Early Prediction of Initiation of Abstinence From Cocaine

Use of a Craving Questionnaire

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The authors administered a five-item craving questionnaire daily to 86 outpatients to determine whether initial craving scores predicted the likelihood of initiation of abstinence within a 30-day period. Patients with higher mean craving scores during the first 3 days of the study were less likely to initiate abstinence. However the relationship between craving and abstinence initiation was not linear. Rather, patients in the top quartile of craving scores were significantly less likely to abstain than were patients in the lower three quartiles. The findings suggest that this rapid, easily administered craving questionnaire may have short-term predictive validity. (Am J Addict 1997; 6:224–231)

Although the term "craving" is frequently used in the drug dependence literature and in clinical settings, the usefulness and even the meaning of the concept remain controversial. Some researchers and clinicians view craving as a critical indicator of clinical status and an important treatment outcome measure in itself,[1] whereas others view craving as a tautological concept that retrospectively rationalizes drug use or its absence.[2–4] According to the latter view, the strength of drug craving is measured by its outcome; that is, an individual who has used drugs, by definition, had stronger craving than someone who has abstained. On the other hand, craving has been correlated with certain more objective measures, such as dose of stimulant administered in the laboratory;[5] this correlation helps to support the validity of the concept of craving as distinct from drug use.

One potentially important advantage of measuring craving is pragmatic: it is

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simple, inexpensive, and can be repeated frequently. Moreover, craving may be clinically important; if a certain level of craving can be shown to precede drug use, then regular monitoring of craving may serve as an "early warning" system that allows a clinician to identify patients at high risk, and thus perhaps intervene before drug use occurs. To date, studies of the predictive validity of cocaine craving measures have produced mixed results. For example, some studies in both cocaine- and opioid-dependent populations[6,7] have shown reductions in drug use to precede a drop in craving scores, whereas other research[8] has shown the opposite temporal sequence.

We have recently developed an instrument to measure cocaine craving[9] based on our own and other authors'[10–11] conceptualization of craving as a multifaceted, dynamic, and episodic phenomenon. We designed a questionnaire to assess five aspects of craving, each on a 10-point scale: 1) current intensity; 2) intensity during the previous 24 hours; 3) frequency; 4) reactivity to drug-related environmental cues; and 5) perceived likelihood of use if in an environment with high drug availability. In a previous report,[9] we demonstrated that this five-question instrument had good psychometric properties, with a high level of internal consistency among the items, unidimensionality on factor analysis, and high levels of correlation among items over time.

In our previous study, we administered this questionnaire daily to 73 patients hospitalized for cocaine dependence and found that inpatient craving levels did not predict likelihood of return to cocaine use during the subsequent 3 months. We posited that this failure to predict outcome could have been due to 1) the fact that craving is markedly influenced by setting and drug availability,[12] thus perhaps making measurement of craving in a drug-free inpatient setting and even predictions of future use by inpatients who are currently drug-free invalid because of the protective setting; and 2) the fact that the follow-up period (i.e., 3 months) was too long for current craving levels to meaningfully predict behavior so far in advance. Therefore, as part of a new collaborative study comparing different forms of psychotherapy and drug counseling for the treatment of cocaine dependence, we administered this craving questionnaire daily to 86 outpatients who were currently using cocaine. Our areas of interest in administering this craving instrument to a population of outpatients were 1) to test the questionnaire's psychometric properties in a different setting, and 2) to investigate the short-term (i.e., 30 days, rather than 3 months) predictive validity of our instrument in an ambulatory setting. We therefore report here data on whether initial craving scores predicted submission of three consecutive drug-free urine screens within a 30-day period.

METHODS

Setting and Sample

The study sample consisted of patients who entered the pilot phase of the National Institute on Drug Abuse (NIDA) Collaborative Cocaine Treatment Study. This study, which is now in its main phase, is comparing the efficacy of supportive-expressive therapy,[13] cognitive therapy,[14] and individual drug counseling[15] (each in combination with group drug counseling), and group drug counseling alone[16] for the treatment of ambulatory patients with cocaine dependence. The study is being conducted at five sites: the University of Pennsylvania, the University of Pittsburgh, Brookside Hospital (Nashua, NH), McLean Hospital (Belmont, MA), and Massachusetts General Hospital (Boston, MA).

In order to be randomized to a treatment condition in the pilot phase of the study, patients were initially required to

enter a "stabilization period," during which they met with a drug counselor for 30 minutes, two to five times per week (depending on clinical need and scheduling issues), and attended a 90-minute drug counseling group, which was held twice per week. Urine toxicological screens were collected 2–3 times per week, depending on frequency of visits. Patients had to produce three consecutive negative (i.e., drug-free) urine screens within 30 days of beginning the study in order to complete the stabilization period successfully and be randomly assigned to one of the experimental treatment conditions listed above. If a patient failed to produce the three consecutive negative urine specimens within this allotted time period, he or she was terminated from the study. All urine screens were collected under direct observation and were analyzed at a NIDA-certified laboratory by use of an initial EMIT screen, followed by confirmation of positive tests by gas chromatography/mass spectrometry. For this article, the term "initiation of abstinence" refers to obtaining these three consecutive negative urine screens and then completing a series of assessments, culminating in randomization to treatment.

Data for this study were collected from 86 patients with a primary diagnosis of cocaine dependence who entered the study at the McLean Hospital ($n = 32$) or Massachusetts General Hospital ($n = 54$) site between June 1992 and January 1994. All patients had a primary diagnosis of cocaine dependence; they were included if they had substance use disorders other than cocaine dependence if 1) cocaine was their primary drug of choice, and 2) they did not meet criteria for current opioid dependence. Individuals were excluded if they required ongoing psychopharmacologic or additional psychological treatment, had no stable mailing address, were planning to leave the area within the next 2 years, were mandated by the court to treatment, or had a history of bipolar disorder or schizophrenia. All patients gave written informed consent before entering the study.

Assessments

Patients were identified as meeting DSM-III-R criteria for current cocaine dependence by use of the Structured Clinical Interview for DSM-III-R (SCID),[17] which was administered by a trained psychologist or social worker. Sociodemographic and substance use history data were obtained with the Addiction Severity Index (ASI), 5th Edition.[18]

The Craving Questionnaire, which has been described in detail elsewhere,[9] is presented in Table 1. We scored the questionnaire by calculating a "daily mean composite"; that is, we added together the scores of the five individual questions and divided by five; daily mean composite scores thus ranged from 0 to 9.

Patients were asked to fill out the Craving Questionnaire daily, beginning with their first clinical visit. At that time, they were given a packet of questionnaires and stamped envelopes addressed to the study site. Patients were asked to complete the questionnaires daily, either at the site or at home if they were not coming in for a clinical visit. They were paid $3 for each completed questionnaire.

Data Analysis

Data were analyzed in order to measure the psychometric properties and the predictive validity of the Craving Questionnaire in an outpatient setting. Internal consistency of the five items was calculated by use of Cronbach's alpha, and factor analysis was used to test the unidimensionality of the questionnaire. The predictive validity of the craving questionnaire was evaluated by logistic regression analysis to examine its value in predicting initiation of abstinence.

TABLE 1. Craving Questionnaire

1. Please rate how **strong** your desire for cocaine is **right now.**

No desire								Extremely strong	
0	1	2	3	4	5	6	7	8	9

2. Please rate how **strong** your desire for cocaine was **during the past 24 hours.**

No desire								Extremely strong	
0	1	2	3	4	5	6	7	8	9

3. Please rate **how often** you had the urge to use cocaine **during the past 24 hours.**

Not at all								Extremely often	
0	1	2	3	4	5	6	7	8	9

4. In the past 24 hours, please rate how strong your urges have been for cocaine when something in the environment has reminded you of it (examples: seeing a razor blade, a spoon, a needle, a mirror, or a beer ad).

No urges								Extremely strong	
0	1	2	3	4	5	6	7	8	9

5. Please imagine yourself in the environment in which you previously used drugs and/or alcohol (a bar, your dealer's house, a shooting gallery, or whatever situation reminds you most strongly of active drug use). If you were in this environment right now, what is the likelihood that you would use cocaine?

Not at all								I'm sure I would use.	
0	1	2	3	4	5	6	7	8	9

Although we collected craving data daily from patients, we are focusing in this report on initial craving scores (i.e., scores during the first 3 days) because of our interest in predictive validity. Because ongoing drug use can stimulate continued craving,[19] we examined initial craving scores to reduce the impact of that confounding factor, which would occur if we examined craving scores throughout the stabilization period. Examination of craving scores throughout the 30-day period as a predictor of randomization would also result in skewed data because the only patients remaining in the stabilization period toward the end of the 30-day period would be those who had been continuing cocaine use; their craving scores would thus likely be higher as a result. Finally, examination of early craving data is clinically relevant because these initial scores can be gathered quickly and, if it helps to predict outcome, can be useful in planning treatment. A sampling period of 3 days was used, rather than fewer days, because of occasional missing data (detailed below), which would have made analysis of only 1 day less representative of the overall study sample.

RESULTS

Sociodemographic Characteristics and Substance Use Histories

The study sample was predominantly white (64%), male (65%), and employed (87%). The patients had used cocaine regularly for a mean of 7.2 (± 5.0) years and a median of 6 years. Fifty-seven percent of the patients used cocaine primarily by smoking, 20% were predominantly intranasal users, 5% were intravenous users, 1% used orally, and the preferred route of administration was unclear in 17%. The patients had used cocaine for a mean of 9.4 ± 8.0 days and a median of 6 days in the previous month, and 2.6 ± 3.8 times, with a median of 1 time in the previous week. They had spent a mean of $296 ± $578 and a median of $150 on cocaine during the previous week. Patients scored a mean of 0.23 ± 0.07 and a median of 0.23 on the ASI Drug Composite Score, with scores ranging from 0.09 to 0.38.

Internal Consistency of the Questionnaire

The association among the five craving items was very high. Cronbach's alpha, used to measure internal consistency, was 0.85 on Day 1 and 0.90 on Days 2 and 3.

Unidimensionality

An exploratory principal-components factor analysis for each of the first 3 days was used to evaluate the extent to which the questionnaire measured one dimension. Only one large factor was found, incorporating all five craving items. This finding supports the unidimensionality of the concept of craving, as measured by this instrument, rather than viewing craving as consisting of several discrete and unrelated components. Maximum eigenvalues for the single factor ranged from 3.16 to 3.61 across Days 1 to 3, explaining 63% to 72% of the variance in the items. Factor loadings are reported for Day 3 because the greatest number of patients completed the scale on that day (n = 77 out of 86): Item 1 = 0.78; Item 2 = 0.93; Item 3 = 0.89; Item 4 = 0.77; and Item 5 = 0.85.

Initial Craving Scores as a Predictor of Initiation of Abstinence

All 86 patients completed at least one Craving Questionnaire during their initial 3 days in the study, with 47% completing two and 37% completing all three. Because craving scores for some patients were based on fewer than 3 days, stability of patients' scores may vary. We calculated the "overall mean composite" craving score for a patient by adding the patient's daily mean composite craving scores and dividing by the number of days on which questionnaires were completed. Logistic regression analysis was used to relate these overall mean composite scores to the outcome measure of initiating abstinence (i.e., producing three consecutive negative urine specimens within a maximum of 30 days). When the ASI Drug Composite Score and a two-way interaction term (for severity × craving) were included in the model, neither was statistically significant. Furthermore, when a measure of frequency of recent cocaine use (i.e., number of times used in the last week) was added to the model, it did not achieve statistical significance. Hence the model reported here excludes those variables. Results showed that overall mean composite scores on the Craving Questionnaire did predict initiation of abstinence: patients with greater craving scores were less likely to initiate abstinence than patients with less craving ($P < 0.05$; odds ratio: 1.24). Thus, the odds of initiating abstinence increased by a factor of 1.24 for each unit decrease in cocaine craving.

Examining the raw data for craving scores suggested that merely examining means would obscure some of the differences between patients who were and were not able to initiate abstinence. Hence, quartiles were chosen for presentation of the results in order to reflect the individual patients' scores, rather than pooled scores.

The chances of initiating abstinence decreased significantly in higher quartiles, as shown in Table 2. By logistic regression, patients scoring in the fourth quartile (greater than 5.8 on the 0–9 scale) had odds of initiating abstinence 4.9 times lower than those in the first quartile (one-tailed test; $P < 0.02$) and 5.2 times lower than those in the second quartile (one-tailed test; $P < 0.02$), whereas the third and fourth quartiles were similar to each other.

DISCUSSION

We have developed an instrument to measure cocaine craving that is easily and quickly administered and has now been demonstrated to have a high level of internal consistency in both inpatient[9] and outpatient cocaine-dependent populations. In

TABLE 2. Relationship between Day 1–3 mean composite Craving Questionnaire scores (by quartile) and abstinence initiation ($N = 86$)

Quartile	1	2	3	4
Range of mean scores	0–2.07	2.08–4.3	4.4–5.8	> 5.8
n	21	22	23	20
Initiated abstinence, %	62	64	52	25
Did not initiate abstinence, %	38	36	48	75

Note: $\chi^2_{[3]} = 8.09$, $P < 0.05$.

this study, we have demonstrated that our measure of craving also has predictive validity in this setting: the overall mean composite score on the instrument during the first 3 days of treatment was predictive of short-term clinical outcome, that is, demonstrated initiation of abstinence within a 30-day period. The questionnaire thus functioned as an inexpensive, easily administered prognostic instrument in a population of cocaine-dependent outpatients.

Previous research has shown craving to be an inconsistent predictor of subsequent drug use. Reasons for this include the fact that some studies have measured craving by relying on a single question about the strength of craving.[7–20] Moreover, even our own previous research, using this same instrument, has not found craving scores useful as a predictor of long-term outcome in inpatients.

The fact that our craving instrument had predictive validity in outpatients but not in inpatients may be due to the important influence of drug availability and classically conditioned cues on craving.[12] Because inpatients are not exposed to some of the environmental cues that may trigger craving, their subsequent exposure to these cues may affect them in ways that they cannot anticipate. Outpatients, on the other hand, have already factored in these environmental cues because of their regular exposure to them. Thus, for example, an inpatient with mild cocaine abstinence symptoms and little cocaine craving may experience severe craving and perhaps return to cocaine use upon return to his home neighborhood, where drugs are available. An ambulatory patient in such a situation, however, will likely report a higher craving score because of his current exposure to these environmental cues.

It is noteworthy that the relationship between craving and subsequent use was not linear. Rather, patients in the top quartile of craving scores (i.e., above the approximate midpoint of our 0–9 scale) were significantly less likely to initiate abstinence than patients in the bottom three quartiles; prognostic differences among patients scoring in the bottom three quartiles (i.e., the lower half of the scale) were minimal. This finding implies that, at least in this population, there was a threshold level of craving around the midpoint of the scale; patients scoring above this level were unlikely to be able to initiate demonstrated abstinence in the subsequent month.

Of course, the strength of an individual's desire to use drugs is only one determinant of the likelihood of actual use. Other factors that play a role in this process include the strength of the countervailing motivation not to use drugs, the possession of behavioral skills (e.g., drug refusal techniques) required to abstain from drugs, and an individual's confidence in his or her ability to abstain. We are currently studying the importance of these factors, in conjunction with craving, as predictors of drug use or abstinence. By further understanding the role of craving in the process of continuation or cessation of drug use, we can hopefully target high-risk individuals and develop interventions specifically designed

to help cocaine-dependent patients either reduce or cope successfully with craving in order to improve overall clinical outcome in this population.

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