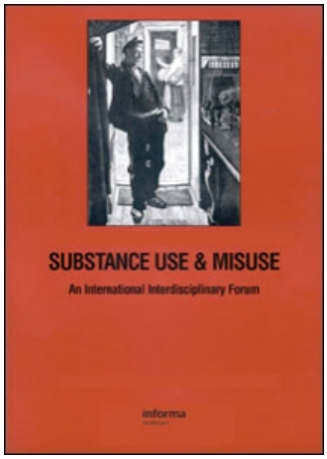

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A Psycho-Economic Model of Ecstasy Consumption and Related Consequences: A Multi-Site Study With Community Samples

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Becker and Murphy's (1988) theory of rational behavior suggests that economic factors play an influential role in the decision leading to drug consumption and possibly dependence. Psychological models, on the other hand, emphasize internal regulatory cues that motivate drug use and play a contributory role in dependence. Until now, the confluence of both economic and psychological models has not been tested empirically. The present study used latent-variable structural equation modeling (SEM) to examine the influence of both economic (social anomie, unit price, and time spent acquiring drugs) and psychological risk factors (motivation, depression, and sexual risk behaviors) on self-reported ecstasy use. Data were obtained from 612 recreational ecstasy users in the United States and Australia participating in a NIDA-funded epidemiological study examining trends in ecstasy use. The sample was mainly white (61%), male (58%), and young (mean age = 23yrs [5.25]). All of the hypothesized latent constructs were statistically reliable and correlated in the expected direction. A saturated SEM indicated that monetary and opportunity cost, but not income, significantly predicted ecstasy use. Among the psychological measures, motivational cues were the strongest predictor of both use and dependence. Inclusion of gender, age, race, education, and site variables did not appreciably alter the final model parameters. The implications of incorporating the role of economic factors in shaping a more refined understanding of addiction are discussed. Suggestions for future research and study limitations are also noted.

Keywords psycho-economic model; ecstasy; MDMA; rational addiction; expectancy; structural equation modeling; decision tree

Introduction

Models of addictive behavior have long suggested that economic factors play a central role in the initiation and continuation of drug use (Bickel, DeGrandpre, Higgins, Hughes, and Badger, 1995; DeGrandpre, Bickel, Hughes, and Higgins, 1992; Fenn, Antonovitz, and

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Schroeter, 2001; Ferguson, 2000; Grossman, Chaloupka, and Anderson, 1998). Becker's Rational Addiction Model (RAM) is the gold standard that associates microeconomic theory with drug consumer behavior (Becker, 1962, 1993; Becker and Murphy, 1988). Based on Rational Choice Theory, the RAM asserts that drug use, like other rational choices, is part of a solution to the consumers' expected lifetime utility maximization. Accordingly, drug users are motivated like everyone else by the satisfaction of their long-term self-interest (happiness), which makes their behavior dependent on economic criteria. In essence, people want to buy commodities, including drugs, at affordable prices, and obtain the best quality drugs as well. Two of the most important factors that play a central role in utility maximization, and which we elaborate below, are unit price (or monetary cost) and time spent procuring the drug (opportunity cost).

To date, the RAM has successfully been used to predict cigarette smoking (Becker, Grossman, and Murphy, 1991; Cameron, 2000; Chaloupka, 1991; Suranovic, Goldfarb, and Leonard, 1999) and alcohol use (Grossman, Chaloupka, and Sirtalan, 1995; Waters and Sloan, 1995). Further extensions have also included models to account for drug initiation (e.g., Saffer and Chaloupka, 1999) and patterns and levels of consumption of marijuana, cocaine, and heroin (e.g., Bretteville-Jensen and Biørn, 2003; Grapendaal, 1992; Grossman and Chaloupka, 1998; Pacula et al., 2000; Silverman and Spruill, 1977). Despite their different economic measures, diverse samples, and varied unique methodologies, these studies highlight the basic notion that economic principles guide human thought and action.

In the present study, we offer a partial test of the RAM using select economic indicators along with psychological measures to predict ecstasy (also called MDMA or 3,4-methylenedioxy-methamphetamine) consumption and its related consequences. Such a model was specifically applied to predict ecstasy use and addiction for two reasons: First, economic indicators predicting consumption include budget constraints (i.e., discretionary income allocated for the purchase of drugs) and market-level factors including price and time spent locating a product (i.e., opportunity cost). Ecstasy was expensive at the beginning of the epidemic (ranging in price from $20 to $40 per pill), reinforcing the cost side of the economic equation. To be successful, a rational economic model should have independent effects from each of these consumer-based predictors to consumption.

The second, and perhaps more important, reason to apply this model to ecstasy is that the use of such a drug has rapidly spread geographically and has become prevalent among adolescents and young adults throughout the world, surpassing reported prevalence rates for cocaine, heroin, hallucinogens, and LSD (e.g., Griffiths, Vingoe, and Jansen, 1997). In the United States, evidence including nationally representative school-based surveys (Johnston, O'Malley, Bachman, and Schulenberg, 2004), household surveys (Substance Abuse and Mental Health Services Administration [SAMHSA], 2004), and emergency room mentions nationwide (SAMHSA, 2003) point toward comparatively elevated rates of ecstasy use over the past decade.

Rising prevalence rates and knowledge of existing cost structures suggest that regular ecstasy users may not be sensitive to economic factors. This raises the question of whether economic models focusing on external market-level factors sufficiently explain drug use–related behaviors. A different view suggests that internal cues (i.e., motivational factors including but not limited to cravings, urges, triggers, and physiological signals) regulate drug consumption and derive primarily from psychological models of human behavior. According to these views, cognitive or emotional signals play an integral role in stimulating the desire to get high.

Each theory offers insights into the complexity of drug use and addiction. Surprisingly, however, there has been limited empirical effort to cross-fertilize between these two views.[1]

In light of this, the present article provides a brief overview of the key concepts forming an economic view of addiction. A formal model that blends economic and psychological factors is tested using confirmatory factor analysis (CFA) and structural equation modeling (SEM), an excellent analytic framework for theory testing (Bentler, 1978) in a multivariable framework. A psycho-economic model is then augmented with the inclusion of gender, race, education, age, and site in an effort to determine whether these additional covariates condition model effects and gain explanatory power in the prediction of ecstasy use.

Theoretical Components of a Rational Addiction Model

Economists suggest that addiction is a rational behavior, shaped by the very same forces that guide product consumerism. In other words, a person chooses an addictive activity as a result of a rational plan to maximize lifetime satisfaction (or utility) from all available resources (Ferguson, 2006). In a rational economic view, subjective personal tastes and preferences are assumed and referred to as a utility function or a measure of satisfaction derived from the consumption of commodities. Choices are also assumed to be limited by the level of income or budget constraints (a measure of purchasing power). In acting rationally, one chooses a course of action that maximizes utility function subject to these constraints. The consumption of an addictive substance occurs only when it makes the highest contribution to the utility maximization process.

The RAM is distinguished from other microeconomic models because it suggests that behavior is forward looking and consistent over time. In these terms, the rational component of Becker's model derives from consumer awareness of future implications of continued product selection and the weight of this awareness on current consumption decisions (i.e., rational behavior conveys forward thinking and is based on salient market information). Drug users are assumed to recognize that their addictive behavior has negative long-term consequences; however, as they weigh the present and future in their consumption decision, they judge that current benefits outweigh future costs (i.e., damage to health). Further, Becker's model assumes that drug users who think only in terms of present consumption (i.e., current satisfaction) are myopic (or impulsive) and discount future implications of current use because they do not consider the future or reflect on the potential adverse consequences of their current behavior. Orphanides and Zervos (1995) suggest that drug users do not consciously choose addiction and might not even be cognizant of their susceptibility to addiction. Either way, economic models of addiction suggest that users will learn from their experience and make adjustments accordingly (Ferguson, 2006).

Additionally, according to the RAM, addiction hinges on the addict obtaining a critical level of past drug habits or stock of addictive capital. Addiction does not happen overnight, but rather is the end result of a long cumulative process of drug consumption. Thus, the RAM argues that addiction involves the operation of psychological mechanisms of reinforcement and tolerance, which are mediated via the stock effect of past consumption. Increase in addiction stock (i.e., high levels of drug use increases tolerance and therefore more drug use is required to obtain the same effect) fuels present consumption because of the reinforcing properties of the drug. In addition, the satisfaction or utility of the drug diminishes over time as tolerance ensues and the effects or high of the drug reach a saturation point. Although the marginal utility from drug use will always be positive, the effect (i.e., satisfaction to the addict may be equated with the perceived high or attenuating withdrawal experiences) obtained from the drug falls off with incremental consumption units of the drug. According to economists, this effect results from the law of diminishing marginal utility, requiring greater

amounts of drug, which in turn incurs more negative consequences. The negative consequences, although not entirely responsible for discontinuation, may influence consumption by affecting the perceived marginal utility (see Ferguson, 2006, for a similar argument proposed for investment in health). This results in the addict weighing the marginal benefits and having to decide whether to keep using. Also, according to RAM, drug users are constantly focused on maximizing their utility seeking a trade-off between utility, addictive stock, and investment necessary (human capital) to continue their addiction. In essence, users actively compare the negative (future harm) with the positive (current satisfaction) effects of an increase in their addictive stock resulting from increases in current consumption. The rational decision to use drugs requires that the marginal increase in pleasure from an increase in current consumption exceeds future harmful effects from a higher stock.

The RAM also considers drug cost (or price) as a key component of addiction. Constrained maximization suggests that rational drug users pay attention to the price of drugs and that income (i.e., budget constraints) weighs heavily on the individual decision to acquire and use drugs. Depending on the magnitude of reinforcement and the strength of a drug's addictive properties, the actual "market" fluctuations in cost determine consumption patterns as a downward-sloping demand schedule (Becker et al., 1991; Chaloupka, Emery, and Liang, 2003). For example, a user has to decide how much disposable income will be relegated to purchasing drugs. If all the essential bills are paid and there is sufficient disposable income, the user must decide how much can be set aside for drugs, with more income overall and more disposable income dictating consumption patterns. Greater available wealth might allow users to disregard certain market factors and purchase higher cost drugs, affecting greater addictive stock. Younger people tend to earn less; thus, age would factor into consumption patterns and be subject to fluctuations in price. Higher price may force younger people with less disposable income to reduce overall consumption in favor of alternative entertainment choices (or buy cheaper or less pure drugs and diminish their addictive stock). Further, young people and individuals with less income would pay less attention to the future and discount more heavily future events (i.e., their health). As a result, they would be more conscious of current price, affecting their economic reality and consumption practices (Becker, 1990).

An economic model must also evaluate time spent obtaining the commodity, given its price and availability; this places value on the consumer's investment in human capital. Given a broad definition of price, economists suggest that opportunity cost, measured by the amount of time spent searching for goods or services, is a reflection of market transactions related to price. In the case of drugs, time spent searching and using must therefore be considered and added to the total cost of substance use. Here too, income may influence opportunity cost, since a person who earns more may have more to lose from long absences at work due to searching for or using drugs. Income also can lower the amount of time an addict has to spend searching for drugs, since higher income-producing individuals may be able to procure purer forms of the drug with less time spent searching (once the user locates a reliable supply of high quality substances). Thus, one can see that an economic model featuring rationality requires that a measure of opportunity cost be incorporated, even when drugs are relatively inexpensive and accessible.

In sum, the standard economic model of rational addiction treats drug consumption as a rational behavior shaped in part by monetary price, opportunity cost, and income. Drug users are assumed to fashion their decision based uniquely on the maximization of a utility function that discounts their future payoffs from consumption. In contrast to the standard economic view, however, other social scientists assert that while it offers a mathematically elegant and plausible explanation of addictive behavior, Becker's RAM fails to consider

important factors that affect drug users' decision-making process and the context in which they make their decision (e.g., Archer and Tritter, 2000; Elster, 1993; Rogeberg, 2003). For instance, some argue that a rational choice does not necessarily have to be economically rational (Zafirovski, 2003), and that rational choice theory does not explain adequately how drug users actually behave in the real world or justify their actions (Legrenzi, Girotto, and Johnson-Laird, 1993). In fact, data show that individual decision making is often influenced by a range of factors that are not necessarily utility driven (e.g., Kahneman, Slovic, and Tverskey, 1982).

Motivational Components of the Model

Behavioral psychologists, in particular, believe that people's behavior is driven by inner motivations. According to this view, a highly differentiated set of motives are required as incentives or reasons to carry out a desired course of action or behavior, including drug use (Miller and Rollnick, 1991). In the psychological literature, the construct *motivation* has received a good deal of attention with respect to drug use (e.g., Cox and Klinger, 1988), primarily highlighting the role of affect regulation (e.g., Cooper, Frone, Russell, and Mudar, 1995), psychobiological factors (e.g., Baker, Morse, and Sherman, 1987), and expectancy models (e.g., Mann, Chassin, and Sher, 1987; Smith, 1994; Stacy, Widaman, and Marlatt, 1990). The general focus of such literature is on craving, urges, triggers, and cognitive expectancies that instigate drinking or drug use. In an expectancy framework, individuals possess schemata or mental pictures regarding the perceived benefits or negative outcomes associated with drinking, which in turn are linked to reinforcement contingencies that induce behavior. In an expectancy framework, drinking is predicted by a belief that the effects of drinking are positive both now and later.

Economic theory draws on a motivational framework as well by positing that income combined with price and opportunity cost drive users to network with other users, resulting in users maximizing happiness (i.e., satisfaction) while reducing or minimizing cost and time spent procuring drugs. The same can be said about frequenting places where drugs are readily available, resulting in reduced economic costs associated with a drug-abusing lifestyle. Rave parties, for instance, where ecstasy has been found to be readily available, have offered the drug at reduced opportunity cost, which maximizes utility. Thus, motivational factors are part of the same equation underlying addiction, whether from an economic or behavioral point of view. Despite the relative strength of this argument in studies of alcohol consumption, it has generally not been applied to other drugs, including ecstasy.

Sexual Risk as a Motivational Factor

A growing literature highlights temporal associations between sexual risk (e.g., lack of protection, multiple partners, and sexual activity while under the influence) and alcohol and drug use (e.g., Cooper, Peirce, and Huselid, 1994; Leigh, Temple, and Trocki, 1994; Schafer, Blanchard, and Fals-Stewart, 1994; Tapert, Aarons, Sedlar, and Brown, 2001). Basic mechanisms account for these relations, including the notion that drug consumption leads to impaired decision-making and poor judgment. Evidence is accumulating that ecstasy impairs cognition with specific deleterious effects on memory (e.g., Bhattachary and Powell, 2001; Gouzoulis-Mayfrank et al., 2000; Rodgers, 2000). Moreover, many forms of drug use impair or suppress higher reasoning skills and have soporific effects. Excessive consumption may diminish social acuity or reduce defenses to sexual advances

(e.g., Murphy, Monahan, and Miller, 1998; Yacoubian and Peters, 2007). Other mechanisms highlight the drug's aphrodisiac effect and relaxation of inhibitions (e.g., Cohen, 1998). Alternatively, a confounding or personality view suggests that the close association between high-risk sexual activity and drug use results from an underlying tendency or personality trait such as unconventionality, sensation seeking, or impulsivity that jointly determines the two behaviors (Justus, Finn, and Steinmetz, 2000; Leigh et al., 1994). Drug users are more inclined to engage in sexual activity either from socialization or residing in a social milieu responsible for inculcating liberal attitudes conducive to sexual activity.

Economists might view sexual risk-taking, including trading sex for money, as a way to circumvent budget constraints, generating income available to build addictive stock. Trading sex for drugs, for instance, reduces opportunity and/or monetary cost, making it simpler to obtain drugs and maximize utility. There is also a modicum of discounting or time preference involved in sexual risk-taking. Whether fueled by the addictive properties of a drug or other non-pharmacological reasons, users trading sex for drugs discount the future health implications of their behaviors, reinforcing some belief that drug users are myopic.

Depression as a Motivational Factor

Substance use may also regulate affective distress, as a palliative coping mechanism, or form of self-medication for physical and mental health problems (e.g., Cooper et al., 1995; Harlow, Newcomb, and Bentler, 1986; Johnson and Kaplan, 1990; Labouvie, 1986; Shedler and Block, 1990). Possible connections between ecstasy use and affect modulation derive from recent psychopharmacological studies suggesting compromised neural substrate function with noted depletions in serotonin (e.g., Gerra et al., 2000; Roiser and Sahakian, 2004). Serotonin (5-hydroxytryptamine) is an important neurotransmitter involved in the regulation of affect and mood, thus implying that drug-induced depletion of serotonin or its precursors, whether temporary or not, could alter mood. Several studies have found a wide range of mood disturbance and deficits in cognitive functioning among ecstasy users compared to poly-drug users and non-drug-using controls (MacInnes, Handley, and Harding, 2001; Morgan, McFie, Fleetwood, and Robinson, 2002; Parrott and Lasky, 1998; Parrott et al., 2002). Given this broad mixture of findings, it is essential to control for depression as another motivational factor, explaining ecstasy use and dependence.

Importance of the Present Study

To summarize, the present study weaves together hallmark components representing both economic and psychological theories of addiction to account for ecstasy use. The common or shared conceptual underpinnings of both theories hold that individuals make choices regarding consumption based on self-interest. Furthermore, reinforcement is an essential component to both psychological and economic models of addiction. Reinforcement, in economic terms, expresses the link between past and current drug use in terms of perceived utility. Increases in the addiction stock lead to increases in the utility (i.e., satisfaction) of current consumption. As the benefit of the use of the drug diminishes with increased amounts, users develop tolerance. Because of diminishing return (marginal utility) that may arise from tolerance, current consumption fuels future consumption. The nature of reinforcement in this decision tree considers the weight given to current consumption, future costs, and the discounting process. In psychology, reinforcement plays a prominent role in linking external activity with internal cognitive processes and ultimately expression

of behavior (e.g., Bolles, 1972). It goes without saying that, for a comprehensive and adequate understanding of such a complex behavior, the confluence of both economic and psychological models is necessary. Thus, the current analyses test the influence of key economic indicators along with psychosocial risk factors on ecstasy consumption and addiction, using an original psycho-economic model of addiction.

Method

Study Protocols

Data for this investigation came from the Tri-City Study of Ecstasy Use, Abuse and Dependence funded by the National Institute on Drug Abuse (NIDA) to examine the feasibility of using DSM-IV (the official nomenclature of the American Psychiatric Association, 1994) diagnostic criteria for club drugs (i.e., ecstasy, ketamine, GHB, and Rohypnol), such as tolerance, withdrawal, craving, loss of control and social consequences. The study recruited recent ecstasy and other club drug users starting in November 2002 and ending in January 2005 from areas indicated by NIDA's International Epidemiology Work Group (International Epidemiological Work Group on Drug Abuse, 1999) as emerging or current areas of high risk. Three sites were selected: Miami, Florida; St. Louis, Missouri; and Sydney, Australia. The study protocol, including consent and all human subject procedures, received institutional review board (IRB) approval at each site institution.

Subject Recruitment. The sentinel sample for trends in club drug use was chosen via Internet postings, advertisements run through college and local newspapers, and flyers posted in areas generally frequented by young people. Eligibility required age from 18 to 35 years, reported use of ecstasy at least five times lifetime and at least once in the past year, and agreeing to the study protocol through a signed informed consent procedure before beginning the study. The study included a test–retest reliability (100% of sample) and validity component (on 50% of sample). For the present analyses only test (or time 1) data were used.

Interview Training. Research team staff (including project director/coordinator and interviewers) at each site participated in a week long intensive training, conducted by the P.I. (LBC), covering the study protocol and assessments. All interviewers submitted five completed interviews (i.e., practice cases) complete with digital recording files for certification. Only those interviewers that met the training standard were certified and allowed to conduct actual interviews. All three sites received the same instruction protocol, utilized the same assessment strategies, and relied on identical subject recruitment procedures. The total number of subject contacts was 1084 with 927 eligible; of them 644 were asked to participate; 612 agreed, including 186 (30%) from Miami, 297 (49%) from St. Louis, and 129 (21%) from Sydney. The remaining persons who were eligible but not invited were on a waiting list to participate.

Survey Instruments. Data collection included extensive computer assisted interviews coupled with in-depth clinical assessments. Data used in this article were based on participants' responses to questions in three instruments: The computerized Substance Abuse Module for Club Drugs (CD-SAM), the Washington University Risk Behavior Assessment for Club Drugs (WU-RBA-CD), and the Center for Epidemiological Studies—Depression Scale (CES-D). The CD-SAM was a modified version of the original CIDI-Substance Abuse Module (SAM), and was revised to include an assessment of adopted DSM-IV criteria to

diagnose abuse and dependence for the individual club drugs (Cottler, Womack, Compton, and Ben-Abdallah, 2001). The SAM (Cottler, 2000; Horton, Compton, and Cottler, 2000) was developed by investigators at Washington University for the WHO in the mid 1980s. In addition to the assessment of various aspects of tobacco, alcohol, and multiple drug use, the CD-SAM enhanced the already comprehensive physical, psychological, and withdrawal symptoms listed for illicit drugs covered in the SAM to include additional items specific to club drugs. The SAM has good test–retest reliability (Compton, Cottler, Dorsey, Spitznagel, and Mager, 1996; Cottler, 2000).

The computerized Washington University Risk Behavior Assessment for Club Drug users (WU-RBA-CD) was adopted from the Risk Behavior Assessment, which was originally developed for use in the Cooperative Agreement studies of HIV risk behaviors in the early 1990's (National Institute on Drug Abuse [NIDA], 1993). The WU-RBA-CD focuses not only on HIV risk behaviors but also situations and events that explain the abuse/dependence liability of club drugs like binging, concomitant use of over-the-counter drugs, school or work performance, rave culture, and parental monitoring. The WU-RBA-CD was used to enrich the substance use data obtained from the CD-SAM, which is primarily diagnostic. The assessment also included a wide range of economic data such as reasons for drug use, dealer and use networks, lifetime quantity of each drug used and detailed information on past 30 days consumption, actual price paid last time used a drug as well as respondent's own expected price, employment, current income, and other relevant information about all kinds of sources of income.

Revisions to the existing and well standardized SAM (Cottler, 2000) and RBA (NIDA, 1993) for the Club Drug Study followed extensive focus group work conducted at the three sites.

The Center for Epidemiological Studies Depression Scale (CES-D) is a 20-item, self-reporting scale developed by the National Institute of Mental Health based on previously validated scales for depression (Radloff, 1977). The CES-D has been widely used as a screening instrument for assessing depressive symptoms in clinical as well as research setting. It covers several aspects of depression occurring within the past week such as depressed mood, concentration, feeling of sadness, sleeping disturbance, among others. The CES-D was used in this study to evaluate the hallmark depressed mood that may result from long term damage to the serotonin transporters from club drugs.

Time Requirements. The CD-SAM took approximately 60 minutes for study participants to complete; the RBA took about 20 minutes, and the CED-D about 5 minutes. In addition, on average, each respondent spent about 15 minutes providing "Locator" information for tracking in the test–retest portion of the study. It was estimated that respondents traveled on average 30 minutes to get to the interview site. All interviews were conducted in private offices. Anonymity and confidentiality were assured to all participants. Individuals could receive up to US$120.00 in monetary compensation for their participation in all three components of the study.

Measures

Ecstasy Use. Information used to assess the use of ecstasy was gathered from questions included in the WU-RBA-CD. Specifically, four indicators reflected a latent construct of ecstasy use including lifetime assessment of number of pills used ("If you were to add up all of the ecstasy pills you have used since you first started using ecstasy, about how many pills would that be?"), with response values recoded in increments of 10 pills ranging from *less*

than 10 pills (coded as "1") to *greater than 100 pills* (coded as "11"); number of times using ecstasy in the past 30 day period ("How many days have you used ecstasy or MDMA in the last 30 days?"), with responses coded in terms of total number of days used; frequency of ecstasy use per day in the past 30-day period ("During these days [when you used], how many times a day did you usually use ecstasy or MDMA?"), with responses coded in terms of number of times ecstasy was consumed per day; and a measure of recent ecstasy use ("When was the last time you used ecstasy or MDMA?"), with response categories ranging from *past 30 days* (1), *not in the past 30 days but during the last 12 months* (2), and *more than 12 months ago* (3). Categories 2 and 3 were recoded to "0" to avoid sparse numbers in the cells. The frequency of ecstasy use per day in the past 30-day period ranged from 0 to 12; this was truncated (due to low frequency of response for number of times greater than 4) to 0–4.

Dependence. With respect to outcome measures of the consequences of ecstasy use, standard DSM-IV abuse and dependence criteria were modeled carefully after those for other illicit drugs and included in the CD-SAM.[2] Criteria for abuse included recurrent ecstasy use: (a) resulting in failure to fulfill major role obligations at school, work, or home, (b) in situations when it is physically hazardous, (c) resulting in substance-related legal problems, and (d) despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effect of ecstasy. Diagnostic criteria for dependence included: (a) tolerance, (b) withdrawal, (c) increased use of larger amounts over a longer period of time than intended, (d) persistent desire or unsuccessful efforts to cut down or control use, (e) great deal of time spent in activities to obtain substance, use substance, or recover from its effects, (f), giving up or reducing important social, occupational or recreational activities because of substance use, and (g) continued use despite knowledge of persistent or recurrent physical or psychological problems caused or exacerbated by the substance.[3] Each one of the abuse and dependence criteria was coded as "1" if endorsed by the subject and as "0" otherwise.

Economic Indicators. Key economic indicators came from the WU-RBA-CD. Manipulation reduced a diverse set of measures into three distinct but conceptually meaningful indices. An index of income status in the past 12 months consisted of four variables: months worked ("In the past 12 months, how many months did you work for pay full time?"), sources of income ("In the last 12 months, what were your sources of income?"), reported earnings ("Considering all sources of your income, how much money did you make altogether in the last 12 months?"), and current employment status ("Which of these best describes your current work situation?"). Work situation items included "unemployed," "working full- or part-time," "homemaker," "student," and "disabled." These responses were then reduced to dichotomous categories including *employed and having an income* (coded as "0") versus *unemployed and not having a visible means of support* (coded as "1"). The measure of sources of income included 12 different response categories, which were further dichotomized into those representing legal means (e.g., paid job, welfare, social security, and alimony) coded as "0" and those representing illegal means (e.g., dealing drugs, prostitution, or sex) coded as "1." Reported earnings contained response categories ranging from $0–3,999 through $25,000 in $5,000 increments and thereafter in larger $10,000 increments through $65,000, then $65,000–$100,000. The index was reduced to a binary variable approximating the federal income poverty level (less than $15,000 for a family of three; Department of Health and Human Services, 2005) coded as "1" and those earning in excess of this amount coded as "0." The resultant income index comprised of the four unit-weighted measures assessed *social anomie* and ranged from 0 through 4 with higher scores indicating participants with lower economic earning and status potential.

Another important measure of economic influence is the cost to acquire an addictive substance. In economics, such cost is referred to as the full price, which generally includes the monetary price paid for a unit of the substance, a value of the time and effort spent to get the substance, an expected cost for future health consequences, and potential penalties for illegal use of the substance. In the present study, the first two components (unit price and time spent obtaining ecstasy) were considered separately. The unit price of ecstasy, also termed *monetary cost*, was self-reported ("How much did you pay for one pill of ecstasy the last time you bought it?"), with response categories collapsed into \$*20 or less* (coded as "1") and *greater than* \$*20* (coded as "0").

Users' time spent procuring ecstasy was also self-reported ("If you wanted to get ecstasy right now, how long would it take you to get it?"), with response categories coded in minutes, hours, days, and weeks. This measure assessed opportunity cost, a proxy for monetary index of motivation. After inspecting the distribution of this measure, we converted all responses to a daily metric and further refined the measure to a binary form representing a day or less (coded as "1") and greater than one day (coded as "0").

Exogenous Measures. We also modeled several psychological risk indices (two were latent constructs) that are correlates and causes of drug consumption and dependence. Data for all created indices came from the WU-RBA-CD. Inclusion of these risk measures allowed us to probe whether economic indicators uniquely predicted consumption, controlling for risk. Additional exogenous measures included a unit-weighted index of sexual risk including dichotomously scored items (yes/no coded as "1" and "0") assessing frequency of vaginal intercourse ("Have you ever had vaginal sex?"), then two more questions for oral and anal sex, age of onset ("How old were you the first time you had sex of any kind?" with *younger than 15* coded as "1" and *older than 15* coded as "0"), having more than three sex partners in the past three months (yes/no), forced sexual contact with a dating partner (yes/no), frequency of condom use ("In the last 12 months, how often have you used a condom or other barrier protection when having vaginal sex?" which was repeated for oral and anal sex with *never* coded as "0," *always* coded as "4," and further divided into *never* and *rarely* coded "1" and *more frequent use* coded as "0," designating lower risk with more frequent condom use), and having ever been under the influence of ecstasy while having any kind of sex (yes/no).

Separately, we modeled a latent construct tapping motivation for ecstasy use including opportunities for obtaining ecstasy ("We're interested in all the ways people get ecstasy, have you ever gotten ecstasy from . . . " with response formats including "spouse, family member, roommate, stranger, and dealer" then forming an additive index ranging from 0 to 5), places to use ecstasy ("We're also interested in all of the places people take or use ecstasy. Have you ever taken or used it . . . " with responses including rave clubs, bars, and fraternities, to name a few, which were dichotomously coded (yes/no) and summed into an additive index), a unit-weighted index of people to share ecstasy with ("Have you ever used ecstasy with . . . " listing different people including spouse, friends, roommates, dealer, to name a few), and a unit-weighted index assessing various affect regulation and positive enhancement motives for using ("Have you ever taken ecstasy for . . . " with response categories including "stress relief, bonding, pressure, spiritual experience, and curiosity," among others, which were coded yes/no (coded as "1" and "0") and summed).

To control for differences in mood and affect, we modeled the CES-D scale as an exogenous latent factor predictor of ecstasy consumption and its consequences (Garrison, Addy, Jackson, McKeown, and Wallen, 1991; Golding and Aneshenel, 1989). Based on prior factor analytic evidence, we used four five-item random parcels capturing the behavioral (e.g., "I talked less than usual"), somatic (e.g., "I did not feel like eating, my appetite was

poor"), affective (e.g., "I had crying spells"), and cognitive (e.g., "I had trouble keeping my mind on what I was doing") components of depression. Although the CES-D assesses diverse aspects of depression, the different features of depression can be represented as a latent construct using clusters or composite scale scores. Random parcels represent an excellent means of preserving scale integrity and cluster homogeneity (e.g., Bagozzi and Heatherton, 1994; MacCallum, Roznowski, and Necowitz, 1992). Items were distributed evenly across the parcels with consideration of content balance and reliability.

Additional demographic measures specified in the model include gender (male coded as "1"), race (White coded as "1" and racial minorities and others coded as "0"), age (with *less than 21* coded as "1" and *older* coded as "0") and education (with *less than high school* coded as "1" and *beyond high school* including vocation and technical education coded as "0").

Model Testing Strategy

Analyses of the influence of economic indicators on consumption and dependence criteria proceeded in a two-step fashion testing first a psychometric model and subsequently a series of structural models (Anderson and Gerbing, 1988). An initial confirmatory factor analysis (CFA) model tested the overall statistical reliability of the hypothesized latent factors (depression, motives, ecstasy use, and dependence). The psychometric model contained information detailing whether the model was conceptualized correctly. In addition, the CFA model provided a means to inspect the error-free correlations among the latent constructs, which would not have been available using exploratory factor analytic techniques. Following the CFA model we conducted a series of structural models that incrementally tested the effects of economic indicators first on ecstasy use, which we term the *unbiased model*, and then on dependence. A fourth model specified latent constructs tapping depression and motives as predictors of ecstasy use and dependence in addition to the three economic predictors. This model is one of several in a series that tests the unique influence of economic indicators on the two endogenous constructs controlling for psychosocial risk. A fifth, or fully conditioned, model specified the two latent construct predictors (depression and motives) an observed measure of sexual risk along with the two endogenous constructs (ecstasy use and dependence). At this point, a sixth and more refined model included empirical specification searches to capture any nonstandard effects (details on these methods are explained below) that were not hypothesized a priori. In light of the obtained mean differences based on race, age, and education we added these measures to the final model to examine whether obtained parameter estimates dramatically changed following their inclusion. The final model was also tested for site differences. Both the measurement and structural models were estimated using the EQS statistical program with normal theory maximum likelihood estimation (Bentler, 1995).

Results

Sample Description and Mean Differences

The total sample of 612 current ecstasy users was 58% male, 61% White, 18.5% African American, 11.5% Hispanic, and 9% "Other." The mean age of respondents was 23.3 years (SD = 5.25). A total of 32% of the sample reported an education level beyond high school, 93% were never married, and 10% reported having children. Recruitment at each site did not vary significantly by gender, $\chi^2(2) = 2.40$, $p = .301$. Table 1 contains descriptive statistics and mean gender differences for measures included in the model. There were only

Table 1
Summary Statistics for the Selected Items & Scales (N = 612)

Latent Construct and Measured Variable	Mean	SD	Skew	Kurtosis	Mean Gender Difference
Income index	1.63	1.12	0.09	−0.89	−0.02
Unemployed, no visible income	0.38	0.48	0.51	−1.74	
Had an Illegal source of income, last 12 months	0.33	0.47	0.72	−1.49	
Total Income below poverty level, last 12 months	0.58	0.49	−0.32	−1.9	
Monetary cost ($20 or less vs. higher)	0.61	0.49	−0.45	−1.8	−0.04
Price of a pill paid last time purchased	20	8.91	0.21	0.18	
Opportunity cost	0.65	0.48	−0.65	−1.59	−0.01
Average Time it would take to get Ecstasy (n days)	5.96	54.22	12.17	147.5	
Motives					
Opportunities to get Ecstasy	1.52	0.97	0.54	−0.34	−0.15
For free	0.87	0.34	−2.22	2.93	
By stealing it	0.04	0.21	4.45	17.87	
As payment for service	0.32	0.47	0.79	−1.38	
Prom dealing	0.29	0.46	0.91	−1.17	
Places/People to take Ecstasy	7.1	2.19	−0.07	−0.48	0.01***
From spouse or partner	0.51	0.5	−0.06	−2.01	
From a family member	0.13	0.33	2.26	3.13	
From a roommate, co-worker or friend	0.94	0.24	−3.64	11.27	
From a stranger	0.62	0.49	−0.48	−1.78	
From a dealer	0.65	0.48	−0.65	−1.59	
At home, apartment or dorm	0.93	0.26	−3.4	9.4	
At a rave	0.77	0.42	−1.3	−0.35	
At a bar or club	0.83	0.38	−1.7	0.95	
At a fraternity or sorority party	0.11	0.32	2.4	3.9	
At work or school	0.15	0.35	2.01	2.07	
At a beach, park, or other public place	0.62	0.49	−0.51	−1.7	
In a car	0.62	0.48	−0.51	−1.7	
Some other place	0.23	0.42	1.3	−0.27	
People to share Ecstasy with	3.04	1.2	0.19	−0.57	−0.14
With spouse or partner	0.79	0.41	−1.4	0.02	
With a family member	0.25	0.44	1.1	−0.71	
With a roommate, co-worker or friend	0.98	0.15	−6.4	39.06	
With a stranger	0.48	0.5	0.07	−2	
With a dealer	0.27	0.44	1.04	−0.92	
Alone	0.27	0.45	1.01	−0.98	
Specific motivation categories	4.23	1.82	0.24	−0.5	0.02
To relieve stress	0.32	0.47	0.76	−1.43	

(Continued)

Table 1
Summary Statistics for the Selected Items & Scales (N = 612) *(Continued)*

Latent Construct and Measured Variable	Mean	SD	Skew	Kurtosis	Mean Gender Difference
To bond with friends	0.68	0.47	−0.76	−1.42	
Pressured by others	0.15	0.36	1.94	1.78	
To get in touch with yourself	0.37	0.48	0.55	−1.7	
To have a spiritual experience	0.31	0.46	0.85	−1.29	
To numb your mind or forget problems	0.41	0.49	0.38	−1.86	
For no reason	0.67	0.47	−0.75	−1.44	
Out of curiosity	0.9	0.3	−2.74	5.53	
For some other reason	0.42	0.49	0.33	−1.9	
Depression					
Behavioral	0.92	0.96	0.8	−0.15	0.03
Unfriendly	0.54	0.75	1.32	1.18	
Restless	1.09	1.02	0.57	−0.79	
Effort	1.2	1.02	0.44	−0.91	
Appetite	0.67	0.89	1.21	0.49	
Somatic	0.55	0.83	1.58	2.21	0.04***
Lethargic	0.83	0.89	0.8	−0.28	
Quiet	0.72	0.89	1.04	0.14	
Crying	0.32	0.64	2.17	4.56	
Disliked	0.4	0.69	1.8	2.94	
Affective	2.44	0.93	0.32	0.91	−0.01
Failure	0.38	0.72	2.04	3.69	
Enjoy life	0.6	0.82	1.18	0.42	
Happy	0.72	0.86	0.98	0.07	
Depressed	0.8	0.9	0.94	0	
Fearful	0.56	0.81	1.33	0.98	
Mind	1.23	0.93	0.26	−0.82	
Cognitive	1.84	1.23	1.19	0.77	0.19
Hopeful	0.73	0.9	1.01	0.04	
Blues	0.7	0.91	1.09	0.12	
Lonely	0.8	0.95	0.95	−0.16	
Bothered	0.67	0.83	1.1	0.5	
As good as other people	0.63	0.92	1.29	0.55	
Sad	0.76	0.81	0.94	0.49	
Sex Risk	5.2	1.6	0.11	−0.18	0.34
Ever had vaginal sex	0.96	0.18	−4.9	23	
Ever had oral sex	0.98	0.14	−6.9	46	
Ever had anal sex	0.47	0.49	0.14	−1.99	
Age first time had sex	0.3	0.45	0.86	−1.3	
Had 3 or more sex partners, in last 3 months	0.17	0.38	1.7	1.05	
Ever experienced forced sexual contact	0.17	0.37	1.8	1.2	

(Continued on next page)

Table 1
Summary Statistics for the Selected Items & Scales (N = 612) *(Continued)*

Latent Construct and Measured Variable	Mean	SD	Skew	Kurtosis	Mean Gender Difference
Use of condom with veginal sex, in past 12 months	0.32	0.47	0.79	−1.4	
Use of condom with oral sex, in past 12 months	0.88	0.32	−2.4	3.6	
Use of condom with anal sex, in past 12 months	0.21	0.41	1.4	−0.01	
Ever used Ecstasy while having sex	0.77	0.42	−1.3	−0.32	
Ecstasy Use					
Lifetime assessment of number of pills used	6.17	4.1	0.1	−1.7	−0.48
Number of times used in past 30 days	0.67	1.02	1.7	2.4	0.01
Frequency of use per day in past 30 days	1.1	2.1	3.3	14.2	0.01
Recency of use	0.31	0.46	0.8	−1.3	−0.01
DSM-IV Dependence Criterion					
Tolerance	0.49	0.5	0.01	−2.01	−0.05
Withdrawal	0.69	0.46	−0.84	−1.3	0.05
Increased use over longer period of time than intended	0.43	0.5	0.3	−2	0.08
Desire or inability to cut down or control use	0.17	0.38	1.7	1.1	0.06
Great deal of time spent to acquire, use, or recover	0.56	0.5	−0.26	−1.9	0.02
Reduce or avoid important activities because of use	0.25	0.44	1.1	−0.73	0.07
Continue to use despite knowledge of potential problems	0.88	0.33	−2.3	3.2	0.03

***Statistically significant difference at = .001.

two notable significant gender differences: males reported more ways to obtain ecstasy, $t(1) = 3.84$, $p \leq .001$ ($M_M = 1.65[1.01]$, $M_F = 1.35[0.87]$); and females scored higher on one of the four random parcels assessing depression, $t(1) = 3.73$, $p \leq .001$ (M_M 0.65[.44], $M_F = 0.81[.56]$).

Racial comparisons (White vs. other) on key model variables (including all indicators of the three economic factors) indicated that Whites compared to others reported less social anomie, $t(1) = 2.31$, $p \leq .05$ ($M_W = 1.43[1.10]$, $M_O = 1.61[1.14]$), higher lifetime quantity of ecstasy use $t(1) = 2.54$, $p \leq .05$ ($M_W = 6.50[4.08]$, $M_O = 5.65[4.00]$), more ways to obtain ecstasy, $t(1) = 2.25$, $p \leq .05$ ($M_W = 1.59[1.01]$, $M_O = 1.42[0.88]$), and more people to share ecstasy with, $t(1) = 2.68$, $p \leq .01$ ($M_W = 3.15[1.26]$, $M_O = 2.88[1.15]$). Among the comparisons based on age (under 21 coded "1" reflecting the legal age limit), younger participants reported greater social anomie, $t(1) = 7.07$, $p \leq .001$ ($M_Y = 2.04[.98]$, $M_O = 1.42[1.12]$), and older participants reported more lifetime use, $t(1) = 4.41$, $p \leq .001$ ($M_Y = 5.17[3.78]$, $M_O = 6.68[4.12]$), and greater sexual risk-taking

behaviors, $t(1) = 5.00$, $p \leq .001$ ($M_Y = 4.56[1.65]$, $M_O = 5.31[1.52]$). Less than a high school education was associated with greater social anomie, $t(1) = 3.07$, $p \leq .01$ ($M_{H-} = 1.83[1.14]$, $M_{H+} = 1.53[1.09]$), more time spent locating ecstasy, $t(1) = 5.83$, $p \leq .001$ ($M_{H-} = 0.81[.39]$, $M_{H+} = 0.58[.49]$), more days using ecstasy in the past month, $t(1) = 3.34$, $p \leq .001$ ($M_{H-} = 1.58[2.71]$, $M_{H+} = 0.87[1.74]$), more times used per day, $t(1) = 2.87$, $p \leq .01$ ($M_{H-} = 0.85[1.11]$, $M_{H+} = 0.59[.96]$), more ways to obtain ecstasy, $t(1) = 2.31$, $p \leq .01$ ($M_{H-} = 1.65[1.03]$, $M_{H+} = 1.46[0.93]$), more people with whom to share ecstasy, $t(1) = 3.57$, $p \leq .001$ ($M_{H-} = 3.30[1.19]$, $M_{H+} = 2.93[1.22]$), and more depressive symptoms on all four indicators ($CESD_1$), $t(1) = 4.66$, $p \leq .001$ ($M_{H-} = 0.84[.64]$, $M_{H+} = 0.60[.52]$), ($CESD_2$), $t(1) = 3.32$, $p \leq .001$ ($M_{H-} = 0.82[.53]$, $M_{H+} = 0.68[.48]$), ($CESD_3$), $t(1) = 2.99$, $p \leq .01$ ($M_{H-} = 0.91[.67]$, $M_{H+} = 0.74[.61]$), ($CESD_4$), $t(1) = 3.55$, $p \leq .001$ ($M_{H-} = 0.80[.65]$, $M_{H+} = 0.61[.59]$). Thus, mean differences for these demographic features suggest the importance of modeling race (4 out of 23), age (5 out of 23), and education (11 out of 23) as exogenous measures.

Prevalence of Ecstasy Use and Diagnostic Features

Based on self-reports, 40% of the sample used ecstasy within the past 30 days (no significant gender differences). Among all users, 59% met criteria for lifetime ecstasy dependence (using DSM IV criteria); 15% as abusers only. The mean number of lifetime dependence criteria was 3.5 (SD = 1.95); among those meeting criteria for current dependence, the number was 4.9 (SD = 1.31) with males reporting more criteria than females ($\chi^2(1) = 4.25$, $p \leq .05$). Based on use in the past 30 days, 17% reported using one pill per use day, 10% reported two pills per use day, 10% reported using between three and five pills per use day and the remaining 63% reported using more than five pills per use day with 15 pills the highest amount. Mean age of onset for ecstasy use was 18.7 years (SD = 2.80) which was slightly lower for those meeting current dependence criteria (M = 18.2, SD = 2.61). Over half of the sample (57%) reported little or no depressive symptomatology, 35% reported between 5 and 10 symptoms, 7% reported between 10 and 15 symptoms, and two individuals (< 1%) reported 16 or more symptoms, generally regarded as a clinical depression.

Tests of Site Differences

Comparisons across sites indicated no difference with respect to age, income, and marital, educational, and employment status. Comparison of racial composition across sites indicated that Miami was largely Hispanic (54.8%) while St. Louis and Sydney were predominantly Caucasian (73.1% vs. 76.7%, respectively).

Characteristics of ecstasy use in the past 30 days differed significantly between sites, with Sydney users reporting more days used, compared to St. Louis and Miami users ($M_{Sydney} = 2.56$, SD = 2.53; $M_{St.Louis} = 0.78$, SD = 2.03 and $M_{Miami} = .60$, SD = 1.4 with $F(2, 609) = 44.46$, $p \leq .0001$), higher frequency of use per day, ($M_{Sydney} = 1.45$, SD = 1.14; $M_{Miami} = 0.53$, SD = 1.00 and $M_{St.Louis} = 0.43$, SD = 0.78 with $F(2, 609) = 56.72$, $p \leq .0001$), and more recent use ($M_{Sydney} = 0.67$, SD = .47; $M_{Miami} = 0.23$, SD = .42 and $M_{St.Louis} = .21$, SD = .41 with $F(2,609) = 55.79$, $p \leq .0001$). Despite the fact that no site differences were found for age of onset, the quantity of ecstasy consumed over a lifetime was highest for Sydney users ($M_{Sydney} = 7.23$, SD = 3.86; $M_{Miami} = 6.50$, SD = 3.99; $M_{St.Louis} = 5.49$, SD = 4.08; $F(2, 609) = 9.32$, $p \leq .0001$).

In terms of economic measures, sites did not differ significantly in income or opportunity cost, but differed significantly in the monetary cost of a pill, with Miami users paying the lowest amount per pill and Sydney users the highest ($M_{Sydney} = 30.19$, SD = 7.13; $M_{St.Louis} = 19.75$, SD = 6.79 and $M_{Miami} = 13.03$, SD = 5.66 with $F(2,609) = 261.83$, $p \leq .0001$). Further, sites did not differ in the ways to get ecstasy, or motives for use, but differed significantly with respect to the number of places to obtain and use ecstasy ($M_{Miami} = 7.66$, SD = 2.06; $M_{Sydney} = 7.46$, SD = 2.04 and $M_{St.Louis} = 6.61$, SD = 2.32 with $F(2, 609) = 15.94$, $p \leq .0001$). Sites also differed significantly with regard to number of people with whom to use ecstasy, with Sydney users reporting more people ($M_{Sydney} = 3.26$, SD = 1.26; $M_{Miami} = 3.07$, SD = 1.20 and $M_{St.Louis} = 2.94$, SD = 1.21 with $F(2,609) = 3.10$, $p \leq .05$).

Sites did not differ in depression symptoms or measure of sexual risk., though they did differ with respect to many DSM dependence criteria including tolerance ($M_{Miami} = 0.56$, SD = .49; $M_{Sydney} = .56$, SD = .49; $M_{St.Louis} = .43$, SD = .49 with $F(2, 609) = 5.31$, $p \leq .01$), withdrawal ($M_{Sydney} = .79$, SD = .40; $M_{Miami} = .68$, SD = .47; $M_{St.Louis} = .65$, SD = .47 with $F(2, 609) = 4.57$, $p \leq .05$), substance taken in larger amounts ($M_{Miami} = .48$, SD = .50; $M_{Sydney} = .47$, SD = .50; $M_{St.Louis} = .37$, SD = .48 with $F(2,609) = 3.30$, $p \leq .05$), great deal of time spent obtaining the drug ($M_{Sydney} = .67$, SD = .47; $M_{Miami} = .62$, SD = .48; $M_{St.Louis} = .48$, SD = .50 with $F(2,609) = 8.41$, $p \leq .001$), and giving up or reducing activities ($M_{Sydney} = .37$, SD = .48; $M_{Miami} = .25$, SD = .43; $M_{St.Louis} = .21$, SD = .41 with $F(2,609) = 6.46$, $p \leq .01$).

Results of the Confirmatory Factor Analysis Model

The confirmatory factor analysis model specified simple measurement structure (non-zero loadings on one latent construct only) and posited freely estimated associations between all four latent constructs. Based on several model fit criteria (Hu and Bentler, 1998), this CFA model adequately represented the data, $\chi^2(146, N = 612) = 537.10$, $p \leq .001$ (χ^2/df = 3.68), Normed Fit Index (NFI; Bentler and Bonett, 1980) = .875, Comparative Fit Index (CFI; Bentler, 1990) = .905, standardized root mean square residual (RMSR) = .08 and root mean square error of approximation (RMSEA; MacCallum, Browne, and Sugawara, 1996; Steiger, 1990) = .07. The CFI is an inferential (adjusted) analogue to the absolute fit indices and shows how much of the variances and covariances in the sample data are captured by the implied population model (and can take on values from 0 to 1). The RMSR measures the average difference across the residual variances and covariances between the predicted and observed covariance matrices. Smaller numbers less than .05 indicate optimal residualization by the imposed model. Estimates of internal consistency for the multi-item latent factors were computed using the Werts, Linn, and Jöreskog (1974) formula for structural composites (these estimates are disattenuated from error). Reliabilities were high for all four constructs including $\alpha = .99$ for motives, $\alpha = .98$ for depression, $\alpha = .98$ for ecstasy use, and $\alpha = .96$ for dependence.

A few model fit indices exceeded their respective benchmarks (both the RMSR and RMSEA were above .05 and the ratio of χ^2/df was above 3.0) but overall indicated that model modifications might enhance the overall fit. Importantly, we reserved implementing any model refinements for a later point in the model testing procedure with the fully conditioned SEM (the model including all exogenous predictors facilitates testing the true model with all regression effects modeled simultaneously).

Figure 1 shows the results of the CFA measurement model. As depicted, standardized parameter loadings from the CFA model indicated each of the four latent constructs was

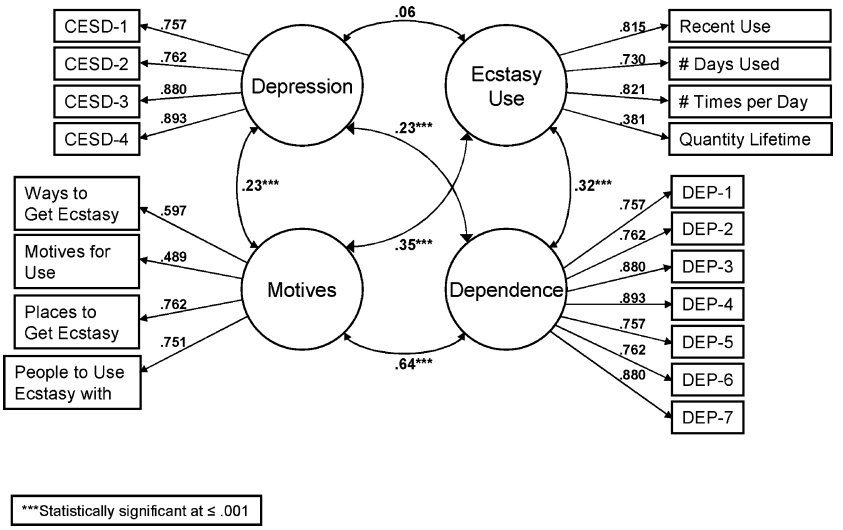

Figure 1. Measurement model depicting four hypothesized latent factors.

statistically reliable. Of the six possible estimated correlations only the one between depression and ecstasy use failed to achieve significance ($r = .06$). Of the remaining associations, depression was associated with higher motives ($r = .23$, $p \leq .001$) and more dependence ($r = .23$, $p \leq .001$). Motives were associated with higher levels of ecstasy use ($r = .35$, $p \leq .001$) and more dependence symptoms ($r = .64$, $p \leq .001$). The latent constructs of ecstasy use and dependence were moderately and positively associated ($r = .32$, $p \leq .001$).

Having obtained a viable psychometric model for the four specified latent constructs, we initiated a series of SEMs using the three economic indicators (income, opportunity cost, and unit price) as predictors of ecstasy use. Although this model is considerably pared down from the final complete model (and not nested with any more complex or subsequent models), it provides unbiased estimates resulting from the regression of ecstasy consumption on the economic indicators. By all indications, the unbiased model did not provide an optimal fit to the data, $\chi^2(11) = 70.8$, $p \leq .001$ ($\chi^2/\text{df} = 6.44$), NFI = .922, CFI = .932, RMSR = .05, and RMSEA = .09. Social anomie was not a significant predictor of ecstasy use; however, the remaining two economic indicators did predict significantly ecstasy use (time spent obtaining ecstasy or opportunity cost: $\beta = .19$, $p \leq .001$ and unit price or monetary cost: $\beta = .19$, $p \leq .001$). Correlations among the exogenous predictors showed that higher levels of social anomie were positively associated with lower levels of unit price ($r = .07$, $p \leq .05$). As a follow-up test, and as a means of testing for suppression (this also has been termed *interpretational confounding* by Burt, 1973, 1976), we specified and tested a model with the income index (essentially constraining to zero the effects associated with opportunity and monetary costs); however, this model did not result in a significant prediction of ecstasy use (the obtained effect for the income index maintained the same magnitude and sign).

The next model specified dependence as an endogenous construct along with ecstasy use and included the three exogenous economic indicators. Again, model fit statistics showed a less than optimal fit, $\chi^2(70) = 271.60$, $p \leq .001$ ($\chi^2/\text{df} = 3.88$), NFI = .852, CFI = .884, RMSR = .07, and RMSEA = .07. While opportunity cost predicted ecstasy use ($\beta = .19$, $p \leq .001$) and dependence ($\beta = .13$, $p \leq .01$), unit price (i.e., monetary cost) predicted

ecstasy use ($\beta = -.21$, $p \leq .001$). Among the specified correlations (both for the exogenous and endogenous measures), the positive association between the income index and unit price remained intact ($r = .07$, $p \leq .05$); as expected, higher ecstasy use was associated with more dependence criteria ($r = .30$, $p \leq .001$).

A third model included a latent construct capturing depression, the economic predictors capturing income, opportunity, and monetary cost and two endogenous latent constructs of ecstasy use and dependence. This model fit the data well, $\chi^2(123) = 366.99$, $p \leq .001$ ($\chi^2/\text{df} = 2.98$), NFI = .893, CFI = .925, RMSR = .06, and RMSEA = .06. Of interest is that, despite not having the ability to test nested models, the incremental addition of predictors to the model accounted for a substantially greater amount of variance in the sample data (reinforcing the explanatory power of these predictors). Among the specified effects, depression was associated with dependence ($\beta = .19$, $p \leq .001$) but not with ecstasy use. Among the economic indicators, opportunity cost was associated positively with ecstasy use ($\beta = .19$, $p \leq .001$) and dependence ($\beta = .11$, $p \leq .05$). Unit price was inversely associated with ecstasy use ($\beta = -.21$, $p \leq .001$: i.e., lower cost with higher consumption). Depression was associated with opportunity cost ($r = .10$, $p \leq .05$) and the income index was associated with unit price ($r = .07$, $p \leq .05$: coding of these scales resulted in higher anomie being associated with cheaper price). The model also included a significant association between disturbance terms (reflecting variance net after prediction) for ecstasy use and dependence ($r = .30$, $p \leq .001$).

A fourth model added to the previous model by positing two additional exogenous predictors that reflected varying levels of risk (i.e., high-risk sexual behaviors and a latent construct tapping motivation). Running the models in an ordered sequence and adding variables incrementally helps to avoid problems with convergence and optimization. Furthermore, this model testing strategy has its advantages when there is a possibility of suppression and start values change dramatically upon inclusion of a particular measure. Following inclusion of the additional exogenous predictors, we obtained a reasonably good fitting model, $\chi^2(206) = 653.80$, $p \leq .001$ ($\chi^2/\text{df} = 3.17$), NFI = .857, CFI = .896, RMSR = .07, and RMSEA = .06. Figure 2 shows the results of this model including the economic indicators, the two exogenous constructs, and an index of sexual risk behaviors.

Among the main hypothesized relations between exogenous predictors and endogenous constructs, there was a significant path from motives to ecstasy use ($\beta = .35$, $p \leq .001$) and from motives to dependence ($\beta = .67$, $p \leq .001$). Interestingly, and in contrast to the previous model findings, depression was not a significant predictor of any of the endogenous constructs, albeit there was a marginally significant relation with dependence ($\beta = .07$, $p \leq .06$). Among the key economic indicators, opportunity cost was associated with more ecstasy use ($\beta = .13$, $p \leq .01$) and monetary cost was inversely associated with ecstasy use (scaled so that cheaper prices were associated with higher consumption: $\beta = -.23$, $p \leq .001$). Sexual risk behavior had a small but significant and inverse association with dependence ($\beta = -.10$, $p \leq .05$).[4]

The model also contained significant correlations among several of the exogenous measures and factors. The largest of these included an association between the motivation construct and high-risk sexual behaviors ($r = .37$, $p \leq .001$), followed in order of decreasing magnitude by associations between depression and motives ($r = .23$, $p \leq .001$, motives and opportunity cost ($r = .21$, $p \leq .001$), depression and high-risk sexual behavior ($r = .11$, $p \leq .01$), depression and opportunity cost ($r = .10$, $p \leq .05$), the income index separately with high-risk sexual behavior ($r = -.09$, $p \leq .05$: more anomie less sexual risk), monetary cost ($r = .07$, $p \leq .05$), and depression ($r = .07$, $p \leq .05$). Overall, these eight correlations help clarify the overlap between the economic indicators and the measures of psychological

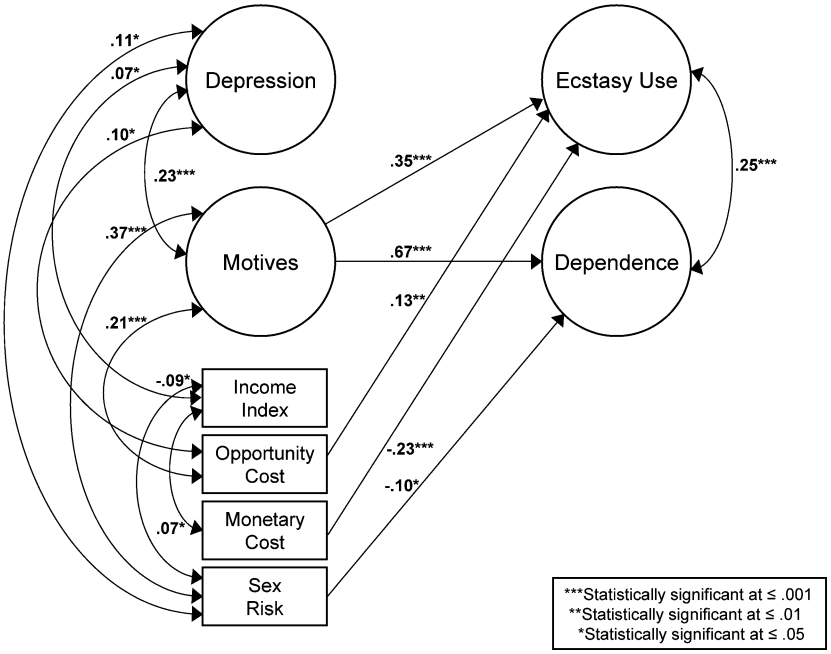

Figure 2. Final SEM depicting influence of economic and psychological factors on ecstasy use.

risk in the model. The only other parameter remaining is the association among disturbance terms for the two endogenous constructs, which reflects their association after prediction ($r = .25$, $p \leq .001$).

At this point we ran empirical specification searches to detect any additional nonstandard effects to help improve the overall model fit. Nonstandard effects provide a more fine-grained analysis of specific relations that were not hypothesized as main effects during the model testing procedure. The Lagrange Multiplier test (Bentler and Dijkstra, 1985; Chou and Bentler, 1990; Lee and Bentler, 1980) in the EQS statistical program produces modification indices that indicate the magnitude and direction of parameter change and corresponding change in likelihood ratio χ^2 value for the model that accompany freeing an individual parameter (3.84 χ^2 for each 1 df represents a significant model increment: see also Bentler, 1995, for matrix algebra computations underlying the LM test and Leamer, 1978, for a thorough discussion of specification searches in the context of economic theory). Inclusion and specification of nonstandard parameters essentially takes a parameter fixed at zero and freely estimates this parameter in the context of other obtained nonzero relations.

Specification searches are conducted in a straightforward manner to assure model consistency (e.g., Silvia and MacCallum, 1988). Each parameter change is checked for theoretical consistency, first addressing whether the proposed change in model parameterization is consistent with prior reported empirical findings; the sign of the parameter is examined in the context of the given zero-order bivariate relations. If a recommended change involves specification of a path involving a factor, the signs of the proposed parameter are checked against all of the indicators reflecting the factor. This procedure protects against suppression and inconsistent models. Given that our main interest rests with the significance of economic indicators (in the context of important psychosocial measures), we first restricted the search to identify effects from economic indicators on observed

indicators of the two endogenous factors (paths to the factors themselves were specified as main effects). Following saturation of the model with these effects, we then searched for additional nonstandard relations that encompass the remaining exogenous factors (depression and motives), sexual risk, and the endogenous factors (and their respective observed measures). Although these latter additions are of less theoretical importance to the overall economic model, they considerably tighten the model and reflect true underlying processes influencing drug abuse (the improvements lead to better model parsimony and reduce overall bias in parameter estimates, see, for example, MacCallum, 1986).

With this in mind, we added six nonstandard effects capturing relations between the economic indicators and endogenous measures. These included a significant path between the income index and number of pills used/day in the past 30 days ($\beta = .07$, $p \leq .05$) and a path from opportunity cost (time spent obtaining ecstasy) and number of pills used/day in the past 30 days ($\beta = .08$, $p \leq .01$). Opportunity cost was associated with lifetime quantity ($\beta = .15$, $p \leq .001$); the index of income was associated with lifetime quantity ($\beta = -.15$, $p \leq .001$). Coding of the income index indicated that fewer financial resources were associated with less lifetime ecstasy use. In addition, monetary cost (unit price) was associated with lifetime quantity ($\beta = .10$, $p \leq .01$) and separately with an indicator of dependence ($\beta = -.08$, $p \leq .05$).

In addition to post hoc modifications reflecting the influence of economic indicators there also were a total of four nonstandard effects that captured relations between exogenous measures (observed indicators aligned with factors or high-risk sexual behavior) and endogenous components of the model (both factors and their indicators). All four relations involved indicators of the motivation construct and lifetime quantity of ecstasy use including paths from number of ways to obtain ecstasy ($\beta = .37$, $p \leq .05$), number of places to obtain ecstasy ($\beta = .41$, $p \leq .05$), and number of people to obtain ecstasy ($\beta = .41$, $p \leq .05$). One additional path included number of motives for using ecstasy to dependence ($\beta = .30$, $p \leq .001$). This final model fit well, $\chi^2(210) = 454.88$, $p \leq .001$ ($\chi^2/\text{df} = 2.16$), NFI = .900, CFI = .943, RMSR = .06, and RMSEA = .04 (the model is stripped of all nonsignificant relations to achieve parsimony). At this point, there were no additional post hoc additions that reflected unequivocal influence of economic indicators on the endogenous components and the overall model change in χ^2 points was not appreciable enough to warrant inclusion of additional specific relations (the CFI exceeded .90 and the RMSEA was under the benchmark of .05).

Additional Models Examining Gender, Race, Age, and Education

The sample was sufficiently large to examine the influence of gender using multiple group comparison procedures. Splitting the sample by gender and testing equivalence of effects across groups represents an elegant statistical comparison. Following recommended conventions (Bagozzi and Heatherton, 1994; Byrne, Shavelson, and Muthén, 1989), we imposed model constraints in a stepwise manner including restricting factor loadings across groups to equivalence (i.e., the null hypothesis positing equivalent factor structures across groups), the factor intercorrelations (i.e., the structural relations between factors are the same across groups), and the regression parameters (i.e., the obtained model effects are identical between groups). Results of these modeling efforts showed partial measurement invariance, with different loadings obtained for one indicator of depression (CES-D: $\lambda_M = .720$ and $\lambda_F = .798$), an indicator of motives (ways to get ecstasy: $\lambda_M = .656$ and $\lambda_F = .531$), and an indicator of the dependence factor ($\lambda_M = .548$ and $\lambda_F = .676$). From a practical standpoint, the

differences in magnitude of factor loadings were statistically significant. The nested model test showed that a model containing three relaxed constraints improved on the fully constrained model, $\Delta\chi^2(3) = 27.43$, $p \leq .001$. Tests of equality of factor correlations indicated that male and female samples were drawn from the same population and further comparisons of structural coefficients for the economic indicators alone and the fully conditioned model also reinforced the obtained model fit both male and female samples equally well.

The same luxury could not be afforded to the race, age, and education measures, where splitting the sample would result in highly uneven groups, straining the robustness of the statistical methods. As a result, we modeled these covariates as dummy coded measures and tested them individually in the final model. An initial conditioned model included race (0 coded as racial minority and 1 coded White) as an exogenous predictor. Importantly, we did not retain the previously obtained nonstandard effects in these models, given they might not be stable with the smaller sample sizes (MacCallum et al., 1996). In our sample, race was not a significant predictor of ecstasy use or dependence, although race was significantly correlated with the income index ($r = -.09$, $p \leq .05$: Whites reported less social anomie), monetary cost (unit price: $r = -.22$, $p \leq .001$), and the motivation construct ($r = .09$, $p \leq .05$). Likewise, we tested age (0 coded as older than 21 and 1 coded as younger than 21) as a predictor of ecstasy use and dependence. Younger participants reported more dependence ($\beta = .19$, $p \leq .001$) and greater social anomie ($r = .26$, $p \leq .001$), more opportunity cost ($r = .12$, $p \leq .01$), and older participants reported more high-risk sexual behavior ($r = -.20$, $p \leq .001$).

The next model examined the effect of education (0 coded as *greater than high school* and 1 coded *less than high school*) on ecstasy use and dependence. Lack of education was a significant predictor of ecstasy use ($\beta = .08$, $p \leq .05$, one-tailed). Among the significant correlations between education and the exogenous predictors, less educated participants spent more time looking to obtain ecstasy ($r = .23$, $p \leq .001$: less education was associated with less time consumed with drug seeking behavior), more social anomie ($r = .12$, $p \leq .01$), more depression ($r = .16$, $p \leq .001$), and more drug motivation ($r = .12$, $p \leq .001$).

Site Analyses

The mean differences by site suggested that predictors might differ by sites. As already mentioned, Sydney ecstasy users paid more for their drugs and used more pills than users in St. Louis and Miami. In addition, diagnostic criteria varied between sites necessitating that we run a model with a dummy coded measures to reflect site differences.[5] Again, we ran this model using the final SEM absent the non-standard effects, which might not be stable with the smaller samples: $\chi^2(236) = 675.71$, $p \leq .0001$ ($\chi^2/\text{df} = 2.86$), NFI = .862, CFI = .905, RMSR = .071, and RMSEA = .055. Site predicted consumption ($\beta = -.46$, $p \leq .001$) and dependence ($\beta = -.09$, $p \leq .05$). Among the specified correlations between exogenous measures, site was associated significantly with price ($r = .554$, $p \leq .001$ with price reverse coded so that Australians paid more), sexual risk ($r = .066$, $p \leq .05$), and motivation ($r = -.107$, $p \leq .01$).

Discussion

This study provides, for the first time, data on economic indicators of ecstasy use, and data on dependence and abuse according to DSM IV criteria on a large number of respondents from three diverse sites, around the world. A carefully, clinically characterized sample such as this has allowed us the opportunity to combine two theories into one, now labeled

the psycho-economic model of ecstasy use. We have found evidence that economic factors, specifically monetary price and opportunity cost (time spent acquiring a drug), influence the decision to purchase and consume ecstasy. Although the analytic framework we used allowed us to examine the unique effects associated with specific economic indicators viewed by economists as important features of any economic model of addiction, including Becker-Murphy's RAM, we were not able to provide a comprehensive test of that specific model. We also found evidence that adding psychological risk factors enhanced the performance of the model.

Importantly, we set about testing the psycho-economic model in an incremental fashion to ensure that we could monitor the changes in parameter estimates as we built a more complex model. The first of these models, a confirmatory measurement model, reinforced the statistical reliability of the hypothesized constructs. The overall fit of the four-factor model was adequate and the relative magnitude and significance of the loadings reinforced the configuration of observed measures to their respective underlying factors. By all indications, the fit of this model could have been improved; however, we chose not to respecify the measurement model using post hoc empirical specification searches. Likewise, we did not specify correlated error terms between constructs, because they could cloud or distort the conceptual meaning ascribed to each construct.

Following derivation of the measurement model, we tested a series of structural equation models to ascertain the unique relations between economic indicators and the two outcome measures: ecstasy use and dependence. These models were incrementally augmented by inclusion of identified psychological risk factors that paint a more vivid picture of motivational and psychological factors influencing ecstasy use and dependence criterion. An important observation from the model fit statistics was the increasing larger share of variance accounted for in the sample data with inclusion of additional predictors. In essence, the addition of these selected measures into the model helped to clarify the relative importance of both economic and psychological factors as necessary predictors of consumption and dependence.

One of the more striking observations from the modeling efforts was the absence of any significant prediction from income to consumption and dependence. This is especially disconcerting since, according to the RAM, budgetary constraints in the form of wealth or disposable income drive consumption. Several reasons could explain why income was unrelated to drug use, including the fact that our measure of social anomie reflected status level, rather than wealth or income.

In contrast to the null findings for income, opportunity, and monetary cost predicted consumption. Favoring the economic argument that price regulates consumer behavior, higher prices paid for ecstasy (over $20/pill) was associated with less use. An important aspect of our psycho-economic model is that the data on pricing comes from the users themselves, rather than data (aggregate or individual) collected from different sources which could lead to "ecological fallacy." Importantly, the inclusion of economic factors in our model of ecstasy use shows that, contrary to popular psychological views of addiction, ecstasy users are not just chemically enslaved people who use drugs without considering the price and amount of time spent to acquire them.

Despite the poor showing of social anomie, there was evidence of a nexus of factors that may be related to social anomie. Three in particular included race, age, and education all of which were related to consumption and to the various economic predictors. Modeling these demographic features showed that white participants reported less economic distress (anomie) and paid more for their ecstasy. Economic theory, specifically the RAM, suggests that younger and relatively poorer people are more aggressive in their pursuit and

consumption of drugs than older and wealthier people because they heavily discount future consequences. In fact, younger participants reported more economic distress and spent more time obtaining ecstasy. They also spent more time locating drug supplies and putting more effort into their drug habit. Future research should focus on a broader set of economic indicators to do a better job at capturing wealth. In the present study, the inclusion of education as a control factor helped to address this issue, since education provides access to wealth through investment in human capital (reflecting the total capability of the individual to earn). Although education was related significantly to consumption, this effect was small, overall. Despite the absence of any strong prediction from income to consumption, income was related significantly to monetary cost. Thus, individuals with more purchasing power (and less anomie) paid more for their drug than individuals with less purchasing power.

Depression was not associated significantly with either ecstasy use or dependence. Rather, depression was associated with more high-risk sexual behaviors, motivation for ecstasy use, and spending less time searching for ecstasy. Additionally, analysis of nonstandard effects showed that respondents reported that the easier ecstasy was obtained (more available), the more it was used. It would appear then that the effect of depression is not directly related to consumption or dependence but rather generated through other measures that reflect the effects of depression. In other words, depression may serve as a catalyst to a cycle of drug acquisition, sexual risk taking, and motivation to consume ecstasy, all of which leads to increased consumption.

Motivation also proved to be a strong predictor of both ecstasy use and dependence. The size of the regression parameters from motives to the endogenous constructs reinforced the importance of psychological features of addiction (i.e., cravings and urges) as driving forces in continued use and problems that arise from continued use, though it is hard to discern whether relations between motivational features of ecstasy use captured the connections between people and places, or reflected the cognitive urges and triggers that presage drug use. What is clear, however, is that psychological motivation to use ecstasy is relatively independent of economic reasons, reinforcing the necessity to model both components to fully account for drug abuse.

The introduction of a latent construct tapping motivation also created suppressor effects and changed model parameters from their expected values, reversing the sign for high-risk sexual behavior. Essentially two explanations for this change in model parameterization are worth considering; one economic and one psychological. The four-indicators construct of the index motives was a fairly heterogeneous construct tapping various opportunities for procuring ecstasy, places and people to share drugs with, as well as specific reasons for obtaining ecstasy (e.g., tension reduction). Several of the opportunity items tapped deviant means of obtaining ecstasy including sex trading for drugs and/or money, stealing, dealing, and making no payment at all. Leigh and Stall (1993) suggest that global overlap can be used to account for similarities in various problem behaviors and their developmental trajectories. For example, social-cognitive models used to account for relations between alcohol use and high-risk sexual behavior and that incorporate impairment, disinhibition, or deficit explanations also can account for relations between ecstasy use and high-risk sexual behavior (e.g., Justus et al., 2000).

If we examine sexual risk from an economic viewpoint, a different picture emerges to account for the negative association between sexual risk on one hand and ecstasy use and dependence on the other hand. Accordingly, sexual risk behavior is associated with monetary gain, through trading sex for money or drugs. In other words, users perceive an increase in utility associated with sexual risk. The gain is obtained when users acquire

ecstasy by trading sex. In fact, the index of high-risk sexual behaviors includes measures of sexual deviance that might arise from sexual trading practices (i.e., multiple partners and unprotected sex). The latent factor tapping motives also may be tied conceptually with high-risk sexual behavior sharing an underlying psychological push or urge to use drugs, act impulsively, engage in socially deviant activities, and seek opportunities to perpetuate an abusing lifestyle, which includes seeking and consuming ecstasy. Either way, the myopic instinct of the user leads to increased high-risk sexual behavior, more ecstasy consumption, and perceived fewer problems associated with its use.

Following derivation of the fully conditioned model, clarification of the full spectrum of economic influences was enhanced with the addition of several nonstandard effects. Using appropriate diagnostic indices, empirical specification searches helped identify fixed parameters that needed to be freed, and following successive respecification of the model these modifications considerably augmented the overall model fit. Interestingly, and despite its relatively lower factor loading, most of these additions concerned economic influences on lifetime quantity of ecstasy consumed. It is quite possible that economic considerations including the drug cost and availability influence consumption over an extended period of time, whereas psychological factors (i.e., withdrawal symptoms and craving) influence more immediate use.

Limitations and Suggestions for Future Research

Like most empirical investigations in the substance use literature, this study has several limitations that are worth noting. First, despite the fact that this is the first and only dataset with recreational ecstasy users from three geographically diverse areas, and is well clinically characterized with diagnostic data and economic data, the sample is relatively small for SEM techniques. An even larger sample would result, perhaps, in smaller standard errors, better power and parameter stability, and ultimately lead to stronger conclusions regarding obtained model effects. A larger sample would also allow for separate comparisons by race and oversampling of racial minorities would even be helpful to assure making robust statistical comparisons with sufficient cell sizes in each race group.

Although we modeled a wide range of economic measures that have not been modeled previously with ecstasy or any other drug, other variables used in studies of alcohol and tobacco were not available due to the illicit nature of the drug studied. These variables include excise tax information and state sales. In addition, as already mentioned, our income questions need to be bolstered.

Another point worth noting is the specification of directional paths in the model. This model was recursive, that is, unidirectional. It is possible that nonrecursive models would adequately fit these data. In particular, depression was specified as an exogenous construct but could easily be conceptualized as endogenous, especially given the close relation between depression and dependence symptoms. Cross-sectional data do not, however, permit drawing inferences about causality (e.g., Gollob and Reichardt, 1987) and only with longitudinal data can we resolve these temporal issues. Along these same lines, the SEM posits direct or main effects and does not entertain interactions between exogenous measures or the latent factors themselves. Clearly, given the complete network of economic measures and their influences on consumption, each other, and the exogenous factors, there is the possibility of higher-order effects. Titration or calibration of effects through moderation or mediation is the next step in this empirical line of research that will help gain a more complete and refined understanding of how economic and psychological factors influence decision-making when it comes to drug abuse.

Implications for Policy, Treatment, and Interventions

This study also suggests certain implications for treatment providers and substance abuse interventions. Treatment providers should consider that price and availability are associated with the decision to use ecstasy, and that income is weakly associated with this decision. Providers should also be trained to integrate economic indicators into both treatment intake and interventions, where appropriate. Moreover, race, age, and education were all efficient predictors of consumption and these demographic factors influence human capital and wealth. Their inclusion along with economic indicators creates a layer of complexity when added to the relative importance of motivational factors as determinants of consumption and dependence. In this respect, efforts at remediation can focus on teaching drug abusers how to handle decisions about income, with intervention modules focusing on improving earning power along with investing in human capital through education and skills acquisition. Additional research is needed to tease apart motivational and subjective cues from broader economic (and more objective) indicators and develop keener insight as to how addicts address economic cues internally. Receiving a paycheck on Friday after a week's work effort may be a potent cue to a drug user seeking opportunities to purchase and consume more ecstasy. How drug users make decisions, judge their current situation, discount the future, and live drug free remains an open book. The field is also in critical need of studying the validity of the concept of ecstasy use and dependence, taking into account both psychosocial and economic aspects of such behavior. The psycho-economic model is a step in that direction.

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RÉSUMÉ

Un Modèle Psycho-Économique de Consommation d'Ecstasy et ces Conséquences Apparentées: Une Étude Multi-sites à Echantillons Communautaires.

La théorie du comportement rationnel de Becker et Murphy (1988) suggère que les facteurs économiques jouent un rôle influent dans la décision entraînant à la consommation des drogues et probablement aussi la dépendance. En outre, les modèles psychologiques mettent en exergue les indicateurs de régulation internes qui motivent l'utilisation de la drogue et jouent un rôle contribuant à la dépendance. Jusqu'à présent, la confluence des deux modèles, l'une économique et l'autre psychologique n'a jamais été mis à la preuve de façon empirique. La présente étude a utilisé la technique des variables latentes de modèles d'équations structurelles (MES) pour examiner l'influence des facteurs économiques (l'anomie social, le prix unitaire, et le temps passé en obtenant la drogue) et les risques psychologiques (motivation, dépression, et comportements sexuels a risque) sur l'utilisation auto-rapporté d'extasie. Les données pour cette étude ont été obtenues de 612 utilisateurs récréatif d'extasie aux Etats-Unis et en Australie qui ont participés dans une étude épidémiologique subventionnée par le NIDA—une étude qu'examinait les tendances de l'usage d'extasie. L'échantillon était principalement composé d'utilisateurs qui étaient personnes de la race blanche (61%), de sexe masculin (58%), et jeunes (âge moyen = 23 ans [5.25]). Tous les concepts latents mis en hypothèse étaient statistiquement fiables et en corrélation dans la direction attendue. Un MES saturé indiquait que les coûts monétaire et d'opportunité, et pas le revenu,

prédisaient de façon significative l'usage de l'extasie. Parmi les mesures psychologiques, les indicateurs de motivation étaient les prédicteurs les plus forts de l'usage de l'extasie et de la dépendance. L'addition du sexe, de l'âge, du niveau d'éducation, et les sites n'ont pas changés de façon sensible les paramètres du modèle final. Ces trouvailles sont discutées dans le cadre de l'incorporation du rôle des facteurs économiques dans la mise sur pied d'une compréhension plus fine de l'addiction. Des suggestions de la recherche à venir et les limitations de cette étude sont aussi notées.

RESUMEN

Un Modelo Psico-Economico del Consume de Ecstasy y sus Consequencias: Un Multi-estudio con Ejemplares de la Comunidad

La teoría de comportamiento racional de Becker y Murphy (1988) sugiere que los factores económicos influyen considerablemente en las decisiones de consumir drogas y posiblemente hasta la dependencia de ellas. En contraste, modelos psicológicos, recalcan que hay señales regulatorias internas que motivan el uso de drogas y que contribuyen a la dependencia de ellas. Hasta ahora, la confluencia de ambos modelos no ha sido comprobada empíricamente. Este studio usó un modelo de ecuaciones estructurales (MEE) compuesto de variables latentes para examinar la influencia de factores económicos (dificultades sociales, precio, y tiempo empleado para adquirir droga) y factores de riesgo psicológico (motivación, depresión, y comportamientos arriesgados sexuales) sobre uso del "éxtasis" basado en reportes de los usuarios. Se obtuvieron datos de 612 usuarios "casuales" del "éxtasis" en los EU y Australia. Estos usuarios participaron en un estudio epidemiológico financiado por el NIDA, y examinó tendencias en el uso de Extasis. El grupo del estudio estuvo mayormente integrado de blancos (61%), varones (58%), y jóvenes (Promedio de edad = 23yrs [5.25]). Todos los constructos latentes teorizados resultaron confiables y se correlaron en la dirección esperada. Un MEE saturado indicó que gastos y oportunidades de comprar eran predictores del uso del ecstasies, pero el ingreso de el participante no lo era. De las medidas psicológicas, los impulsos motivadores fueron los predictors más fuertes del uso y de la dependencia. La inclusión del sexo, edad, nacionalidad, nivel educacional, y sitios no alteraron los parámetros finales del modelo significativamente. Los resultados se exponen con el objeto de incorporar a los factores económicos para construer un entendimiento de la adicción más refinado. Sugestiones para futures investigaciones y limitaciones de este estudio también se notaron.

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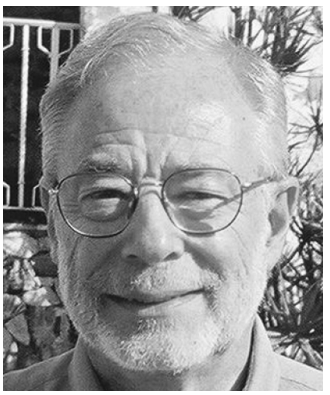

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Notes

1. An example of such confluence between economic theory and psychology can be found in Edwards (1954), which contains a scholarly discussion regarding the particular components of individual decision-making that overlaps quite nicely with some of the main tenets of economic rationality. See also Camerer (1995) for a thoughtful opus on decision making from an economic perspective. Both Cameron (2000), who refers to psychoeconomics, and Rabin (2002), who refers to behavioral economics, present an excellent discourse on the potential cross-fertilization (i.e., a merger) between psychology and economics. In a related vein, Lewin (1996) presents an excellent review of how the two fields need each other to proffer explanations for behavior.
2. Although early studies of ecstasy users contributed to the belief that ecstasy had generally a few negative health effects (Peroutka, Newman, and Harris, 1988; Solowij et al., 1992), more recent studies have shown that club drugs users recognize and do report symptoms of abuse and dependence (Cottler et al., 2001; Topp et al., 1997).
3. We were unable to obtain a satisfactory model positing distinct constructs of abuse and dependence. The statistical artifact of an almost perfect correlation between the two constructs necessitated modeling only one construct. Also, collapsing these two into a single latent factor might go against the grain of certain nosological criteria; thus, we decided to

proceed in our modeling efforts specifying only the dependence construct. This enables us to gain certain clarity with respect to negative sequelae of ecstasy consumption and use a construct possessing greater reliability (alpha for the abuse construct was .91, whereas alpha for the dependence construct was .96). From the perspective of model fit, a model positing two constructs produced a correlation of $r = .98$, $p \leq .001$ and the model fit well, $\chi^2(43) = 81.01$, $p \leq .001$, NFI = .939, CFI = .970, RMR = .03, RMSEA = .04. A model constraining the correlation between Abuse and dependence to unity also fit well, and the nested difference between the base and constrained model was not significant, $\Delta\chi^2(1) = .52$, $p =$ n.s., indicating the constrained model fit the data equally well.

4. Based on the psychological meaning associated with sexual risk-taking, we expected greater sexual risk to be associated with greater dependence. This expectation is consistent with the literature on sexual risk and drug use (for an excellent review, see, for example, Leigh and Stall, 1993). In essence, and using this argument, sexual risk behaves like addiction, driving the individual to act compulsively (and perhaps impulsively) leading to the same dependence problems that occur with substance use. The data support this contention once we strip the model down to the bare essentials. In other words, trimming the model of all the exogenous constructs and leaving only the economic measures and sexual risk, the path from sexual risk to ecstasy use is positive and significant ($\beta = .09$, $p \leq .05$), as is the path from sexual risk to dependence ($\beta = .14$, $p \leq .01$). However, once we begin incrementally adding exogenous constructs to the base model, there is statistical evidence of suppression. Once the endogenous constructs (dependence and ecstasy use) are residualized on depression and motives (in addition to the economic indicators), a completely different picture emerges.

   We conducted a series of analyses to isolate the change in sign and found the reversal occurred with the introduction of the motivation construct. Stripped of everything exogenous in the model (including the economic indicators), we obtained a positive relation between sexual risk and dependence ($\beta = .14$, $p \leq .01$) and this effect remained consistent with the introduction of the depression factor ($\beta = .12$, $p \leq .01$). Furthermore, the association between depression and sexual risk was positive ($r = .11$, $p \leq .01$). However, introduction of the motivation construct changed the sign appreciably between sexual risk and dependence ($\beta = -.11$, $p \leq .05$). Other parameters of importance in this model included the coefficient from motivation to dependence ($\beta = .66$, $p \leq .001$) as well as the associations between sexual risk and depression ($r = .25$, $p \leq .001$) and the association between sexual risk and motivation ($r = .37$, $p \leq .001$). When we ran this model regressing consumption and dependence on the economic indicators, the same results were obtained. That is, there was a positive and significant path from sexual risk to dependence ($\beta = .14$, $p \leq .01$). Likewise, the relation between sexual risk and ecstasy use was positive ($\beta = .09$, $p \leq .05$).

5. The first step in testing whether the U.S. and Sydney samples are drawn from the same population constrains the factor loading (lambda) matrix to equality. This model fit well, $\chi^2(311) = 748.297$, $p \leq .0001$, NFI = .828, CFI = .891, SRMR = .102, and RMSEA = .068. By all indications, releasing any of the factor loading constraints would not make a significant improvement in the overall model fit (a nested comparison of the fully constrained model with a less restricted model positing relaxed factor loadings would require a difference of at least 3.84 χ^2 points for each degree of freedom corresponding to a single parameter change). The next model constrained the factor intercorrelations (phi matrix) to equality between sites. This model fit well, $\chi^2(316) = 758.314$, $p \leq .0001$, NFI = .826, CFI = .890, SRMR = .108, and RMSEA = .068. Again, there was no indication that freeing any of the cross-group constraints in the factor correlation matrix

would improve significantly on the model. A third and final step involved testing equality of the obtained structural (predictive) parameters. This model included the economic indicators as predictors of consumption and dependence. Fit statistics showed this model was adequate, $\chi^2(454) = 946.144$, $p \leq .0001$, NFI = .797, CFI = .882, SRMR = .093, and RMSEA = .060. Importantly, while none of the model fit indices achieved their suggested benchmarks, the purpose of this tiered model testing strategy was to examine the tenability of cross-group constraints. Since no constraints needed to be relaxed to achieve a superior model fit, the two samples could be said to come from the same population.

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