that combining alcohol and cocaine leads to more violence than either drug alone. Some retrospective studies that have looked at human drug users to investigate the effect of alcohol/cocaine combinations on violence provided evidence suggesting that violence and agitation are attributable more to the use of alcohol than cocaine.⁴³⁻⁴⁵ Although findings from two studies suggest that there is a synergistic effect of alcohol and cocaine combination on violent behavior, the data are difficult to interpret due to lack of appropriate control groups.^{46,47}

In summary, this study reports the occurrence and severity of CRBs. In agreement with prior studies, we found that cocaine-dependent individuals report a variety of CRBs, though their frequency and severity vary greatly. Extending prior observations, we found that other, less studied symptoms are also common. The symptoms of CRBs captured by the SAPS-CIP are highly inter-correlated, and CRBs associate with hallucinations and delusions. Most of the behavioral symptoms (especially those of marked or greater severity) occurred together with psychotic symptoms, suggesting that there may be common vulnerability factors that contribute to both sets of symptoms. One clinical implication of the results reported here is that the presence of CIP raises the risk of dangerous violence, suggesting that emergency settings should make explicit provisions for staff and patient safety in the presence of patients with CIP.

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Table 1
Distribution of SAPS-CIP cocaine-induced behavioral symptoms, according to type of behaviors

Cocaine-dependent subjects (N = 243) were assessed for severity of different types of symptoms, using the SAPS-CIP. Numbers in parentheses are percentages of subjects experiencing the indicated class of CRB.

Scores	0	1	2	3	4	5
Aggressive/Agitated	106(43.6)	28(11.5)	45(18.5)	32(13.2)	16(6.6)	16(6.6)
Repetitive/Stereotyped	38(15.6)	25(10.3)	61(25.1)	58(23.9)	46(18.9)	15(6.2)
Unusual Social/Sexual	20(8.2)	31(12.8)	95(39.2)	71(29.2)	16(6.6)	9(3.7)

Frequencies (percentages) of SAPS-CIP Global scores of aggressive and agitated behaviors (N=243). Numbers in parentheses are percentages of subjects in each category

Table 2

Score	Using weapons	Arguing/irritable	Yelling	Physical assault	Others
N (Does not apply)	215(88.5%)	115 (47.3%)	187(77.0%)	201 (82.7%)	221 (90.9%)
B (Borderline)	9 (3.7%)	25(10.3%)	18 (7.4%)	11 (4.5)	4 (1.6%)
D (definite)	19 (7.8%)	103 (42.4%)	38 (15.6%)	31 (12.8%)	18 (7.4%)

Table 3

Spearman correlations and significance levels among SAPS-CIP behavioral symptom anchor scores (N = 243)

Symptoms	Repetitive/ Stereotyped	Unusual Social/Sexual
Aggressive/ Agitated	.325 p < .0001	.380 p < .0001
Repetitive/ Stereotyped	-	.439 p < .0001

Table 4

Comorbidity diagnosis v.s. CRB total scores and number of CRB symptoms

Comorbidity diagnosis	Comorbidity diagnosis	CRB total score	Statistic	No. of CRBs	statistic
Alcohol dependence	Yes (N=132)	12.25+/-4.89	t = -2.56**	7.06+/-3.01	t = -3.264**
	No (N=111)	10.61+/-5.05		5.84+/-2.60	
Tobacco dependence	Yes (N=183)	11.97+/-4.92	t = -2.58**	6.67+/-2.96	t = -2.66**
	No (N= 60)	10.07+/-5.09		5.63+/-2.05	
Opiate dependence	Yes (N=102)	12.00+/-5.35	t = -1.316	6.75+/-3.09	t = -1.191
	No (N=141)	11.14+/-4.75		6.30+/-2.73	
Cannabis dependence	Yes (N=86)	12.80+/-4.16	t = -3.037**	6.72+/-2.75	t = 0.938
	No (N=157)	10.79+/-5.32		6.36+/-2.97	
Other stimulant dependence	Yes (N=20)	14.30+/-3.99	t = -2.632**	8.40+/-2.39	t = -3.146**
	No (N=223)	11.25+/-5.04		6.31+/-2.88	

** p<0.01