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## Do adolescent Ecstasy users have different attitudes towards drugs when compared to Marijuana users?

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### Abstract

**Background**—Perceived risk and attitudes about the consequences of drug use, perceptions of others expectations and self-efficacy influence the intent to try drugs and continue drug use once use has started. We examine associations between adolescents' attitudes and beliefs towards ecstasy use; because most ecstasy users have a history of marijuana use, we estimate the association for three groups of adolescents: non-marijuana/ecstasy users, marijuana users (used marijuana at least once but never used ecstasy) and ecstasy users (used ecstasy at least once).

**Methods**—Data from 5,049 adolescents aged 12–18 years old who had complete weighted data information in Round 2 of the Restricted Use Files (RUF) of the National Survey of Parents and Youth (NSPY). Data were analyzed using jackknife weighted multinomial logistic regression models.

**Results**—Adolescent marijuana and ecstasy users were more likely to approve of marijuana and ecstasy use as compared to non-drug using youth. Adolescent marijuana and ecstasy users were more likely to have close friends who approved of ecstasy as compared to non-drug using youth. The magnitudes of these two associations were stronger for ecstasy use than for marijuana use in the final adjusted model. Our final adjusted model shows that approval of marijuana and ecstasy use was more strongly associated with marijuana and ecstasy use in adolescence than perceived risk in using both drugs.

**Conclusion**—Information about the risks and consequences of ecstasy use need to be presented to adolescents in order to attempt to reduce adolescents' approval of ecstasy use as well as ecstasy experimentation.

### MeSH Keywords

Adolescents; Ecstasy; Marijuana Smoking; Health Knowledge; Attitudes; Health behavior

## 1. Introduction

Perceived risk and attitudes about the consequences of drug use, perceptions of others expectations (e.g., what parents and friend expect), and self-efficacy (belief) influence the intent to try drugs and continue drug use once use has started. A theoretical framework related

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to these concepts is the theory of reasoned action which specifies that ‘people act in accordance with their intentions and perceptions of control over their behavior, while intentions in turn are influenced by attitudes towards the behavior, subjective norms, and perceptions of behavioral control’ (Ajzen, 2001; Ajzen and Fishbein, 1980). Another framework is Bandura’s self-efficacy theory which explains that cognitive processes play an important role in the ‘acquisition and retention of new behavior patterns’ (Bandura, 1977). Hence, individuals who underestimate the risks and harms associated with drug use are usually the ones more likely to engage in drug use (Danseco et al., 1999; O’Callaghan et al., 2006). Conversely, those who believe that a specific drug causes harm are more likely not to use it (Gonzalez and Haney, 1990; Duitsman and Colbry, 1995; Bachman et al., 1998; Johnston et al., 2006).

In recent years there has been accumulating evidence of the harms associated with ecstasy (3–4, methylenedioxymethamphetamine; MDMA) use (Tancer and Johansen, 2003). It is well established that ecstasy can cause acute adverse effects that include: difficulty concentrating, anxiety, depressed mood, increased elation, dissociation feelings, delusions, confusion, increase in blood pressure, dry mouth, nausea, insomnia, loss of appetite, and sweating, and hyperthermic syndromes (Morland, 2000; Liechti et al., 2001; Tancer and Johansen, 2003; Verheyden et al., 2003). Ecstasy use has been also associated with increased symptoms of emotional and behavioral disturbances (Morland, 2000; Liechti et al., 2001; Harris et al., 2002; Parrott et al., 2002; Lieb et al., 2003; Tancer and Johansen, 2003; Verheyden et al., 2003, Pape and Rossow, 2004; Sumnall and Cole, 2005, Martins et al., 2006). In one study, nearly half (43%) of the young adults and adolescents who used MDMA more than four times met diagnostic criteria for dependence, as evidenced by continued use despite knowledge of physical or psychological harm, withdrawal effects, and tolerance (or diminished response); and 34 percent met the criteria for drug abuse (Cottler et al, 2001). While many ecstasy users perceive some health risk related to their ecstasy use (Gamma et al., 2005; White et al., 2006), there are others who do not perceive any risk or harm related to their ecstasy use (Carlson et al., 2004). A more controversial issue is whether there are harms associated with marijuana use (Hall 2001). Marijuana dependence develops in approximately 14–17% of adolescents who ever use marijuana (Anthony, 2006; Hall and Degenhardt, 2007). Moreover, marijuana dependence may lead to an increased risk of other illegal drug use and depressive and psychotic symptoms (Hall and Degenhardt, 2007).

During adolescence, many lifestyle and environmental influences are related to the propensity to use drugs. Adolescents’ perceptions that their peers approve of substance use and consider substance use normative substantially influences their own substance use (Musher-Eizenman et al., 2003; Urberg et al., 2003; van den Bree and Pickworth, 2005). Parental attitudes (Wood et al., 2004; Sargent and Dalton, 2001) and permissiveness have been associated with adolescents’ substance use (Wood et al., 2004; Hyatt and Collins, 2000). Adolescents who have better school grades and aspirations to attend college are less likely to use drugs (Bachman et al., 1998). Religion, drug education, and media campaigns can influence adolescents’ attitudes towards drugs and reduce the chance of use (Bachman et al., 1998; Palmgreen et al., 2001).

Since 2002, perceived risk in regards to marijuana use has been increasing among 12<sup>th</sup> grade students (17–18 year olds) and disapproval of marijuana use has slightly increased since 2004 (Johnston et al., 2007). Recent estimates from the 2006 Monitoring the Future (MTF) reveal that 42% of 12<sup>th</sup> grade students have already used marijuana (32% in the past-year), down from a high of 50% in 1997 (Johnston et al., 1997). The 2006 survey also estimates that 6% of 12<sup>th</sup> graders have experimented with ecstasy at least once (4% use in the past year), and although down from a high of 12% lifetime and 9% past year in 2001, these rates are still of great concern. (Johnston et al., 2007). Perceived harm and risk of ecstasy use had been increasing among 8–12<sup>th</sup> grade students, but from 2004 to 2006 there has been a sharp decline

in perceived risk of ecstasy use among 8<sup>th</sup> grade students (13–14 year olds) and a slight decline in perceived risk of ecstasy use among 10<sup>th</sup> and 12<sup>th</sup> grade students suggesting ‘generational forgetting’ (Johnston et al., 2007). Since 2002, disapproval of experimenting with ecstasy has been increasing among older adolescents, however more recently (e.g., 2004 to 2006) decreases in disapproval of trying ecstasy once or twice have been emerging among younger youth which ‘makes them vulnerable to a rebound in ecstasy use’ (Johnston et al., 2007). The disapproval of drug use and perceived risk of harmfulness due to drug use have been found to be important determinants of marijuana use among high school seniors (Bachman et al., 1998). Yet, little is known about the associations between adolescents’ attitudes (e.g., approval of drug experimentation and drug use) and beliefs (e.g., perceived risk) towards drug use and their use of ecstasy.

In this paper we take an approach analogous to Bachman et al. (1998) to examine associations between adolescents’ attitudes and beliefs towards ecstasy use. However, since previous research has found the vast majority of ecstasy users have a history of marijuana use (Martins et al., 2005; 2007), we estimate the association for three mutually exclusive groups of adolescents: 1- lifetime non-marijuana/ecstasy users (never used marijuana or ecstasy prior to the interview), 2- lifetime marijuana users (defined as respondents that used marijuana at least once but had never used ecstasy prior to the interview), and 3- lifetime ecstasy users (defined as respondents that used ecstasy at least once independent of their marijuana use status). From this point onwards, we will simply refer to respondents as non marijuana/ecstasy users, marijuana users, and ecstasy users. We hypothesize that adolescents who use ecstasy (who tend to be polydrug users) are more likely than those who only use marijuana to approve of drug use and perceive less risk of harm due to drug use. We used data from an epidemiologic nationally representative sample of U.S. adolescents’ aged 12–18 year olds, to:

1. explore the association of lifetime drug use with perceived risk by investigating whether adolescents who believe that drug use causes little/no harm are more likely to be lifetime marijuana users and ecstasy users than those who believe that drug use causes harm;
2. explore the association of lifetime use with influences on attitude by a) investigating whether adolescents with attitudes favorable of drug use are more likely to be lifetime marijuana users and ecstasy users than those who do not approve of drug use; and b) whether parents knowledge of their drug use and friends positive attitudes towards drug use are associated with adolescents’ lifetime marijuana and ecstasy use;  
and
3. explore whether the magnitudes of these associations with lifetime ecstasy use differ from the magnitudes of similar associations with lifetime marijuana use. We hypothesized that adolescents with positive attitudes towards drug use and beliefs that drug use cause no/little harm would be more likely to use both marijuana and ecstasy.

## 2. Methods

### 2.1. Sample and measures

**2.1.1. Sample**—Data for this research are from the Restricted Use Files (RUF) of the National Survey of Parents and Youth (NSPY) which is a household survey designed to evaluate the impact of the National Youth Anti-Drug Media Campaign sponsored by the Office of National Drug Control Policy and conducted by Westat under contract to NIDA. A multi-stage sampling design was used to provide an efficient and representative cross-section of America’s youth between the ages of 9–18 years. Children 9–11 years were recruited to complete a questionnaire that focused more on children’s perception of the media campaign, rather than on children’s

actual drug use and drug use correlates, and were excluded from this study because there was no data on their ecstasy use or other correlates of drug use. Adolescents living in all types of residential housing units were eligible; however, youth living in institutions, group homes, or dormitories were excluded. The NSPY investigators felt that experiences of youth living in dormitory settings would be different from the majority of youth interviewed at home, thus requiring separate analyses. The weighting procedure took the sampling strategy into account. It was estimated that the sample represented 70% of the age 9–18 civilian population (Hornik et al., 2003). Detailed information about the sampling and survey methodology of the NSPY can be found elsewhere (Hornik et al., 2003; Orwin et al., 2005).

This study focuses on the 12–18 years old who were asked about ecstasy use (n=5,090) that first appeared in the follow-up (Round 2) conducted between July 2001 and June 2002 (85% response rate). A few youth (n=41) were excluded because of incomplete or missing data. The 5,049 12–18 year-old youth included in this report represent 77.5% of the 6,516 youth aged 9–18 years old interviewed in round 2 of the NSPY. The analysis sample was comprised of 51% male, 66% White, 29% 12–13 year olds, 45% 14–16 year olds, and 26% aged 17–18 years (weighted proportions).

**2.1.2. Assessment**—The survey questions were chosen to resemble questions included in other surveys such as the Monitoring of the Future (MTF) (Bachman et al., 1996), the Community Action for Successful Youth (Metzler et al., 1998), the National Household Education Survey (NHES, Collins and Chandler, 1997), and the National Survey on Drug Abuse—now renamed as the National Survey on Drug Use and Health (NSDUH, SAMSHA, 1996). Because of the sensitive nature of the drug behavior data, a Certificate of Confidentiality was obtained. Interviews were conditional on parental or legal guardian permission (active written parental consent) and participant written assent was secured. Questionnaires were administered in respondents' home using lap-top computers. Audio-assisted self interview (ACASI) methods allowed respondents to self-administer the survey in total privacy. A recorded voice presented sensitive questions and answer categories orally over headphones and responses were selected by touching the computer screen. In addition to extensive assessment of exposure to anti-drug and Media Campaign messages, other questions assessed personal drug experiences with marijuana, ecstasy, and inhalants, perceived risk, attitudes and beliefs, and other personal data (e.g., demographics). Data analysis activities were approved by a Johns Hopkins University institutional review board.

**2.1.3. Measures**—Lifetime marijuana and ecstasy use was assessed by the questions: 'Have you ever, even once, used marijuana?' and 'Have you ever, even once, used ecstasy?' Based on the responses to these questions, adolescents were divided into three mutually exclusive drug use groups: no use of either marijuana or ecstasy by the time of the interview (n=4,083 – 76.5%), use of marijuana but not ecstasy (n=802–19.3%, defined as respondents that used marijuana at least once in their lifetime but that had never used ecstasy by the time of the interview), and use of ecstasy (n=164–4.2%, defined as respondents that used ecstasy at least once independent of their marijuana use status, there were 14 ecstasy users who had not used marijuana). The survey did not assess lifetime frequency of drug use for marijuana or ecstasy to allow us to differentiate experimenters from long-term, frequent, or heavy users, however one item assessed the frequency of past year use of marijuana.

Different sets of drug specific questions (relative to marijuana and separately for ecstasy) were used to create an index of perceived risk and approval of drug use. Based on a combination of the responses to whether youth thought 'people risk harming themselves (physically or in other ways) when using <drug>', we created a perceived risk index: 1- Risk if use of both Marijuana and Ecstasy, 2-Risk if use Marijuana but no risk if use Ecstasy, 3-Risk if use Ecstasy but no risk if use Marijuana, 4-No risk if use of either Marijuana or Ecstasy. Approval/disapproval of

drug use was assessed by the question ‘People differ on whether or not they disapprove or approve of people doing certain things. Do you disapprove or approve of people trying <drug>once or twice?’ Using a combination of the responses across drugs an index was created: 1-Disapprove of both Marijuana and Ecstasy use, 2-Disapprove of Ecstasy use but approve of Marijuana use, 3-Approve of Ecstasy use. Very few youth (n=54; 40 non drug users, 9 marijuana users, and 5 ecstasy users) disapproved of marijuana use while acknowledging approval of ecstasy use and because the estimates resulting from such a small group of individuals would be very unstable we choose to combine them with the other ecstasy approval category.

Items also assessed parental and friend influences. Attitudes related to parental knowledge and punishment towards drug use was assessed via two items: ‘If you used marijuana, inhalants, or other drugs, how likely is it that at least one of your (parents/caregivers) would know about it?’ and ‘If one of your (parents/caregivers) knew that you used tobacco or alcohol, how likely is it that he or she should punish you in some way?’. Because alcohol and tobacco use is illegal in adolescence and to be able to identify different levels of parental permissiveness towards drug use, we combined the response options for the former variables in the following index: 1-Parents know and punish, 2-Parents know/don’t punish, 3-Parents don’t know/parents punish, 4-Parents don’t know/don’t punish. To assess adolescent’s attitudes about friends’ attitudes towards drug use all adolescents were asked: ‘How do you think your close friends would feel about you using ecstasy, even once or twice, over the next 12 months?’ Response options were recoded as close friends’ approval and disapproval of future ecstasy use. We were not able to use the question regarding close friends’ attitudes towards marijuana use because, due to a skip pattern in the questionnaire, it was only asked to half of the respondents in the study.

A dichotomous variable representing low and high importance of religion in the youth’s lives was created from responses to: ‘How important is religion in your life?’ where not important or a little important were coded as low importance and pretty important or very important were coded as high importance. Average grade in school was assessed by: ‘Which of the following best describes your average grade in school? A response card provided options going from A (93–100) to D (69 or below), as well as an option that indicated ‘my school does not give grades’. Aspirations of attending college was a recoded variable based on the responses to: ‘Suppose you could do just what you’d like and nothing stood in your way. Please look at this card and tell me which of the following things you would want to do? Choose all that apply. Response options were: a) attend a technical or vocational school, b) serve in the armed forces, c) graduate from a 2-year college program, d) graduate from a 4-year college program, e) attend graduate or professional school after college, f) none of the above. All those who answered that they wanted to graduate from a 2 or 4 year college program and or attend graduate or professional school after college were coded as having aspirations to attend college.

The three-level general exposure to the Anti-Drug Media Campaign was an index created by the designers of the NSPY based on response to a set of six different questions on exposure to the anti-drug Media campaign ads on TV, radio, newspapers or magazines, movie theaters or rental videos, and public anti-drug ads on buses, malls or sport events (Westat, 2006). Drug education classes or programs included attending several special classes about drugs, films, lectures or discussions, drug information on Channel One, or a special in-school TV channel.

## 2.2. Statistical Analyses

After basic contingency tables analyses, we estimated the crude associations and then adjusted for demographics and average grades in school and importance of religion because they were significantly associated with the odds of being either a marijuana or an ecstasy user. To account for sample weighting and the complex survey design, STATA 9.0 survey commands and the

jackknife replicate weight commands were used to correctly estimate the variance (StataCorp, 2005). The NSPY has specific cross-sectional survey weights and each round includes 100 replicate weights designed for variance estimation. Possible associations between adolescents approval of drug use and beliefs related to drug use with adolescent marijuana and ecstasy use were analyzed using jackknife weighted multinomial logistic regression models (outcome variable: 0- non-drug use, 1-marijuana use but not ecstasy use, 2-ecstasy use). In all models, to ensure generalizability of the findings, missing data on any of the covariates was included as a separate category. Results are presented via Odds Ratio (OR), adjusted Odds Ratio (aOR) and 95% confidence intervals (CI).

### 3. Results

#### 3.1 Drug use groups

Nearly 77% of the sample had never used either marijuana or ecstasy, 19% had used marijuana but had not used ecstasy, and 4% of the adolescents had used ecstasy (the majority, 95%, also used marijuana). Ecstasy users not only tended to also have lifetime marijuana use, but they also tended to be more frequent recent users of marijuana; 53% of the ecstasy users used marijuana 10 or more times in the past year, but only 20% of the marijuana users used 10 or more times in the past year. In regards to other drug use, 10% (n=86) of those in the marijuana group and 33% (n=52) of those in the ecstasy group had used inhalants, respectively.

As seen in Table 1, older adolescents were more likely to use ecstasy as well as marijuana than younger adolescents; however there was no variation in drug use by gender, race/ethnicity, or residential region. Even though the majority of marijuana and ecstasy users had average school grades of A or B, a greater proportion of marijuana users (31.9%) were more likely to have lower grades in schools (grades C/D) as compared to their non-drug using counterparts (18.7%; OR=2.9 (1.5–5.6)); and there was a trend for ecstasy users (31.9%) to be more likely to have lower grades in schools (grades C/D) as compared to their non-drug using counterparts (18.7%; OR=3.7 (0.9–16.2)). A greater proportion of marijuana (39.3% vs. 22.9%, OR= 2.2 (1.4–3.6) and ecstasy (59.5% vs. 22.9%, OR=5.0 (1.6–15.7) users considered religion less important in their lives as compared to their non-drug using counterparts respectively. Anti-drug media campaign and drug education program exposure was similar across all youth, independent of their drug use status.

#### 3.2 Perceived risk, attitudes and marijuana use

As seen in Table 2, half of the youth who had used marijuana only (i.e., no ecstasy use) saw no risk in using marijuana but did perceive a risk with using ecstasy and over a quarter of the adolescents saw no risk in using marijuana or ecstasy. Only one in five of the marijuana users perceived a risk in using both marijuana and ecstasy. A similar pattern was seen with approval attitudes. Prevalence of parents approval of drug use- parents don't know youth use drugs nor would punish if knew youth used drugs- was three times higher among marijuana users as compared to non-drug users.

While there were differences in levels of perceived risk in using marijuana and ecstasy among marijuana users (who had not used ecstasy) versus non-drug using youth in the unadjusted models, these differences became non-significant when the attitude variables were also held constant (Table 2). Adolescents who had used marijuana but not ecstasy were more likely to approve of drug use as compared to non-drug using youth who disapproved of both marijuana and ecstasy use in the crude model and in the adjusted models (Table 2). Marijuana users were more likely to have parents who did not know whether they used drugs nor punished them if they used drugs as compared to non-drug using youth whose parents knew if they used drugs and punished them in the crude model, but the association diminished in strength when

perceived risk and other attitudes were also held constant. Marijuana users were more likely to have close friends who approved of ecstasy use as compared to non-drug using youth when perceived risk and other attitudes were also held constant.

### 3.3 Perceived risk, attitudes and Ecstasy use

Among the youth who used ecstasy, just under a half of the adolescents saw no risk in using either marijuana or ecstasy (Table 2). One in five of the ecstasy users perceived a risk in using both marijuana and ecstasy. Among ecstasy users 71% (95%CI=45–88) approved of both marijuana and ecstasy use, while only 10% (95%CI=2–40) of them disapproved of using both drugs). Prevalence of parents approval of drug use- parents don't know youth drugs nor punish if knew youth used drugs- was four times higher among ecstasy users as compared to non-drug users. Most of the ecstasy users had close friends that approved of ecstasy use (72%, 95% CI=47–88) while only 10% (95%CI=6–13) of the non-drug users had close friends that approved of ecstasy use.

Adolescents who were ecstasy users were more likely to think that there is no risk in using marijuana or ecstasy as compared to non-drug using youth who perceived a risk with using either drug in the crude model and in the model that controlled for demographics. The association became non-significant when the attitude variables were also held constant. Ecstasy users were more likely to approve of ecstasy use as compared to non-drug using youth who disapproved of use of both marijuana and ecstasy in the crude and adjusted models (Table 2). Ecstasy users were more likely to have parents who did not know whether they used drugs nor punished them if they used drugs as compared to non-drug using youth whose parents knew if they used drugs and punished them in the crude model. The association was largely attenuated and became non-significant when perceived risk and other attitudes were also held constant. Ecstasy users were more likely to have close friends who approved of ecstasy use as compared to non-drug using youth when perceived risk and other attitudes were also held constant.

### 3.4. Comparison of perceived risk and attitudes among Marijuana users versus Ecstasy users

While not always significant, in general the perception of risk appears to be associated with less drug use. Among marijuana users, the association between use and the perception of no risk of using either marijuana or ecstasy was fairly similar (Table 2), while among ecstasy users the association with use appeared to be stronger when no harm was perceived specifically with ecstasy use (Table 2). Drug use was also associated with an attitude of approval and this differed across the drug types. Ecstasy use was more strongly associated with approval of ecstasy use (aOR=11) than marijuana use with approval of marijuana use among the marijuana users (aOR=5). There was a tendency for drug use to be associated with more lenient parents, and a higher percentage of ecstasy users indicated they had parents that do not punish them (51%) as compared to 29% of the marijuana users. Ecstasy use (aOR=6.8) was more strongly associated with close friends' approval of ecstasy use than marijuana use (aOR=2.2).

## 4. Discussion

The main findings of this study were: 1) Adolescent marijuana (who do not use ecstasy) and ecstasy users (most of whom also used marijuana) were more likely to approve of marijuana and ecstasy use as compared to non-drug using youth, even when adjusted for perceived risk, parental knowledge/punishment and close friends' approval of ecstasy use; 2) Adolescent marijuana (who do not use ecstasy) and ecstasy users (most of whom also used marijuana) were more likely to have close friends who approved of ecstasy as compared to non-drug using youth, even when adjusted for perceived risk, parental knowledge/punishment, and approval of drug use; 3) The magnitudes of these two associations were stronger for ecstasy users (most

of whom also used marijuana) than for marijuana users (who did not use ecstasy) in the final adjusted model; 4) our final adjusted model shows that approval of marijuana and ecstasy use (or low disapproval of use of both drugs) was more strongly associated with both marijuana and ecstasy use in adolescence than perceived risk in using both drugs.

Our findings regarding the associations of marijuana use and ecstasy use with approval of drug experimentation/use (or lower disapproval of drug experimentation/use) are in accordance with other studies that focused on marijuana use only (O'Callaghan et al., 2006; Bachman et al., 1998). For some youth, attitudes of approval may not be entirely drug specific but rather a general disposition towards drug involvement and polydrug use. In our study, a subgroup of adolescents with more positive attitudes towards ecstasy experimentation and ecstasy use appears to be different from a subset of youth that appear to have positive attitudes towards marijuana only. One explanation for this subgroup difference might be the fact that there was a greater proportion of ecstasy users (69%) in the older age group (17–18 year olds) as compared to marijuana users (45%). Also, there is the possibility that ecstasy users have progressed further in the “drug use gateway pathway”, since it is well established that marijuana initiation typically precedes the initiation of other illegal drugs, including ecstasy (Fergusson and Horwood, 2000; Fergusson et al., 2006; Kandel, 2003; Martins et al., 2007). Marijuana use also provides the opportunities to become involved with other drugs (Wagner and Anthony, 2002).

Because most ecstasy users are or will become polydrug users in young adulthood (Carlson et al., 2004; Martins et al., 2005; Martins et al., 2007), our findings can be useful to prevention programs that target adolescent polydrug use and not only ecstasy use. Prevention programs may need to consider different strategies in changing attitudes towards drug use once marijuana use has begun. For example, one school drug-prevention program based on three theoretical models (health belief model-Rosenstock et al., 1988, social learning model-Bandura, 1985, and the self-efficacy theory-Bandura, 1977) was able to decrease positive attitudes towards marijuana use and decrease marijuana use among girls who had initiated tobacco or marijuana use (Longshore et al., 2007). Researchers have suggested that prevention programs that target a decrease in ecstasy use should focus on the more common acute and sub-acute side-effects of ecstasy use in order to decrease approval of ecstasy use (Baggott, 2002; Carlson et al., 2004).

Because approval of drug use was significantly associated with marijuana and ecstasy use above and beyond perceived risk and parental and friends attitudes we speculate that individual personality characteristics such as impulsivity and sensation-seeking, and/or childhood behavioral problems such as aggression and hyperactivity might be the underlying mechanisms that lead to approval of drug use (Barkley et al., 2004; Crawford et al., 2003; Petras et al., 2004). Donohew and colleagues (1999) have already suggested that high levels of sensation-seeking are positively associated with prodrug attitudes. Thus, adolescents with a risk-taking personality profile would be the ones more likely to approve of illegal drug use. Future studies need to further investigate childhood personality and behavioral problem phenotypes and take them into account when planning prevention efforts. If our speculation holds true, the challenge for prevention researchers will be on how to modify not only childhood behavioral problems, but also, intervene to modulate personality characteristics. For instance, even though sensation-seeking is in great part a biological trait, there is a belief that it can be modified or changed and can be considered a developmental behavior (Crawford et al., 2003).

Adolescents' perceptions that friends had positive attitudes towards drug use were related to both marijuana and ecstasy use, while adolescents' perceptions that parents were more permissive in relation to drug use were associated only with marijuana use in the final model. This might have happened because levels of parental knowledge and punishment might be



related to parents' own personal experience with drugs; it is likely that parents' are more familiar with marijuana use than with ecstasy use. Our results replicate and extend previous findings in the area of adolescents' attitudes towards drug use (Musher-Eizenman et al. 2003; Urberg et al., 2003; van den Bree and Pickworth, 2005; Sargent and Dalton, 2001; Hyatt and Collins, 2000). None of these studies have explored the association of ecstasy use with adolescents' perceptions of friends' attitudes towards drug use. Those living in more permissive environments could be more prone to use ecstasy, and, consequently, experiment with a larger range of illegal drugs, and might need more thorough and effective intervention strategies targeting decrease in their drug use. Prevention programs can show adolescents that drug use is less normative than they actually believe by showing adolescents that not all adolescents experiment with drugs as well as encourage them to affiliate with non-drug using peers (Musher-Eizenman et al., 2003). There is also the possibility that when adolescents are reporting their perceptions of friends' attitudes towards drug use they are actually reporting their own attitudes towards drugs; thus, their responses to these questions might be biased (Musher-Eizenman et al., 2003).

Future studies need to investigate which are the childhood and adolescence protective factors associated with negative attitudes towards drug use/ecstasy use. For instance, having less permissive parents and having close friends that oppose to drug use might be protective towards using ecstasy. Peer-opposition to marijuana use, but not parental opposition to drug use, has already been shown to be a protective factor in relation to adolescent marijuana use (Beal et al., 2001; Chabrol et al., 2006). Other environmental factors such as family cohesiveness, neighborhood characteristics and harder access to illegal drugs may also be associated with beliefs and attitudes towards drug use.

This study has several limitations. It is a cross-sectional study which limits abilities to make causal inference; future longitudinal analyses of the NSPY data will be able to overcome this limitation. Ecstasy users in our study might refer to ecstasy as tablets/capsules that do not contain pure MDMA but might contain other substances (Baggott et al., 2000), as such; studies which verify MDMA use might yield different results. There is the possibility that experimental and regular users of marijuana and ecstasy might differ in regards to personal and environmental factors, however, the NSPY does not have data on lifetime frequency of use of marijuana and ecstasy, thus, we could not test for differences between experimental and regular users of these drugs. Perceived harm related to drug use might be low for some of the adolescents because they have already used that specific drug and did not experience negative consequences in relation to that drug use, this issue can be clarified with analysis of longitudinal data. Our subjects might be underreporting their drug use (Morrall et al., 2003). However, the use of ACASI in epidemiological surveys diminishes the underreporting of sensitive behaviors such as drug use and sexual behaviors (Schutz et al., 1994; Turner et al., 1998; Morrall et al., 2003). Another of the study's limitations is in regards to the fact that youth living in institutions, group homes, or dormitories were excluded from the data collection, thus, it is not possible to extrapolate our findings to this potentially vulnerable subpopulation.

Notwithstanding these limitations, we believe this study has several strengths, including the NSPY research methods, its large sample size and generalizability to the U.S. non-institutionalized adolescent population. The probability sample of household-dwelling adolescents includes youths who have become disengaged from school (i.e., chronic absentees) and dropouts, as well as those in very disadvantaged families, making its sample frame more complete than the corresponding sampling frames in school-based, clinic or telephone surveys. This study brings forth important findings that have significant implications, particularly for prevention. Future studies need to use longitudinal data in order to look at the directionality between attitudes and beliefs towards drug use and ecstasy experimentation and regular use.

Consequently, future studies will provide basis for better prevention and intervention strategies that aim to decrease ecstasy experimentation and regular use among youth.

In conclusion, in addition to informing youth about the risks and consequences associated with the use of other drugs commonly perceived by adolescents as less abnormal (e.g., tobacco, alcohol, and marijuana) information on ecstasy could be presented in age-appropriate language with a goal of reducing adolescents' approval of ecstasy use as well as ecstasy experimentation. Interventions must start early enough (e.g., in childhood) to allow adolescents to develop protective beliefs and attitudes because once permissive attitudes and behaviors have been established they may be hard to change. Successful school prevention programs that focus on changing attitudes towards drug use such as the AlertPlus program (Longshore et al., 2007) should consider incorporating ecstasy-related material into their curriculum. Parents should also be better informed about the harms associated with ecstasy use and prevention efforts could emphasize better parental communication skills, which would, consequently, decrease parental permissiveness towards the use of ecstasy. Educational websites such as the 'NIDA for teens' website (teens.drugabuse.gov) and the NIDA website on club drugs (www.clubdrugs.gov) are a new alternative as well as a reinforcer of school-based intervention efforts.

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Demographics and possible moderator variables of the 12–18 year-old total sample (n=5,049) and of lifetime Ecstasy and Marijuana Users, NSPY-RUF, round 2.

Table 1

	Total n=5,049	No Drug Use n=4,083	Marijuana Use n=802	no Ecstasy Use	Ecstasy Use <sup>§</sup>
	% wgt col % wgt	% wgt col % wgt	% wgt col % wgt	OR (95%CI) <sup>†</sup>	OR (95%CI) <sup>†</sup>
<b>Gender</b>					
Male	2,603	76.5	19.3	---	---
Female	2,446	51.0	52.5	1.0	1.0
<b>Age</b>					
12–13	1,837	36.3	7.2	1.0	1.0
14–16	2,341	45.3	47.5	5.2 (2.7–10.1)	4.3 (0.7–26.0)
17–18	871	18.3	45.2	12.3 (5.2–29.2)	28.1 (4.4–178.2)
<b>Race/ethnicity</b>					
White	3,404	65.3	66.3	1.0	1.0
African-American	709	16.4	15.1	0.9 (0.5–1.6)	0.2 (0.01–3.3)
Hispanic	735	4.0	15.0	1.0 (0.5–2.0)	1.1 (0.2–5.1)
Other	201	14.4	3.6	0.9 (0.3–2.8)	0.6 (0.03–14.3)
<b>Region</b>					
Northeast	775	17.2	17.0	1.0	1.0
Midwest	1,148	23.0	22.7	1.0 (0.4–2.5)	0.8 (0.1–4.2)
South	1,862	36.9	36.1	1.0 (0.4–10.3)	0.7 (0.2–2.5)
West	1,264	22.9	24.2	1.1 (0.4–11.0)	0.8 (0.2–3.2)
<b>Average grade in school</b>					
A	1,619	33.7	20.1	1.0	1.0
B	2,263	46.2	42.3	1.5 (0.9–2.8)	2.1 (0.5–9.2)
C/D	1,078	18.7	31.9	2.9 (1.5–5.6)	3.7 (0.9–16.2)
School does not give grades	22	3.4	0.7	3.3 (0.04–289.4)	13.7 (0.4–443.6)
<b>College plans</b>					
Yes	67	10.5	5.0		
No	3,739	22.4	30.0	0.8 (0.5–1.2)	0.7 (0.3–1.9)
missing	1,300	75.3	69.8	1.0	5.3 1.0
<b>Importance of religion</b>					
Low	1,359	22.9	39.3	2.2 (1.4–3.6)	5.0 (1.6–15.7)
High	3,687	77.1	60.5	1.0	1.0
missing	3	0	0.2		
<b>General exposure to Anti-Drug Media Campaign</b>					
Low	1,166	23.6	23.1	1.0	1.0
Moderate	1,140	22.7	26.5	1.2 (0.6–2.3)	0.8 (0.2–3.9)
High	2,658	52.1	48.9	1.0 (0.6–1.6)	0.9 (0.3–2.7)
missing	85	1.6	1.5		
<b>Attended Drug Education Program</b>					
Yes	3,821	24.2	23.6	1.0 (0.6–1.9)	1.0 (0.4–2.7)
No	1,197	75.2	75.9	1.0	1.0
missing	31	0.6	0.5		

<sup>§</sup> Only 14 ecstasy users were non-marijuana users.

<sup>†</sup> Base-category: Non-drug users (non-marijuana/ecstasy users).

% wgt: weighted proportions

Odds Ratio<sup>f</sup> estimates of perceived risk index, approval of drug use index, approval of punishment index, and friends' approval of Ecstasy use among 12–18 year-old lifetime Marijuana and Ecstasy users, NSPY-RUF, round 2.

	No drug use			Marijuana use (no ecstasy use)			Ecstasy use		
	Prevalence (n)	Crude OR (95% CI)	aOR (95% CI) <sup>*</sup>	Prevalence (n)	Crude OR (95% CI)	aOR (95% CI) <sup>*</sup>	Prevalence (n)	Crude OR (95% CI)	aOR (95% CI) <sup>*</sup>
<b>Perceived Risk</b>									
Risk in using both MJ and MDMA (n=2,669)	60.4 (2,528)	1.0	1.0	19.2 (148)	1.0	1.0	17.9 (23)	1.0	1.0
No risk MJ but risk if use MDMA (n=1,269)	20.9 (786)	7.7 (4.4–13.3)	2.3 (1.0–5.2)	51.3 (423)	5.4 (2.7–10.8)	2.3 (1.0–5.2)	37.9 (60)	6.1 (1.4–27.1)	3.2 (0.6–16.4)
No risk if use MDMA but risk if use MJ (n=156)	2.8 (127)	4.2 (1.2–14.9)	2.2 (0.6–8.7)	3.8 (21)	4.8 (1.5–15.2)	2.2 (0.6–8.7)	2.8 (8)	3.4 (0.3–32.4)	5.1 (0.5–55.3)
No risk if use MJ or MDMA (n=912)	15.6 (629)	5.2 (3.0–9.1)	1.8 (0.8–4.1)	25.8 (210)	4.7 (2.4–9.1)	1.8 (0.8–4.1)	48.4 (73)	9.0 (2.4–33.9)	6.7 (1.6–26.8)
<b>Approval of drug use</b>									
Disapprove MJ and MDMA use (n=3,205)	73.2 (3,056)	1.0	1.0	17.0 (145)	1.0	1.0	9.9 (14)	1.0	1.0
Disapprove MDMA use but approve MJ use (n=1,105)	17.0 (660)	13.2 (7.2–24.2)	5.9 (2.9–12.0)	52.0 (416)	9.4 (4.7–18.6)	5.9 (2.9–12.0)	19.1 (29)	8.4 (1.1–61.6)	5.0 (0.6–43.7)
Approve MJ and MDMA use <sup>†</sup> (n=728)	9.7 (358)	13.7 (7.2–25.8)	4.9 (2.2–10.9)	30.7 (249)	10.3 (5.2–20.2)	4.9 (2.2–10.9)	71.0 (121)	54.5 (7.9–378.1)	35.6 (4.7–272.0)
<b>Parental knowledge and punishment</b>									
Parents know and punish (n=3,350)	71.7 (2,993)	1.0	1.0	39.6 (309)	1.0	1.0	27.7 (48)	1.0	1.0
Parents know/ don't punish (n=286)	3.3 (118)	9.5 (4.1–22.0)	2.6 (0.8–8.1)	17.1 (119)	4.9 (1.9–12.5)	2.6 (0.8–8.1)	34.8 (49)	27.6 (5.8–131.2)	9.8 (2.0–46.8)
Parents don't know/parents know/don't punish (n=1,146)	21.0 (825)	2.7 (1.7–4.4)	1.5 (0.8–3.1)	31.4 (282)	2.4 (1.4–4.2)	1.5 (0.8–3.1)	21.0 (39)	2.6 (0.4–15.2)	2.0 (0.3–11.5)
Parents don't know/don't punish (n=244)	3.5 (125)	6.1 (2.7–13.5)	2.5 (1.0–6.1)	11.7 (91)	4.0 (1.8–9.1)	2.5 (1.0–6.1)	16.6 (28)	12.3 (2.6–58.6)	6.3 (1.1–36.1)
<b>Close friends approve of Ecstasy use</b>									
No (n=4,254)	90.4 (3,681)	1.0	1.0	65.3 (529)	1.0	1.0	27.9 (44)	1.0	1.0
Yes (n=771)	9.2 (382)	5.1 (2.6–10.0)	2.2 (1.0–4.9)	33.9 (269)	4.2 (2.0–8.8)	2.2 (1.0–4.9)	72.1 (120)	25.3 (7.4–86.5)	20.2 (5.3–77.1)

<sup>f</sup> Base-category: Non drug users (non-marijuana/ecstasy users). Results are from multinomial logistic regression model with categorical outcome (0=no drug use, 1=marijuana use with no ecstasy use, 2=ecstasy use).

<sup>††</sup>Model 1, Adjusted Odds ratio: model includes demographics (gender, age, race, and region of the country) and average grades in school, and importance of religion.

\* Model 2, Adjusted Odds ratio: model includes the other risk and attitude variables, demographics, average grades in school, and importance of religion.

<sup>¶</sup>Includes those that disapproved MJ but approved MDMA use Only 14 ecstasy users were non-marijuana users.