Published in final edited form as:
J Addict Med. 2010 June 1; 4(2): 74–80. doi:10.1097/ADM.0b013e3181aa8dd4.

Increased alcohol consumption, nonmedical prescription drug use, and illicit drug use are associated with energy drink consumption among college students

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Abstract

Objectives—This longitudinal study examined the prevalence and correlates of energy drink use among college students, and investigated its possible prospective associations with subsequent drug use, including nonmedical prescription drug use.

Methods—Participants were 1,060 undergraduates from a large, public university who completed three annual interviews, beginning in their first year of college. Use of energy drinks, other caffeinated products, tobacco, alcohol, and other illicit and prescription drugs were assessed, as well as demographic and personality characteristics.

Results—Annual weighted prevalence of energy drink use was 22.6%$_{wt}$ and 36.5%$_{wt}$ in the second and third year of college, respectively. Compared to energy drink non-users, energy drink users had heavier alcohol consumption patterns, and were more likely to have used other drugs, both concurrently and in the preceding assessment. Regression analyses revealed that Year 2 energy drink use was significantly associated with Year 3 nonmedical use of prescription stimulants and prescription analgesics, but not with other Year 3 drug use, holding constant demographics, prior drug use, and other factors.

Conclusions—A substantial and rapidly-growing proportion of college students use energy drinks. Energy drink users tend to have greater involvement in alcohol and other drug use and higher levels of sensation-seeking, relative to non-users of energy drinks. Prospectively, energy drink use has a unique relationship with nonmedical use of prescription stimulants and analgesics. More research is needed regarding the health risks associated with energy drink use in young adults, including their possible role in the development of substance use problems.

Keywords

College students; energy drinks; prescription stimulants; longitudinal study; caffeine

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Since energy drinks were first introduced in the 1990s, the industry has experienced considerable growth with an average annual growth rate of 55% from 2002 to 2006, and annual sales now totaling approximately $5.4 billion (Packaged Facts, 2007). Given that energy drinks are typically marketed to adolescents and young adultse—especially males (Reissig et al., 2009)—it is not surprising that the past-month prevalence of energy drink use among college students is high, with estimates ranging from 39% to 57% (Malinauskas et al., 2007; Miller, 2008b; Oteri et al., 2007). Unfortunately, energy drink consumption has gone largely unnoticed in the scientific literature, but from a public health perspective, it is important to understand the potential impact energy drinks may have on the health and well-being of young adults.

Only a small number of studies of college students have attempted to identify the correlates of energy drink consumption and describe the patterns of use. A consistent finding is that students who consume energy drinks have higher rates of alcohol and other drug involvement (Miller, 2008a; O'Brien et al., 2008; Oteri et al., 2007). One survey of 602 college students found that the frequency of energy drink consumption was positively associated with use of alcohol, tobacco, marijuana, and nonmedical prescription drug use, as well as alcohol-related problems (Miller, 2008a). In that study, energy drink users also had higher rates of risky sexual behavior, failure to wear a seatbelt, and other risk-taking behaviors.

The use of energy drinks as a mixer for alcoholic beverages appears to be widespread, 54% of college students who used energy drinks reported mixing energy drinks with alcohol while partying (Malinauskas et al., 2007). O'Brien et al., (2008) reported that 15% of college energy drink users mixed energy drinks with alcohol in order to drink more and not feel as drunk. Empirical studies show that although mixing caffeine with alcohol does reduce the feeling of intoxication, it may not reduce objective measures of impairment, thus increasing the potential for alcohol-related injury (Ferreira et al., 2006).

Research evidence is conflicting regarding demographic correlates of energy drink use. Most studies indicate that males are more likely to use energy drinks (Miller, 2008a, 2008b; O'Brien et al., 2008), but at least one study has observed the opposite (Malinauskas et al., 2007). Recent industry attempts to appeal to female consumers with sugar-free and diet versions of energy drinks, along with more feminine brand names such as GO GIRL™![1] and Rip It™ Chic[2] might have been successful in narrowing the earlier gender gap. O'Brien et al., (2008) reported that Whites were more likely than non-Whites to consume alcohol mixed with energy drinks and Miller (2008a) found that, for Whites, alcohol use was associated with the frequency of energy drink consumption. There is also some evidence that the correlates of energy drink use might vary for different race groups. For example, alcohol problems and use of alcohol, tobacco, and prescription drugs nonmedically were associated with energy drink use among Whites but not among African-Americans (Miller, 2008a).

Although energy drinks typically include a variety of ingredients such as sugar, amino acids (e.g., taurine), herbal extracts (e.g., ginseng), and B-complex vitamins (Aranda & Morlock, 2006; Kapner, 2008; O'Brien et al., 2008; Oteri et al., 2007; Seidl et al., 2000; Triebel et al., 2007), the stimulant effects of energy drinks appear to be primarily attributable to the caffeine content (Aranda & Morlock, 2006; Smit et al., 2004). The U. S. Food and Drug Administration (FDA) does not require manufacturers to disclose the amount of caffeine on their products' labeling, but a recent study of manufacturers' information revealed that

[1]Nor_Cal Beverage Co., Inc.; West Sacramento, CA/USA
[2]National Beverage Corp.; Ft. Lauderdale, FL/USA

caffeine content ranged from 75 to 174 mgs per can for the eight top-selling brands, and ranged from 50 to more than 500 mgs among other brands (Reissig et al., 2009). Numerous studies have shown that the effects of caffeine are dose-related, with low to moderate doses of caffeine (20 to 200 mgs) producing increased happiness, energy, alertness, and sociability. Conversely, higher does are more likely to produce undesirable effects, such as anxiety, jitteriness, and upset stomach (Griffiths et al., 2003). The widely varying amounts of caffeine in energy drinks combined with the inadequate product labeling and the marketing to youth increases the likelihood of caffeine overdose (i.e., caffeine intoxication), which can be medically problematic (Garriott et al., 1985; Kerrigan & Lindsey, 2005; Mrvos et al., 1989).

Research evidence suggests a link between high caffeine consumption and other drug problems. Heavy caffeine use, caffeine toxicity, and caffeine dependence have been shown to significantly increase the odds of developing a substance use disorder, including abuse or dependence on cannabis, cocaine, or alcohol (Kendler et al., 2006). A link has also been observed between caffeine consumption and nicotine consumption with tobacco smokers consuming more caffeine than non-smokers. Moreover, the primary advertising focus of most energy drinks has been to promote the psychoactive, performance-enhancing, and stimulant effects of these products, with the marketing of some energy drinks such as Cocaine™, [3] and Blow™, [4] appearing to glorify illicit drug use (Reissig et al., 2009).

Little research has investigated the possible link between the use of energy drinks and other stimulant drugs, such as nonmedical use of prescription stimulants, amphetamines, and cocaine. This study aimed to: 1) describe the longitudinal changes in prevalence of energy drink consumption among a college student population; 2) compare users and non-users of energy drinks with respect to demographic, personality, and substance-use characteristics; and, 3) examine the prospective relationship between energy drink consumption and subsequent drug use, including nonmedical prescription drug use. We hypothesize that energy drink use will be related to an increased risk for subsequent use of other drugs, especially stimulant-type drugs.

METHODS

Design

Data were collected in three consecutive annual interviews, as part of the College Life Study, an ongoing longitudinal study of a cohort of 1,253 college students. Recruitment occurred in two stages at one large, public university in the mid-Atlantic region of the U.S. In 2004, all incoming first-time first-year students, ages 17 to 19, were eligible to complete a brief screening survey during summer orientation. A total of 3,401 students completed the screening survey (89% *response rate*), representing 82% of the incoming freshman class. Screening survey data were then used to create a sampling frame of students eligible for longitudinal follow-up, which was stratified by race, sex, and history of drug use. To ensure an adequate number of students at risk for drug use in college, students who ever used illicit drugs or nonmedically used prescription drugs prior to college were oversampled. Annual face-to-face interviews were conducted, beginning with a two-hour baseline interview administered sometime during their freshman year (*n*=1,253, 86% *response rate*). Baseline participants were eligible for every follow-up, regardless of participation in prior follow-ups or ongoing enrollment status at the university. Participants received $5 for completing the screening survey and $50 for each interview, plus an additional $20 bonus for completing

[3]Redux Beverages, LLC; Las Vegas, NV/USA
[4]I Love Blow, Las Vegas, NV/USA

follow-up interviews within 4 weeks of the anniversary of their baseline interview date. Informed consent was obtained, and the study was approved by the university's Institutional Review Board. A federal Certificate of Confidentiality was also obtained. More detail on the sampling methods and follow-up can be found elsewhere (Arria et al., 2008a).

Participants

The analysis sample for the present study consists of the 1,060 individuals who participated in all of the first three annual interviews (85% of the original baseline sample). Importantly, the sample was demographically similar to the general population of undergraduate students at the university: about half were male (46%), 71% were white, and 74% indicated their mother had a four-year college degree or more. Most (90.3%) were still enrolled at the same university through Year 3 of the study.

Measures

Demographics—Sex was coded as observed at baseline. Data on race were obtained from the university's administrative database, as allowed by participants' informed consent. As a proxy for socioeconomic status, self-report data on mother's education was collected in the screening survey.

Sensation-seeking—As a measure of personality, the Zuckerman-Kuhlman Personality Questionnaire Short Form (ZKPQ-S) was administered as part of the baseline interview. The ZKPQ-S includes a 7-item subscale measuring impulsive sensation-seeking, which pertains to the need for excitement and novelty, as well as unpredictability and the tendency to act quickly without thinking. Because of its construct validity as a correlate of drug use, drinking, and other risky behaviors among college students (Zuckerman, 2002), this measure was included as a hypothesized correlate of energy drinks. The short version of the subscale used in this study has previously demonstrated satisfactory reliability for both male and female college students (Cronbach's α=.62 and .71, respectively), similar to the original version, and has good convergent validity with the lengthier original version (Zuckerman, 2002). The mean scale score in the analysis sample was 3.5 (*SD*=2.2) and the Cronbach's α was .74.

Energy Drink and other Caffeine Consumption—Beginning in the Year 2 interview, participants were asked two questions about their caffeine consumption. First, they were asked the open-ended question, "What types of caffeinated products do you consume?" Participants were encouraged to list as many different products as applied, and were shown a card listing a variety of popular caffeinated products, including coffee, tea, soft drinks, energy drinks, pills, and other products. Participants were later classified as energy drink users or non-users based on whether they mentioned energy drinks or not. The second caffeine item asked participants to estimate the typical, maximum, and minimum number of servings of caffeine they consume during a typical week. For this question, participants were asked to consider all the different types of caffeinated products they consume with one serving defined as the equivalent of one 8-ounce cup of regular coffee.

Alcohol and Other Drug Use—In a series of questions modeled after the 2002 National Survey of Drug Use and Health (NSDUH), participants were asked in each interview about their use during the past year of alcohol, tobacco, seven types of illicit drugs (marijuana, inhalants, hallucinogens, cocaine, amphetamines [including methamphetamine], heroin, and ecstasy) and three types of prescription drugs they might have used nonmedically (stimulants, analgesics, and tranquilizers). All data on prescription drug use were restricted to nonmedical use only, meaning any use of "medications that were not prescribed for you or that you took only for the experience or feeling they caused," excluding any over-the-

counter medications, consistent with the NSDUH interview. For alcohol, separate questions captured the number of days they drank during the past year and the typical number of drinks they consumed on days they drank. To aid in estimating how much they drank, participants were shown a card with photographs depicting standard drink sizes. For the present study, binary variables were created to indicate use or non-use of each illicit and prescription drug at least once during the past year. As an overall indicator of drug involvement, an index was computed as a count of illicit or prescription drugs used in the past year, up to a maximum possible total of 10. Similarly, an index of the number of drugs ever used in one's lifetime was computed using baseline data on lifetime use of each substance. Past-year tobacco use was coded as a series of binary variables at each assessment, as well as lifetime tobacco use at baseline.

Statistical Analyses—Because experienced drug users were oversampled, sampling weights were used in computing prevalence estimates. Sampling weights were computed within each cell of the sampling frame, according to race, sex, and pre-college drug use, by dividing the number of individuals in each cell of the sampling frame by the corresponding number of individuals in the longitudinal sample. Thus, prevalence estimates represent the entire screened population of incoming first-year students. To compare energy drink users and non-users, descriptive statistics were computed for their respective demographic and substance use characteristics as reported by Year 2. All comparisons were subjected to *t*-tests and chi-square tests to evaluate statistical significance. To measure the prospective relationships between energy drink use and subsequent drug use, we first compared energy drink users and non-users with respect to their rates of incident drug use in Year 3. For each comparison, the sample was restricted to individuals who had never used the drug by Year 2. Use of inhalants, amphetamine, and heroin was extremely rare and therefore excluded from these analyses.

Next, a series of logistic regression models were conducted with Year 2 energy drink use as the independent variable of primary interest. The binary dependent variables were Year 3 use of each of eight drugs: tobacco, marijuana, hallucinogens, cocaine, ecstasy and nonmedical use of prescription stimulants, analgesics, and tranquilizers. For these analyses, it was desirable to take advantage of all available data, so rather than restricting the sample to drug-naïve individuals, prior use of the drug of interest was held constant, along with the other control variables (sex, race, mother's education, sensation-seeking and typical caffeine consumption). Due to missing data on some of the control variables, the analysis sample for the regression analyses was reduced from 1,060 to 965.

RESULTS

Prevalence of Energy Drink Use

Of the 1,060 individuals in the sample, 264 indicated in the Year 2 interview that they consumed energy drinks. This corresponds to an estimated prevalence of 22.6%$_{wt}$ of all second-year students. Among the same sample one year later, 429 individuals were energy drink users, corresponding to 36.5%$_{wt}$ of all third-year students. Thus, the sample prevalence of energy drink use increased by 62.5% from Year 2 to Year 3.

Comparison of Users and Non-users of Energy Drinks

Table 1 presents comparisons between energy drink users and non-users. Energy drink users were disproportionately male but otherwise similar to energy drink non-users. Not surprisingly, energy drink users tended to consume more servings of caffeine per week on average, relative to non-users, especially during a week of "maximum" consumption (14.0 *vs.* 12.2; $p<.05$). Additionally, relative to non-users, energy drink users also had significantly

greater levels of alcohol and drug involvement on every measure tested. For instance, the data on concurrent substance use during Year 2 shows that energy drink users drank alcohol more frequently (83.9 *vs.* 68.5 days in the past year), consumed more alcohol on drinking days (6.0 *vs.* 4.7 drinks), used more drugs in the past year (1.7 *vs.* 1.2), and were more likely to have used tobacco (55.3% *vs.* 43.5%) relative to energy drink non-users (all at $p<.001$). Similar differences were observed with respect to their prior substance use as reported in Year 1. As expected, energy drink users scored significantly higher on the ZKPQ-S measure of impulsive sensation-seeking ($p<.05$).

Energy Drink Use and Subsequent Drug Use

Table 2 presents the results of the bivariate analyses of Year 3 incident drug use as predicted by energy drink use in Year 2. For most of the drugs under study, energy drink use did not significantly increase the risk of starting to use a drug for the first time in the subsequent year. For example, among marijuana-naïve individuals in Year 2, incident marijuana use by Year 3 was observed in 12.0% of energy drink users, as compared with 10.0% of energy drink non-users. However, energy drink users were significantly more likely to initiate nonmedical use of prescription stimulants (18.8% *vs.* 8.2%; $p<.001$) and prescription analgesics (8.5% *vs.* 4.0%; $p<.05$) in the subsequent year.

Table 3 presents the results of the prospective models predicting Year 3 drug use on the basis of Year 2 energy drink use. As can be seen in Year 3, energy drink use significantly predicted nonmedical use of prescription stimulants (*AOR*=2.05, 95% *CI*=1.41–2.97; $p<.001$) and prescription analgesics (*AOR*=1.46, 95% *CI*=1.00–2.12; $p<.05$) in the subsequent year independent of demographics, caffeine consumption, and prior use of the drug of interest. No other drug use outcomes we studied were significantly associated with prior energy drink use.

Post-Hoc Analyses

To explore the possible prospective associations between energy drink use and subsequent substance use frequency, post-hoc analyses were conducted to replicate the 8 models shown in Table 3 after substituting variables on past-year substance use frequency for the binary variables. The dependent variables (i.e., number of days the substance was used in the past year) were count data with positively skewed distributions and excess zeros; therefore the models were tested using zero-inflated negative binomial specifications. As in the original models, Year 2 energy drink use distinguished between Year 3 users and nonusers of prescription stimulants and analgesics, but not for any other substances. Additionally, we observed an absence of any significant associations between Year 2 energy drink use and Year 3 substance use frequency, holding constant Year 2 substance use frequency, with the sole exception of tobacco. Thus, although energy drink use did not predict increased risk for tobacco use, it was predictive of increased frequency of tobacco use (*AOR*=1.5, *95% CI*=1.2–2.0; $p=.003$).

DISCUSSION

An important contribution of this study is the finding that approximately one-quarter of second-year students consumed energy drinks. One year later, the corresponding figure increased to more than one-third, representing a 62.5% annual increase. Although we have no information about how frequently or heavily these students consumed energy drinks, it is apparent that a substantial number of students are familiar with these products, and that, at least in our college student sample, the market for these products is growing rapidly. Cross-sectional comparisons of users and non-users of energy drinks in Year 2 revealed that energy drink use was consistently related to significantly higher levels of drug and alcohol

involvement, both concurrently and in the past. This finding confirms prior evidence linking energy drink use to heavy drinking (Miller, 2008a; O'Brien et al., 2008) and drug use (Miller, 2008a). Moreover, the longitudinal design enables the present study to extend prior evidence by demonstrating a prospective link between energy drink use and subsequent nonmedical use of prescription stimulants and prescription analgesics, even controlling for prior nonmedical use of these prescription drugs.

Several limitations of this study must be acknowledged. First, participants were recruited from one university, and therefore results may not generalizable to college student populations with different characteristics (e.g., small private colleges). Second, the interview item we used to categorize participants as energy drink users and non-users was limited in that no particular threshold for frequency, quantity, or recency of use was specified, and therefore we cannot say how much variability exists among users in this regard. Future studies should gather more comprehensive information on consumption to investigate possible dose-dependent relationships between energy drink consumption and subsequent drug use. Finally, data on caffeine consumption were somewhat imprecise. However, due to the wide variability in caffeine content of popular brands of coffee and other beverages, it is difficult to obtain accurate estimates of caffeine exposure, and therefore we regard our rough measure of number of caffeine servings as sufficient to address the present aims.

Industry data on energy drink sales depict a period of rapid growth in recent years (Packaged Facts, 2007), yet little is known about the corresponding changes that may be occurring in consumption patterns. In 2006, hundreds of new energy drink brands were introduced in the U.S. market (Packaged Facts, 2007), and during roughly the same one-year interval, we observed a 65% increase in the proportion of students at one university who consumed energy drinks. Thus, the present study provides some evidence that college students—at least at the university we studied—may be responding to these marketing efforts. Further studies documenting changes in the prevalence, frequency, and quantity of energy drink consumption are underway with our cohort.

Our longitudinal, prospective design will be advantageous for understanding the longer-term consequences of energy drink consumption, including outcomes related to substance abuse, physical health, and psychosocial functioning. In light of the present findings and other recent evidence of a relationship between energy drink use and drug use (Miller, 2008a), one possibility is that energy drink use might exacerbate the development of a substance use disorder for individuals with an underlying susceptibility, for example, by contributing to dose escalation when drinking alcohol (Malinauskas et al., 2007; O'Brien et al., 2008; Oteri et al., 2007). Due to their high sugar and caffeine content, energy drinks pose a number of possible adverse effects for physical health including nervousness and rapid heartbeat that warrant further study. The potential for cardiovascular risks when used in combination with other stimulant drugs or by caffeine sensitive populations are of particular concern (Bichler et al., 2006; Kalus & Berlie, 2007), as is the possibility of an increase in alcohol-related injuries (O'Brien et al., 2008).

The present finding that energy drink use has a unique prospective relationship with nonmedical use of prescription stimulants and analgesics points to a need for further research on the commonalities between these two behaviors, including motives for use. It is possible that, unlike “street” drugs, both energy drinks and prescription drugs share popularity among students whose drug-use motives tend to be utilitarian (e.g., as a study aid) or status-oriented, such as among the “self-treatment” subtype of nonmedical users described by McCabe et al., (in press). To the extent that some users might derive a performance benefit from energy drinks, whether real or perceived, one plausible scenario is that some college students might use them as a study aid in an effort to compensate for lost

sleep and poor class attendance resulting from their substance use involvement (Arria et al., 2008c; Arria et al., 2009; Malinauskas et al., 2007).

Future research should seek to identify additional characteristics of energy drink users. The present finding that energy drink users tended to have a higher propensity for sensation-seeking is consistent with prior evidence supporting an association between sensation-seeking and higher caffeine consumption (Jones & Lejuez, 2005) and should be replicated and extended with other measures such as peer substance use. Based on the present finding that, independent of sensation-seeking, energy drink use was associated prospectively with nonmedical use of prescription stimulants and analgesics—but not with use of illicit drugs—is intriguing. One possible explanation is that energy drinks, like prescription drugs (Friedman, 2006), might be regarded by some students as safer, more normative, or more socially acceptable than using illicit "street" drugs, perhaps because they think of energy drinks and prescription drugs as being both legal to purchase and ostensibly safe to use (Arria et al., 2008b). The interrelationships between energy drink use and perceived risk, sensation-seeking, and other personal characteristics will be investigated in future studies with this cohort.

Although numerous questions have yet to be answered regarding the risk factors and consequences of energy drink use, certain implications warrant mention here. Parents, educators, and health professionals who observe students using energy drinks should regard this as a possible marker for heavy drinking and other drug involvement. Considering clear evidence of a strong link between energy drink use and heavy drinking and drug use, policies could be enacted that would discourage energy drink use, such as limiting advertisements in campus venues and publications, and limiting sales of energy drinks in on-campus retail outlets. At the national level, regulatory agencies should enforce industry-wide standards for responsible messaging about the purported benefits and possible risks associated with energy drink consumption.

CONCLUSIONS

The present study was primarily exploratory with an emphasis on drug and alcohol use, and our results point to a profile of energy drink users as being at high-risk for substance abuse problems. Underlying personality and temperament characteristics, family history of substance abuse, and comorbid mental health conditions are all risk factors for substance abuse that may also have relevance for energy drink use.

Acknowledgments

Sources of Support: Grants from the National Institutes of Health, National Institute on Drug Abuse: R01-DA14845, R01-DA03890.

The authors wish to extend special thanks to Laura Garnier, Elizabeth Zarate, Gillian Pinchevsky, the interviewing team, and the participants. This research was supported by the National Institute on Drug Abuse grant R01-DA14845. Dr. Griffiths' effort was supported by the National Institute on Drug Abuse grant R01-DA03890.

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TABLE 1

Comparison of demographic, personality, and substance use characteristics among users and non-users of energy drinks (*n*=1,060)

	Energy Drink Users (*n*=264)			Energy Drink Non-Users (*n*=796)			
	%	***Mean***	***SE***	**%**	***Mean***	***SE***	**Sig.**
Demographics & Personality							
Sex (% male)	65.5			39.4			***
Race (% white)	72.2			70.6			
Mother's Education							
(% with graduate degree)	37.7			35.0			
Impulsive sensation-seeking		3.7	0.1		3.4	0.1	*
Concurrent Substance Use (Year 2)							
Alcohol: Drinking days		83.9	3.9		68.5	2.3	***
Alcohol: Drinks per drinking day		6.0	0.2		4.7	0.1	***
Drugs: Past-year count		1.7	0.1		1.2	0.1	***
Caffeine: typical servings/week		7.7	0.4		6.7	0.3	*
Caffeine: max servings/week		14.0	0.8		12.2	0.4	*
Tobacco (% smoked in past year)	55.3			43.5			***
Tobacco: Days smoked (among past-year smokers)		88.3	10.8		68.7	6.1	
Marijuana (% used in past year)	70.0			58.3			***
Marijuana: Days used (among past-year users)		61.7	6.8		49.8	4.0	
Prior Substance Use (Year 1)							
Alcohol: Drinking days		56.5	3.0		44.4	1.7	***
Alcohol: Drinks per drinking day		5.6	0.2		4.5	0.1	***
Drugs: Lifetime count		1.7	0.1		1.3	0.1	***
Drugs: Past-year count		1.5	0.1		1.0	0.1	***
Tobacco (% smoked in lifetime)	71.2			58.3			***
Marijuana (% used in lifetime)	76.1			65.8			**
Marijuana: Days used (among past-year users)		45.5	5.6		30.3	2.6	*

* $p<.05$;

** $p<.01$;

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***$p<.001$

Statistical significance was evaluated for continuous variables using *t*-tests of mean differences. For categorical variables, statistical significance was evaluated using the Chi-square test of independence.

TABLE 2

Comparison of incidence rates of initiating new drug use between Year 2 and Year 3 for eight drugs, among users and non-users of energy drinks in Year 2

	Energy Drink Users	Energy Drink Non-Users	
Incident New Drug Use in Year 3	**% (*n*/*n*)**	**% (*n*/*n*)**	***Sig.***
Tobacco	13.9 (9/65)	9.4 (27/288)	
Marijuana	12.0 (6/50)	10.0 (24/239)	
Hallucinogens	5.1 (10/198)	2.9 (20/684)	
Cocaine	6.7 (15/223)	6.2 (42/680)	
Prescription Stimulants	18.8 (29/154)	8.2 (48/584)	***
Prescription Analgesics	8.5 (16/188)	4.0 (25/633)	*
Prescription Tranquilizers	4.4 (10/229)	6.0 (43/719)	
Ecstasy	3.6 (9/248)	3.2 (24/747)	

* $p<.05$;

** $p<.01$;

*** $p<.001$

Incident drug use is the number of new users at Year 3 divided by the number of Year 2 non-users for each drug. Sample sizes vary, as prior users of each drug were excluded for each comparison. Data on prescription drugs pertain to nonmedical use only. Statistical significance was evaluated using the Chi-square test of independence.

TABLE 3

Results of eight multiple logistic regression analyses predicting Year 3 drug use on the basis of Year 2 energy drink use (n=965)

Model #		*AOR*	*95% CI*		*Sig.*
1	Tobacco	0.97	0.67	1.41	
2	Marijuana	1.01	0.69	1.47	
3	Hallucinogens	1.00	0.68	1.47	
4	Cocaine	1.16	0.77	1.75	
5	Prescription Stimulants	2.05	1.41	2.97	***
6	Prescription Analgesics	1.46	1.00	2.12	*
7	Prescription Tranquilizers	0.78	0.52	1.18	
8	Ecstasy	−0.07	−0.52	0.37	

* p<.05;

** p<.01;

*** p<.001

For each model, the dependent variable is past-year use (*v.* non-use) of the drug as of the Year 3 interview. Adjusted odds ratios (*AOR*) depict the effect of energy drink use (*v.* non-use) at the Year 2 interview. In each model, the effects of race, sex, mother's education, sensation-seeking, caffeine consumption, and prior use of the drug of interest were held constant. An additional 95 individuals were excluded due to missing data on one or more control variables. Data on prescription drugs are restricted to nonmedical use only.