Wanting and Drug Use: A Biocultural Approach to the Analysis of Addiction

DANIEL H. LENDE

ABSTRACT *The integration of neurobiology into ethnographic research represents one fruitful way of doing biocultural research. Based on animal research, incentive salience has been proposed as the proximate function of the mesolimbic dopamine system, the main brain system implicated in drug abuse (Robinson and Berridge 2001). The research presented here examines incentive salience as the mediator of the wanting and seeking seen in drug abuse. Based on field work with adolescents at a school and a drug treatment center in Bogotá, Colombia, this article addresses: 1) the development of a scale to measure the amount of incentive salience felt for drugs and drug use; 2) the results from a risk-factor survey that examined the role of incentive salience and other risk factors in addiction; and 3) the ethnographic results from in-depth interviews with Colombian adolescents examining dimensions of salience in the reported experiences of drug use. Incentive salience proved to be a significant predictor of addicted status in logistic regression analysis of data from 267 adolescents. Ethnographic results indicated that incentive salience applies both to drug seeking and drug use, and confirmed the importance of wanting, a sense of engagement, and shifts in attention as central dimensions of experiences related to drug use.* [biocultural, addiction, substance use and abuse, incentive salience, adolescence, Colombia]

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INTRODUCTION

This article examines a central question within research on addiction: how and why individuals compulsively want drugs. In particular, the article will take what is generally thought of as a biological risk factor—the effect of drugs on the mesolimbic dopamine system, the main brain system impacted by drugs of abuse (Di Chiara 1998; Robbins et al. 1998)—and demonstrate how to reconsider this risk factor in biocultural terms. This biocultural approach shifts the debate of what causes addiction away from the single-field focus of most research on the problem. For example, biomedical research highlights the pharmacological qualities of drugs and the genetic vulnerabilities of individuals (Goldstein 2001), whereas research in the social sciences has stressed the impact of context on drug use behavior (Heath 2000; MacAndrew and Edgerton 1969). In this article, biology and culture both come into play.

The research presented here began by drawing on two formative points. First, the impact of drugs can be considered in terms of the function of those brain systems that are affected. This emphasis on function has direct links to evolutionary approaches to addiction, and thus to biological anthropology (Lende and Smith 2002; Smith 1999). Second, the overall impact of drugs is not limited to their pharmacology—social learning and context can powerfully shape the perceived effects of drugs, so that individuals learn what a drug high is supposed to be like (Becker 1953; Waldorf et al. 1991).

These two points, however, do not specifically indicate how to undertake a biocultural research project. As biopsychosocial research on substance abuse has shown, an epidemiological approach represents one way to address different risk factors (McCaffrey and Forneris 1997; Pandina and Johnson 1999). Although risk factors have generally been conceptualized in terms of one of the three implied areas—biology, psychology, and sociality—this methodological approach offers the ability to compare the impact of different factors. In this research it was adapted to incorporate a measure of incentive salience developed using a biocultural approach.

This article will also consider the conjunction of the pharmacological impact of drugs and the cultural dimensions of use through the consideration of drug abusers' experiences. This approach is consistent with psychological anthropology's recent focus on phenomenology and embodiment (Csordas 2002; Desjarlais 2003), as well as its traditional emphasis on an intentional, meaning-making individual. Using this phenomenology of drug use, the role of incentive salience, as shaped by both biology and culture, will be illustrated in a way that scale ratings of one to five do not provide.

Overall, this article integrates neurobiology and ethnographic research in two specific ways: 1) testing the incentive salience theory of addiction using structured data, and 2) drawing on in-depth interviewing to examine the experiential dimensions of incentive salience in substance abuse. Together, these two points demonstrate how the wanting involved in compulsive drug seeking and consumption is best understood using a biocultural approach. The experiences of adolescents in Bogotá, Colombia form the core of the research used to examine the role of incentive salience in substance abuse. Before looking specifically at their experiences, however, it is important to first consider the biological background to wanting and drug abuse.

INCENTIVE SALIENCE AND DRUG ABUSE

The principal approach used in understanding and treating addiction in medical settings has relied on the view of addiction as being driven by reward. Reward is generally identified with pleasure, which reinforces drug-taking behavior. Blum et al. summed up this view in their article on addictive behavior, "the mesolimbic dopamine circuit is a hard-wired system in the brain . . . that provides pleasure in the process of rewarding certain behavior" (1996:132). In this view, both drug seeking and drug use are motivated by the *innate* pleasure that drugs cause. Drug abuse results when drugs, due to tolerance (a loss of effect), no longer produce the same positive effect. Addicts enter into withdrawal, taking more and more drugs to produce pleasurable effects to counter the negative experiences of withdrawal (Koob and Le Moal 1997).

More recently, a new neurological approach to the role of brain systems in drug abuse has emphasized not the rewards that drugs produce, but how drugs affect the motivations and incentives that individuals experience vis-à-vis drugs (Di Chiara 1998; Pihl and Peterson 1995; Robinson and Berridge 2001). In other words, these theories have emphasized drug seeking over drug taking, proposing that "wanting" and drug seeking are central components of addictive behavior.

Based primarily on research with animal models, Robinson and Berridge (1993, 2000, 2001) have developed one of the most prominent of the motivational models of brain function and substance abuse. Instead of reinforcement, Robinson and Berridge propose that the central brain system implicated in substance abuse—the mesolimbic dopamine system—mediates "incentive salience." They write, "We have suggested that it is the process of incentive salience attribution that transforms . . . the neural and psychological representations of stimuli, so that they become especially salient stimuli, stimuli that 'grab the attention,' that become especially

attractive and wanted, thus eliciting approach and guiding behavior to the goal" (Robinson and Berridge 2000:S104).

Robinson and Berridge highlight "wanting" as the subjective feeling of incentive salience, providing the desire to search out and consume drugs (or do other things, such as when food is salient, wanting to go eat). Furthermore, Robinson and Berridge's theory emphasizes the importance of associative learning and context in shaping the attribution of salience, rather than drugs creating an internal feeling of pleasure. This view, where salience is part of larger behavioral interactions with the environment, helps open the door for biocultural research through the consideration of sociocultural processes.

Robinson and Berridge do not deny the importance of positive reactions to drug, positing that "liking" drugs plays a central role in the initiation of drug use. However, they propose that drug *abuse* is driven by an individual's sensitization to *wanting* drugs. Through sensitization, or an increased reaction to drugs, "drug cues trigger excessive incentive motivation for drugs, leading to compulsive drug seeking" (Robinson and Berridge 2003:36). Thus, Robinson and Berridge's theory proposes that with increasing levels of drug use, those brain cells affected by drugs produce a greater-than-normal salience signal. Based on this increase in the amount of salience signaled, the addicted individual experiences a powerful desire for drugs.

In clinical terms, this heightened salience of drug cues and drug-related behaviors corresponds to the compulsive drug seeking seen in substance abuse. In other words, the excessive salience drives the compulsion to use, from seeking out drugs that no longer provide the same pleasurable effect to problems with relapse when addicts are attempting to maintain abstinence. Thus, in comparison to the classic reward approach, this theory helps explain certain problematic aspects of drug abuse. Nevertheless, the research that led to the creation of this theory was based primarily on work with rats, and required some reworking to be used in an anthropological project.

INCENTIVE SALIENCE: WANTING AND SEEKING

The translation of neurobiological ideas into the more subjective domain of individual self-reports was an important first step in developing the research presented here. Robinson and Berridge (1993, 2000, 2001) have emphasized wanting as the subjective experience related to incentive salience attribution. This wanting—a conscious desire for drugs—can drive both drug seeking and drug relapse, the sudden surge in wanting during abstinence. Thus, the excessive wanting of incentive salience can

be seen as the proximate mechanism driving cravings, the compulsive urge and/or desire to consume drugs (Halikas 1997). Ethnographic research has confirmed that "wanting" was a common way that drug abusers described the experience of craving (Merikle 1999). Thus, wanting received support as a relevant domain for exploration.

Robinson and Berridge have also emphasized the role of salience in drug seeking more generally, but do not provide other explicit subjective considerations. Translating "drug seeking" into subjective terms relied on a more formal examination of the neurobiological literature. Robinson and Berridge (2000) mentioned the attentional aspect of incentive salience, that drug cues "grab attention." This approach to the motivational aspect of drug abuse has been developed in work by Di Chiara (1998) and Pihl and Peterson (1995). In this view, incentive salience (or motivation) is as much about anticipation and a focus on drug cues, as it is about wanting. This approach has been supported by research indicating that the mesolimbic dopamine system has direct effects on attentional processes in the brain (Robbins et al. 1998). Based on this approach, seeking behavior involves having drugs at the center of attention, and other behavioral options at the periphery of attention. As Pihl and Peterson (1995) have argued, this incentive system provides a sense of what to pay attention to, of what is important in any particular situation. In other words, we focus on what we seek out.

A broad view of the evolved functioning of the dopamine system proved useful for highlighting behavioral engagement as a second aspect of drug seeking (Lende and Smith 2002). Redgrave et al. (1999) proposed that the dopamine system works as a proximate mechanism for animals to switch from one behavior to another, and Ikemoto and Panksepp (1999) have discussed the dopamine signal as providing something akin to a "go—no go" signal in the animal's brain. Put differently, incentive salience is about engaging in a behavior, not just the motivation for a behavior. Incentive salience means not just wanting but doing, preferably *now*. Thus, a sense of being involved in a particular behavior, of an urge to continue it (the "go" signal), became a second aspect of drug seeking, alongside an attentional focus on drugs and drug behavior.

Overall, then, three subjective aspects of incentive salience were identified for this research: wanting, shifts in attention, and behavioral engagement. These facets provided a framework for the development of a scale to formally test incentive salience as a risk factor for drug abuse. A considerable part of the fieldwork in Colombia was devoted to developing this scale using an ethnographic approach. This scale was then incorporated into a risk factor survey on drug use and other risk factors, derived primarily from previous epidemiological research on drug use in Colombia (Brook et al. 1998). The same three-dimensional framework

also provided an initial set of themes to explore in qualitative research with adolescent drug users. This qualitative research provided an ethnographic grounding and expansion to the biological framework presented here. These interviews also illuminated the role of culture and meaning making in substance abuse, where the interpretive understanding of wanting complements the epidemiological results of the overall research.

RESEARCH SITES

Studies of drug use and abuse generally fall on either side of the use/abuse divide. For example, epidemiological studies often focus on drug use, whereas clinical studies examine abusers (Brook et al. 1998; Graham et al. 1998). Similarly, anthropological studies have generally focused either on substance use (Heath 2000) or on addicts (Bourgois 1995). This study was conceived as a project that focused both on a clinical population and a more general population, providing the data necessary to examine why some people abuse substances and others do not.

The first research site was a treatment center for adolescent drug abusers located just outside Bogotá, the capital of Colombia. This center has separate programs for adolescent boys and girls, who came from a range of middle-class and lower middle-class neighborhoods in Bogotá. Based on age restrictions, almost all individuals in the treatment center were from 13–18 years old. Because of a combination of space and demand factors, the program for boys generally had twice as many individuals enrolled as the program for girls. Although the vast majority of adolescents at the treatment center had significant substance abuse problems, a small number of adolescents did not. Generally these were adolescents who had legal problems due to selling drugs and had chosen treatment in lieu of jail. The main drug consumed by adolescents in treatment was marijuana (for example, 38.6 percent indicated it was their drug of choice in the survey), followed by basuco (similar to crack) and cocaine. Other illegal drugs used included inhalants and "pepas," a ubiquitous category for pills bought on the street.

The second research site was a secondary school located in a middle-class neighborhood in Bogotá. This school was specifically for adolescents who wanted to recoup an academic year after having academic or disciplinary troubles at another institution. This school enrolled individuals from the same or similar neighborhoods as the adolescents in the treatment center. The adolescents' ages ranged from 12–19. There were also twice as many boys as girls at the school, based almost entirely on enrollment. Most school adolescents used alcohol or cigarettes, followed by marijuana (for example, 9.1 percent indicated that marijuana was their

drug of choice in the survey sample). Although most school adolescents had few problems with substance use, there were some individuals who abused drugs and thus were quite similar to the adolescents in treatment. At both sites, adolescents were recruited through informed consent of the individual and one parent or guardian.

METHODS

Research was conducted for 16 months at both sites, beginning in September 1999 and lasting to December 2000, with an additional month of data collection in July 2001. Four main methods were used in chronological order, supplemented by extensive participant observation. These methods were: 1) a questionnaire on drug attitudes, with written responses to open-ended questions; 2) a semistructured interview exploring the motivations of adolescents to use or not to use drugs (interview #1); 3) a risk factor survey, with structured scales covering levels of drug use and different risk factors related to use (including the incentive salience scale); and 4) an in-depth interview on the particular experiences adolescents had with drugs, with a focus on the dimensions of wanting and seeking drugs (interview #2).

In essence, each method built on the other. The broad but superficial information provided by the questionnaire gained ethnographic depth through the first interview covering adolescent motivations. Together, these two methods supplied the materials used to create the incentive salience scale, which was then included in the risk factor survey. Finally, the second interview provided the ethnographic detail on incentive salience to complement the quantitative analysis done with the risk factor survey.

The Attitude Questionnaire

This anonymous questionnaire began with basic demographic and substance use questions (sex, age, and yes/no answers to use of alcohol, cigarettes, marijuana and any other drugs in their lifetime and in the last 30 days). The questionnaire then presented three open-ended questions: 1) What do you think a drug is?, 2) What do you yourself think of drugs?, and 3) Why do you think people use drugs? Three hundred and thirty individuals gave written responses to the questionnaire, based on two applications at the school (no repeated applications) and one at the treatment center to all available individuals who had given consent. Two hundred and sixty-four of these individuals came from the school (64 percent male), and 66 from the treatment center (66 percent male).

All answers to each question were entered into a database. General analysis of positive and negative descriptions of drugs was done across four categories of users for the school respondents (no alcohol or cigarette use ever, alcohol and/or cigarette use but no illegal drug use, illegal drug use in lifetime but not last 30 days, and illegal drug use in last 30 days) and one lump category for treatment respondents. The data used specifically for the development of the scale were drawn from the 66 individuals in treatment, and the 40 individuals at the school who indicated they had used marijuana and/or any other drug in the last thirty days (15 percent of the school sample). Two types of data were extracted from this sample of 106: motivations to use drugs, and descriptives of drug seeking and drug use. Recurring themes were identified in these two lists, and representative statements covering the differing themes were assembled into an initial list of possible items to be used in the salience scale.

Interview #1: Motivations to Use Drugs

This semistructured interview consisted of several set questions, followed by probes and expansions based on initial answers (Briggs 1986; Spradley 1979). The set questions were: 1) What do you think of alcohol? 2) What do you think of marijuana?, and 3) What do you think of other drugs? After covering each of these questions in depth, respondents were asked briefly about their own substance use and any personal or family problems that the individual might have or had with substance use.

One hundred and fifty-one of these interviews were conducted, 108 at the school (68 percent male) and 43 at the treatment center (63 percent male). At both sites, the sample was a convenience sample, based on individuals who were available for interviewing outside of class, therapy, or other organized activities. This sample covered a wide range of experience with drugs at the school (from no lifetime use of alcohol to high levels of present or previous illegal drug use) and individuals at different points of treatment at the center.

The specific themes explored through the probes were developed over time, a common technique in both grounded theory (Strauss and Corbin 1998) and cognitive anthropology (D'Andrade 1991; D'Andrade and Strauss 1992). The interviews initially focused on a basic examination of adolescent thoughts on drugs. Three specific areas of exploration then emerged as data collection proceeded: a) definitions and categories of drugs (drawing on approaches represented in D'Andrade 1995 and Lakoff 1987), b) cultural models around drugs and drug use (based on D'Andrade 1991 and D'Andrade and Strauss 1992), and c) phenomenological and

embodied aspects of drug use (see Csordas 2002; van der Geest and Whyte 1989). This final area, in particular phenomenological descriptions of addictive behavior, provided the specific data used in designing the incentive salience scale. Analysis focused on identifying the recurring elements in the descriptions to provide a list of common characterizations of drug use by the adolescents. Representative statements were also extracted from these interviews to help form the initial list of possible statements for the incentive salience scale.

Risk Factor Survey

The survey consisted of 314 different items, including basic demographic information, scales to measure recognized risk factors for adolescent substance use and abuse, questions covering levels of substance use, and scales to determine problems related to substance use. The majority of the survey was derived from Brook et al.'s (1998) previously validated epidemiological work on risk factors and drug use in major Colombian cities. Brook et al's (1998) work demonstrated the importance of four domains of risk in Colombia: a) individual characteristics and personality, b) family traits, c) peer factors, and d) cultural/ecological factors, all of which impacted levels of adolescent marijuana use in Colombia. These same four domains were covered in this survey.

Other scales (e.g., the sensation seeking scale used in this article) were drawn from two other sources: the National Survey of Parents and Youth, part of the National Youth Anti-Drug Media Campaign (Office of National Drug Control Policy 2000), and the National Longitudinal Study of Adolescent Health (1999). Scales drawn from these epidemiological surveys were translated into Spanish, and then back-translated, by two bilingual individuals (one a native Spanish speaker, the other a native English speaker). The entire survey was pilot tested at both research sites before final administration.

Two hundred and seventy-one adolescents took the surveys. The survey was administered twice at both research sites (no repeat administrations). The sample included all available adolescents who had provided informed consent. Three individuals from the school were excluded for giving incomplete responses (e.g., a third of questions answered), and one individual from the treatment center who also did not complete the survey because of functional illiteracy. Of the final sample (of 267), 154 came from the school (70 percent of them male) and 113 from the treatment center (71 percent male). After data entry and cleaning, all data analysis was done using SPSS statistical software. A significance level (p) of 0.05 was set at the beginning of analysis. The logistic regression techniques used in

this article were based on Kleinbaum and Klein (2002), supplemented by the general statistical overviews from Monro (2001). Specific aspects of the data analysis (e.g., definition of the variables) are elaborated at greater length below.

Interview #2: Wanting and Seeking

This semistructured interview covered three basic areas: the same domains of risk addressed in the survey (self, family, friends, and context, e.g., school and neighborhood), a comprehensive drug history, and an in-depth exploration of experiences related to drugs and drug use. The interviewing approach emphasized the person-centered techniques used in psychological anthropology (Hollan 2001), as well as the probing techniques developed in motivational interviewing (Miller and Rollnick 1991).

The main point of the section of the phenomenology of use was to engage the respondent, rather than the anthropologist, in doing the "thick description" of his or her own experiences (Geertz 1973). Two specific forms of questioning were developed to address the subjective dimensions of wanting. First, the respondent was asked to cover a typical day of drug use step-by-step, with repeated probes on what the individual was experiencing during the process of obtaining and using drugs. Rather than directly asking how or why a certain experience was important or salient to the individual, these probes drew on the reflective listening technique described by Miller and Rollnick (1991), which provides a means of building descriptions through open-ended questioning.

Second, respondents were asked the question: If you could describe your experiences with drugs as an imaginary place, what sort of place would this be? This question helped provide adolescents with a format to get their experiences into words, and highlighted the symbolic and metaphorical aspects of their experiences with drug use. Probes were used to elaborate on initial responses to clarify the meaning particular answers had for the individual, and to connect these answers back to the step-by-step description of use previously provided.

Forty two individuals completed the second interview, 30 from the school (60 percent of them male) and 12 from the treatment center (50 percent male). Given the research focus on drug abuse, nearly half of the interviews at the school were conducted with individuals who were present or past illegal drug users. For this article, data analysis focused on the subjective experiences with drug use. Relevant excerpts were coded and then extracted into separate documents for a review of common themes. These common themes were then related to the three theoretical themes from the literature review.

OVERVIEW OF THE RESULTS

The results will cover three areas: 1) the creation of the incentive salience scale, based on the ethnographic results from the questionnaire and the first interview; 2) analysis of incentive salience and other risk factors as predictors for substance abuse based on the survey results, and 3) the ethnographic results from the second interview, providing an in-depth look at descriptions of incentive salience.

Although normally a method—the incentive scale—is not considered part of the results, the steps taken to create the scale are presented here for two reasons. The more pragmatic reason is that the construction of the scale was based on the combination of the literature review and ongoing ethnographic results while in the field. Thus, the scale forms part of the research results. At a larger level, biocultural anthropology will increasingly rely on integrative methods. Presenting *how* neurobiological research, ethnographic results, and epidemiological approaches were combined in creating a scale represents an important part of building biocultural anthropology.

CONSTRUCTION OF THE INCENTIVE SALIENCE SCALE

Ethnographic Results

The incentive salience scale was created by drawing on the results of the questionnaire and the first interview. The first step in this process was identifying the common dimensions related to wanting and seeking drugs in the adolescents' descriptions. One important thing that emerged early in this review process was that the dimensions of wanting, shifts in attention, and behavioral engagement applied to more than just anticipating and seeking out drugs, the main focus of Robinson and Berridge's theory. The dimensions of incentive salience applied to both seeking out and using drugs, leading to a wider focus on how drugs and drug use were salient to users.

Based on this wider view of salience, six common elements were then identified in the adolescents' descriptions. First, one of the most typical ways of describing addictive experiences in Colombia was "querer más y más," to want more and more drugs. During my ethnographic research, this emphasis on wanting—the Colombian's summary description of what addiction was—took on more relevance as I realized the diversity in positive appraisals and "rewards" from substance use, ranging from "forgetting everything" to riding a skateboard better. Other ways used to describe this experience included "deseo" and "sentir ganas," to feel a desire to consume drugs. Overall, the emphasis on wanting and desire provided a clear

indication of the relevance of the incentive salience approach to understanding drug abuse in this population.

There were three commonalities across adolescent responses that related to shifts in attention while seeking out and using drugs. First, individuals emphasized "las sensaciones," the sensations, they experienced while using drugs. An oft-repeated idea about these sensations was that they were very "present" in their minds. Second, substance abusers at times spoke of using drugs "sin darme cuenta"—"without realizing" or "without thinking about it," a typical phrase to describe how individuals lost track of their amount of use. For example, one respondent narrated about having too many drinks at a party without realizing this and then suddenly seeing that he was stumbling around drunk with his head spinning. Third, when speaking about wanting to use drugs, users often said that this meant "de una vez," "immediately" or "at once." Abusers often told me that they could not wait, they had to go at once to use drugs, especially if "se presenta la oportunidad," if the opportunity comes up.

Two final characteristics of the descriptions related to engagement in seeking out and using drugs. One phrase frequently used to describe addictive behavior was "dedicado a eso," to be dedicated to that, in the sense of a person spending his or her time doing that and nothing else. Finally, the experience of use was often delineated in terms of "el momento," the moment. Individuals spoke of being "metido en el momento," of being into the moment, in a literal sense, being inserted into it.

Generation of Statements

At the same time that I was summarizing the main elements of drug experiences, I created a list of possible statements to include in the incentive scale by drawing on what the adolescents had written and said to me. Forty-eight statements were initially drawn out of the questionnaires and interviews based on the simple criterion of providing an idea for *how* drug use might be salient to adolescents there. Thirty two of these statements were then omitted based on two criteria: close similarity to another statement, and lack of a strong correspondence with the neurobiological framework.

The final scale contained eight items. These eight items were based on the ethnographic results covered above. Items that matched ideas of wanting, involvement, and attention but did not correspond to the common ethnographic themes were eliminated. Thus, the final scale had items that matched both the framework derived from the neurobiological review and the ethnographic research. The translation of the scale is presented in Table 1.[1]

Table 1. Incentive salience: Translation of the final scale.

The following statements are about what you could have experienced when you have consumed psychoactive substances. Please say how well each phrase describes your own experiences with consumption.

At times I have started to consume and consume without thinking about anything else
When I have consumed, at times I have felt completely into the moment
In the moment of consuming, the sensations feel very present
At times what has most mattered to me is the desire to consume
At times consuming feels like you want more and more
At times when I have wanted to consume, I have wanted to do it immediately
At times with consuming, I have felt that nothing else exists except the sensations of themoment
At times when an opportunity to consume has come along, I have not been able to focus on other things

Scale:
Describes what I have experienced: 1 = Very Well, 2 = Well, 3 = More or Less, 4 = A Little, 5 = It Does Not Describe It

Using reliability analysis on all the items of the scale, the scale had an alpha of 0.949, well above the normal cut-off of 0.8 (Nunnally and Bernstein 1994). Eliminating any item in the scale gave a lower overall alpha, indicating that all items were relevant to what the scale was designed to measure. A factor analysis extracted one significant factor (eigen value = 5.89, above the accepted cut-off of 1.0), accounting for 73.6 percent of the total variance. These results, that all items contribute to an internally consistent scale loading onto one factor, provide good evidence that the combination of theory and ethnographic results that guided the construction of this scale provides a useful way to develop a locally appropriate measurement that addresses a biocultural variable.

SURVEY RESULTS: OVERVIEW

The survey, with responses from 154 school adolescents and 113 adolescents in treatment, provided the data to test whether incentive salience proved to be a significant predictor of substance abuse problems. Incentive salience was tested alongside five other risk factors. Sensation seeking, given both its established link to substance abuse and as a possible

confounder for incentive salience (given similarities to the seeking out of sensations) was included (Glantz and Pickens 1992). Four predictive variables for marijuana use among Colombian adolescents were drawn from Brook et al.'s (1998) different risk domains—individual, family, peer, and culture/ecology. These variables were individual delinquency, the adolescent's relationship with mother, peer drug use, and experiencing armed violence. A dichotomous outcome variable—addicted status, indicating the presence or absence of a substance abuse problem—was used in logistic regression analysis (Kleinbaum and Klein 2002).

Variables

Addicted status. This dichotomous variable divided individuals into "addicted" (n = 121) and "nonaddicted" (n = 117) categories. In the "addicted" category, 89 individuals were from treatment and 32 from the school. In the nonaddicted category, 10 individuals were from treatment and 107 from the school. Meeting any of the following three criteria indicated inclusion in addicted status: 1) reported using five times or more a day (the highest score), 2) reported trying to stop or cut back on substance use four times or more (the highest score), and 3) reported 17 or more on total problems related to substance use (averaging more than 2 reported problems over 8 different categories). All individuals not meeting at least one of these criteria were classified as nonaddicted.

Incentive salience. This eight-item scale provided a measure of how salient the experiences related to drug seeking and consumption were to the respondent (n = 243, range 0 to 32, mean 15.67, SD 10.548). This variable was recoded so that 32 indicated the highest endorsement of incentive salience and 0 the lowest endorsement. Using a reliability analysis, this scale had an alpha = 0.949 in this data set.

Sensation seeking. This four-item scale was taken from the National Survey of Parents and Youth (Office of National Drug Control Policy 2000) (n = 253, range 4 to 16, mean 8.37, SD 3.111). Each item asks about how much the respondent seeks out provocative and/or sensation provoking experiences. Using a reliability analysis, this scale had an alpha = 0.671 in this data set.

Individual delinquency. This scale consisted of nine possible delinquent behaviors, rated 0 to 4 to indicate number of times committed in the past 12 months (n = 262, range 0 to 32, mean 12.90, SD 11.237). The scale was taken from Brook et al. (1998). Using a reliability analysis, this scale had an alpha = 0.924 in this data set.

Relationship with mother. The four items in this scale referred to how close and caring the adolescent's present relationship was with his or her mother (n = 258, range 4 to 20, mean 17.33, SD 3.098). The scale was drawn from the National Longitudinal Study of Adolescent Health (1999), and represents a condensed version of Brook et al.'s (1998) more extensive questions on parental relations. Using a reliability analysis, this scale had an alpha = 0.809 in this data set.

Drug-using friends. This question asked how many of the respondent's friends used any drug besides marijuana for nonmedical purposes (n = 265, range 1 to 4, mean 2.43, SD 1.15). The ratings went from 1 to 4, where 1 = None, 2 = Only a few, 3 = Some, and 4 = Most. This question was taken from Brook et al. (1998). Of the respondents, 28.7 percent responded none of their friends, 24.9 percent responded a few of their friends, 21.5 percent responded some of their friends, and 24.9 percent responded that their friends used drugs.

Experiencing armed violence. This measure consisted of four items asking for the number of times (0 to 4 or more) the individual might have experienced different types of armed violence, including being threatened with a weapon, being hit or shot, and being cut with a knife (n = 250, range 0 to 16, mean 4.83, SD 4.07). The scale was drawn from Brook et al. (1998). Using a reliability analysis, this scale had an alpha = 0.757.

RESULTS

An initial model was constructed with all six predictor variables in an initial block. Sex, age, and research site were included as control variables in a second block. Using backward conditional regression, sensation seeking, individual delinquency, and relationship with mother dropped out as nonsignificant ($p > .05$). Forward conditional regression was then run, which did not eliminate any other variable. The final model included incentive salience, drug-using friends, and violence experienced (see Table 2). A separate model run with interaction terms for each of these variables and the variables with the controls indicated no significant interactions. In the final model with three variables, the Hosmer and Lemeshow test of goodness of fit gave a Chi-square of 4.907, nonsignificant at $p = .767$, which indicated an adequate fit.

DISCUSSION OF SURVEY RESULTS

The results of the survey indicate three variables that are significantly associated with substance abuse in this population—incentive salience,

Table 2. Logistic regression results from incentive salience analysis.

	Beta (β)	SE	Wald	Sig. (p)	Exp (β)	Lower 95% CI	Upper 95% CI
Incentive Salience	.099	.027	13.29	.000	1.104	1.047	1.165
Drug Using Friends	.570	.231	6.07	.014	1.768	1.124	2.782
Experiencing Armed Violencet	.158	.071	4.98	.026	1.171	1.019	1.346
Constant	−3.06	2.38	1.65	.198	—	—	—

Note: Results control for sex, age, and research site.

drug-using friends, and armed violence experienced by the individual. Similar to Brook et al.'s (1998) work, violence and peer drug use are both important aspects of substance abuse in Colombia. In research in the U.S. and elsewhere, peer social networks tend to reinforce particular behaviors, including drug use (Glantz and Pickens 1992; Pandina and Johnson 1999). In Bogotá, the ethnographic results indicate that as individuals became more involved in substance use, they changed peer groups, leaving behind "los sanos" (the healthy but boring ones) for "malas amistades" (bad friendships). These friends, especially on the street, were a source of comfort and support that often was not present in the homes of drug abusing adolescents.

With violence, the significant association does not mean that the increased experience of violence drives greater substance use. It is important to take account of experiencing armed violence's significant Pearson correlations with other variables, in particular individual delinquency (.70, $p < .01$), as well as time spent on the street (.45, $p < .01$) and early traumatic experiences (.45, $p < .01$). In other words, this variable appears to capture aspects of both involvement in delinquent behaviors *and* traumatic experiences that could increase the predisposition to use.

Ethnographic results indicate a pattern where increased involvement in substance use and abuse drives greater exposure to violent situations (such as engaging in delinquent behaviors to obtain drugs). Indeed, adolescents often left and/or were forced out of their homes because of escalating substance use. Once out on "the street," these individuals experienced heightened violence as they entered the illegal economy and/or gangs, and used increasingly violent means to obtain resources for drug use and other activities. At the same time, they were in an extremely vulnerable position, often being robbed of their own resources, involved in gang activities, and/or fighting with private security forces or police. In other words, these adolescents became involved in a high-risk environment where both drug use and violence were common. The variable

experiencing armed violence, then, likely captured the level of involvement that these adolescents had in delinquent activities *and* exposure to a vulnerable situation due to an escalation in substance use and loss of contact with family.

In interpreting the results for incentive salience, the low odds ratio (exponent of β) of 1.104 needs to be thought of in terms of the large range of this variable (0 to 32). Thus, for each one point increase in salience, the individual is 1.1 times more likely to be in the addicted category according to this study. However, the purpose of this study was not to produce a valid estimate of the risk that increasing incentive salience brings for substance abuse. These results provide strong support that incentive salience is a significant part of how we need to understand the problem of substance abuse, and further research is now needed to extend the assessment of incentive salience using a more formal epidemiological design. However, there is another way that we can understand the role of incentive salience in substance abuse—the second interview permits a qualitative assessment of how drug use is salient to adolescents in Colombia.

INTERPRETING INCENTIVE SALIENCE

The coming section will address how the three dimensions of salience—wanting, involvement, and attention—also appear in the descriptions of drug use provided by the adolescents in the second interview. These descriptions deepen our understanding of what incentive salience means in terms of actually being in the "addicted status" used to categorize adolescents above. Here, the adolescents' descriptions open a window onto incentive salience not just as biology but as lived experience. In the responses that follow, all the individuals had significant abuse problems.

Wanting

Descriptions emphasizing wanting and desire came through clearly when adolescents discussed the cravings they felt to consume drugs while sitting at home or walking the street. These cravings, which some called "ansiedades" or anxieties, generally precipitated drug use in adolescents with substance abuse problems. As one 19 year old at the school described, the cravings for marijuana were like "climbing a mountain with a glass of water and I go climbing and I get thirsty. . . You get tired like that, wiped out, and you start drinking that glass of water."

A 16-year-old girl in treatment provided a more evocative metaphor: "It's like you are in prison and you want to see your family and you can't. And you want so much to see them and you get really worked up to get out of there, out of the prison where you are in a cage and you can't take it,

you start to sweat, to be restless, and no matter what, you have to. What I mean, you pay whatever to get out of there, it's something like that, you can't even put up with yourself. You've got to satisfy those longings. Like seeing your family because you want to, because you miss them, because you want that. It's quite similar with consuming."

Adolescent drug users also reported experiencing the desire for drugs while seeking them out, for example, going to buy at a local drug market. Interestingly, respondents consistently said the wanting was greater *after* they had decided to use. For example, one 17-year-old boy in treatment said, "Well, before consuming, at the beginning like you repented, like you were thinking if you consumed or not, that was the dilemma. But after, once you were inside . . . then you were more anxious to consume."

Beyond craving and seeking, wanting also applied directly to the drug experience, to the loss of effect and the desire to keep consuming more. In this sense, salience is a powerful aspect of the actual consumption of drugs. One boy described using this way, "It is like something is making me move so that I go and keep consuming . . . It's like this feeling inside, like something that says to me, come along, go consume, you want it. And so I want to keep consuming. That's what it's like for me." A girl in treatment echoed this same idea: "Well, I'd be using and each time I wanted more and more and to be in it each moment and like not to waste any little thing [referring to the drugs]."

Involvement: Seeking and Consuming

Seeking out drugs was a central behavior that adolescents described—how to get drugs, where to go, how to avoid police, and so forth. As described above, experiencing the desire to consume drugs was a major part of this seeking behavior. Others also spoke of urges here, of something moving them toward drugs. These sorts of descriptions, without the element of wanting, were relatively rare, but nonetheless existed. One 17-year-old girl in treatment described how she used to go have a few drinks in the evening. "So when I was like a little dizzy, I started to get that little taste and those little tickles for here [in my stomach] all strange and that anxiety that you want to because you know that it is what calms you and . . . and I was going at once, I caught the bus, I stopped drinking and everything and straight for the 'olla' [where drugs were bought and consumed] . . . So I went along like that, I went by the 'olla' and I got down just like that. That's what the impulse was like, I got off without even wanting to, I got off and when I was off I was saying, two and that's it. And then I was on two and I just went along and went along and went along." Thus, from feeling the desire and anxiety to consume, this girl passed to feeling impelled along by the impulse to use drugs.

The sense of behavioral involvement also appeared in descriptions of the act of drug use itself. Consumers often spoke of being "occupied" with consuming. This description comes from a 14-year-old boy in treatment: "Marijuana is to maintain you occupied. I always went to 'la olla' and I bought my bag of marijuana, but one that would last for about two months, and that's what I smoked. I was a chimney, I lit one and then another . . . Only thinking in that."

Attention

The shift in attention and awareness was part of what made drug use salient to the adolescents. The sense of being involved in "the moment" and the attentional aspects of the experience itself formed part of what made drug use compelling. My favorite word for this was "englobado," a description that some adolescents (especially girls) used to describe how they felt while using. "Wrapped up in it" is one way to translate this, though one girl, trying to explain the meaning of this word to me, also described it like gum—being stuck to it. For example, an 18-year-old former marijuana abuser at the school told me about how he got wrapped up in looking at an apple for a long time while high, entranced by the sensual aspects of the fruit. He summed up, "You just stay there thinking and meditating on the apple, you think a lot of things."

Overall, there was a sense of absorption into the experience, emphasized in the description of this boy in treatment as he talked about the actual experience of being on drugs: "You feel your arms warm, it's great, and you start to do creative things while walking around . . . and you feel like you're talking all strange, saying things . . . whoa, what did I say, and doing things, it absorbed me being like that." Here the experience is absorbing—there are changes in attention—through the way his body felt, the way he moved and talked, the sense of creativity.

For most adolescent drug users, using drugs was not only about getting absorbed into a different experience, but was associated with getting away from painful lives. One boy at the treatment center was very clear that he smoked more marijuana when he was sad. I asked him why. "Well, because it picked up my spirits, and it didn't let me get depressed . . . Yeah, it took away all my being sad and I got all happy." A 16-year-old girl in treatment echoed this about her marijuana use, "You feel all asleep, like all high, like gone, like 'ohhhh.' It feels really good, it feels like a total break, you feel relaxed, without problems, you feel that everything is great, that everything is . . . Or, look, marijuana as such, it helps one out a lot."

Overall, this shift in attention away from worrisome, stressful or painful things on one's mind was a consistent theme. For "problems" of all sorts, drugs were an "escape," they made you forget, they took you on a

trip. Problems with one's family in particular were a potent motive to get out of the house, to use drugs to forget. One 15-year-old girl at school actively linked her marijuana use to a difficult relationship with her mother, especially her mother accusing her of being a prostitute. In contrast to the troubles at home, she said, "the sensations felt very present."

The former drug abuser in the school who described the apple to me echoed this same shift, "I had problems in school or at home, on every side, and with consuming, it's not so much that you forget about things, but that some things lose importance and other things gain importance." I asked him what gained importance, and he said, "Like feeling the sensations, thinking some things, what I was telling you just now [about the apple], and there were times I started to play soccer." However, when this experience ended, "you came back once again to reality and it was like . . . something that you didn't want, like an obligation to come back once again."

Relapse also entered into this dynamic of shifting attention, even if for a moment, away from painful experiences and thoughts. One girl at the treatment center described her experience with a relapse earlier in the program, when she "deserted" with another girl and ended up on the street in Bogotá. "We went to Bogotá, and we started to smoke a lot of marijuana. We just passed all the time smoking, so each time when I felt that the high was passing, I got all unhappy because I missed all this. Because I already had my things clear, like what was the path of good and the path of bad. So I then knew where I was going to end up, and I felt so much pain that I kept on smoking and kept smoking and walking . . . Each time that the high started to go, I saw myself so dirty, I was already like a disposable person [a street person], so I kept smoking and kept smoking."

The Three Elements Together

As demonstrated above, it proved possible to identify the different elements of incentive salience—wanting, involvement, and shifts in attention—that were linked to the actions of the mesolimbic dopamine system. At the same time, all three of these were present in several of the descriptions provided by adolescents. A 15-year-old girl in treatment described using basuco (crack) as follows: "It's about feeling the adrenaline, about feeling that you're consuming and that the others are following you, about feeling good or feeling those strong emotions, like those help you forget so many things, and to feel that I'm just good, that I've got something that moves me, so, that's why I thought it was better to consume." Similarly, this last quote from a boy in treatment emphasizes desire, maintaining involvement, and the shift in attention: "Well, you get this desire to like continue on in the same video, in the same game, like to go back to feeling nothing, to not feeling any problem."

CONCLUSION: UNDERSTANDING INCENTIVE SALIENCE'S ROLE IN ADDICTION

The promising thing about the incentive salience theory is that it offers a biologically based theory that represents a significant alternative to the biomedical approach emphasizing the hard-wired reward of drugs and subsequent physiological withdrawal. The research presented here provides strong support for extending this animal-based model to the understanding of problems of substance abuse experienced by people. In particular, the epidemiological research demonstrated that the incentive salience score was a significant predictor of addicted status. Furthermore, the overall research confirmed the neurobiological framework of wanting, attention, and engagement developed to understand how incentive salience would be experienced by individuals.

The results also point to a significant reformulation in understanding the impact of incentive salience on drug use and abuse. Robinson and Berridge emphasize the importance of incentive salience to the compulsive desire to use drugs and the drive to seek them out. However, the results here indicate that individuals experienced wanting, shifts in attention, and behavioral engagement while *using* drugs as well. In retrospect, these results are not contradictory to the incentive salience theory—which concerns the activation of a system and its associated function—but point to a more complex application of the theory to drug use. Given that drugs do impact the mesolimbic dopamine system, it is not surprising that incentive motivation is felt *while* individuals are using, and not just as a sensitized reaction after the fact. Moreover, Robinson and Berridge's emphasis on cues overlooks the fact that these cues are most powerfully present in the situation of use itself. These cues—for example, holding the drug in one's hand—can help trigger incentive salience.

The results also indicated the importance of developing a biocultural understanding of incentive salience and drug abuse. Based on animal research, Robinson and Berridge proposed a primarily biological model. However, the ethnographic work indicated two important things. First, the role of an intentional, meaning-making person—a consistent emphasis of psychological anthropology—became important in understanding *why* the drug experience was salient to the individual, and not just how a shift in attention and engagement happen in the brain. In particular, the shift away from painful experiences and of being engaged in powerfully present sensations were two consistent themes that adolescents who abused drugs discussed in the interviews.

Second, Becker's (1953) foundational work on "learning the high" among marijuana users can also be applied to the role cultural learning plays in the attribution of incentive salience. Colombian adolescents' emphasis on addiction as "wanting more and more," the "moment" of use,

and to be "wrapped up in it" all represent particular cultural ways of understanding drug use there. These idioms of thought and language shape how the adolescents understood the experience, what to do about it, and what it meant to them. Future research should investigate how individuals learn to pay attention to certain cues and decide to seek out drugs or not. For example, one adolescent reported talking to herself about wanting to use, building up motivation to leave her house against possible severe parental disapproval. This sort of research could then connect incentive salience with research and theory about drug careers, of how drug users organize their lives around seeking out and using drugs (Agar 1973; Stephens1991).

Indeed, the epidemiological results indicate that incentive salience is only one of the things that we need to understand about addiction. Friends and the experience of violence also proved important in the Colombian context. Thus, incentive salience does not work on its own. Even with the impact of drugs on the brain, there is still an interpreting individual with a specific history (of risk, family dynamics, and so forth) who becomes involved in specific sociocultural contexts of drug use. Incentive salience helps us to understand one aspect of addiction—the compulsive involvement that substance abusers have with drugs. This understanding can work in conjunction with broader epidemiological research on risk as well as anthropological work on the role that structural inequalities play in placing individuals at risk and how societies deal with people who develop a substance abuse problem (Bourgois 1995; Singer et al. 1992).

In summary, the research presented here makes a case for two things. First, the research shows the importance of the incentive salience approach to understanding drug abuse, using a framework of wanting, attention, and engagement and a focus on both drug seeking and drug use. Second, this research illustrates the powerful ways that neurobiological and ethnographic research can mutually inform each other. The neurobiology provided a specific theory; this theory was then explored and expanded through ethnographic work. The conjunction of these two produced a biocultural understanding of both *how* and *why* individuals compulsively want drugs.

DANIEL H. LENDE is an assistant professor of anthropology at the University of Notre Dame.

NOTES

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1. The phrases are rather literal translations of the original Spanish, and are not intended for use in English. The eight items in Spanish read: 1) A veces he empezado a consumir y consumir sin darme cuenta de nada más. 2) Cuando he consumido, a veces me he sentido completamente metido en el momento. 3) En el momento de consumir, las sensaciones se sienten muy presentes. 4) A veces lo que más me ha importado es el deseo de consumir. 5) A veces estar consumiendo se siente como que uno quiere más y más. 6) A veces cuando he querido consumir, lo he querido hacer de una vez. 7) A veces con el consumo he sentido como que nada más existiera sino las sensaciones del momento. 8) A veces cuando ha ido llegando la oportundidad para consumir, no he podido enfocarme en otras cosas.

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