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Heavy Drinking and Polydrug Use among College Students

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Abstract

Excessive alcohol consumption is a serious problem on college campuses but may not be adequately captured by traditional methods of defining binge drinking. This study examined a new approach to categorizing alcohol use and its relationship with illicit drug use. A survey was administered to 484 college students ages 18 to 25. Drinkers were divided into three groups based on the number of typical drinks consumed per day: “light”—1 to 4 ($n=182$); “moderate”—5 to 9 ($n=173$); and “heavy”—10 + ($n=56$). Heavy drinkers could be differentiated from moderate and light drinkers on age of onset of alcohol use, illicit drug use, and frequency of illicit drug use. A binary categorization of “binge” vs. “nonbinge” drinking may obscure important differences within binge drinkers. These findings have implications for prevention, as well as clinical risk assessment of college student drinkers for adverse consequences of concomitant alcohol and illicit drug consumption.

Heavy alcohol use by American college students remains as much of a current public health concern today as it was when it initially received national attention a decade ago (National Center on Addiction and Substance Abuse at Columbia University (CASA), 2007; Hingson, Heeren, Winter, & Wechsler, 2005; Keeling, 2000; Wechsler, 1995; Wechsler, Davenport, Dowdall, Moeyken, & Castillo, 1994). National surveys such as the Harvard School of Public Health College Alcohol Study and Monitoring the Future indicate little, if any, changes in college student heavy drinking patterns during the past decade (Johnston, O'Malley, Bachman, & Schulenberg, 2004; Keeling, 2000; O'Malley & Johnston, 2002; Wechsler, Dowdall, Maenner, Gledhill-Hoyt, & Lee, 1998; Wechsler, Lee, Kuo, Seibring, Nelson, & Lee, 2002). The increased risks that heavy drinking students pose both to themselves and to others, including academic problems, injuries, automobile accidents and fatalities, violence, high-risk sexual behavior (Hingson et al., 2005; Prendergast, 1994; Presley, 1993; Wechsler et al., 1994; Wechsler, Dowdall, Davenport, & Castillo, 1995), and sexual victimization (Abbey, 2002; Mohler-Kuo, Dowdall, Koss, & Wechsler, 2004; Testa, 2002), are well documented.

Measurement of Alcohol Use in College Students

The consumption of five or more drinks in a row for males or four or more for females at least once in a two-week period has been defined as “binge drinking” (Wechsler et al., 1994). This definition of binge drinking has been adopted as a primary method of measurement by the preponderant number of researchers who investigate college student alcohol use. However, both the definition of binge drinking and its use in measuring alcohol abuse in college students have raised controversy (e.g., Inter-Association Task Force on Alcohol and Other Substance Abuse Issues (IATF), 2000; DeJong, 2001; Schuckit, 1998; Wechsler & Austin, 1998). For example, the IATF issued a proclamation on August 11, 2000, decrying this use of the term binge drinking in college students, pointing out that this definition of binge drinking “does not give an accurate indication of intoxication levels, or risk factors such as the time during which

the drinking occurs and the size of the person doing the drinking, or other physical and mental circumstances known to impact intoxication" (IATF, 2000). Moreover, the use of the phrase "in a row" introduces a level of ambiguity into the measurement of "binge drinking," which would, for example, allow a male student who drank four drinks in the morning, had breakfast, had four more drinks in the afternoon, ate dinner, and then had another four drinks in the evening not to be considered a binge drinker. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) attempted to clarify the definition by adding a time constraint of "within a two-hour period" and a longer duration of one year (NIAAA, 2004). This new measure was correlated with the standard definition and was independently associated with negative drinking outcomes (McCabe, Knight, Teter, & Wechsler, 2005). With the new definition, 63.6% of college students met criteria for binge drinking as compared to 53.1% with the standard definition. Many college students drink well beyond the binge drinking threshold—notably, White, Kraus & Swartzwelder (2006) found that 20% of males and 10% of females consumed twice the amount as would be measured by the "binge" drinker definition, and called for more attention to these "extreme drinking practices." Other alternative measures for describing alcohol consumption among college students include alcohol abuse and dependence (Dawson, Grant, Stinson, & Chou, 2005), and peak drinking levels (Gruenewald, Johnson, Light, & Saltz, 2003).

Illicit Drug Use in College Students

Whereas alcohol consumption has remained the same during the past several years, national surveys of college students suggest that illicit drug use has risen during a similar time period. The College Alcohol Study (CAS), which included thousands of randomly selected undergraduates in 1993, 1997 and 1999, across 119 U.S. colleges, showed that recent marijuana and other illicit drug use increased across most student demographic subgroups and at all types of colleges during this period. In 1993, 12.9% of students reported marijuana use in the past 30 days, while 15.7% of their counterparts reported use of same in 1997—an increase of 22% (Gledhill-Hoyt, Lee, Strote, & Wechsler, 2000). From 1993 to 2001, students' past-year marijuana use increased from 23% to 30%, and past-year use of other illicit drugs increased from 11% to 14% (Mohler-Kuo, Lee, & Wechsler, 2003). CASA (2007) found that between 1993 and 2005 the percent of college students using any illicit drug in the past year increased from 30.6% to 36.6%, with cocaine and ecstasy use increasing the most.

The Relationship between Alcohol Use and Illicit Drug Use in College Students

Binge drinking appears to be associated with the use of a variety of other illicit drugs (CASA, 2007; Kuntsche, Rehm, & Gmel, 2004; Strote, Lee, & Wechsler, 2002). From the CAS, a strong relationship is observed between the frequency of binge drinking and past-year use of marijuana, cigarettes, amphetamines, LSD, other hallucinogens, and chewing tobacco, with frequent binge drinkers being the most likely to have reported use of these other drugs in the past year, and nondrinkers the least likely (Wechsler, Dowdall, Davenport, & DeJong, 1995). Compared to nonbinge drinkers, frequent binge drinkers were almost three times more likely to smoke cigarettes; four times more likely to use marijuana; five times more likely to use amphetamines, LSD, and chewing tobacco; and six times more likely to use hallucinogens—all in the past year. More than half of frequent binge drinkers used marijuana and cigarettes in the past year, compared to 13% and 22% of nonbinge drinkers. According to the 1999 CAS, more than 90% of students who used marijuana in the past 30 days used other illicit drugs, smoked cigarettes, and/or binge drank. Eighty-seven percent of students who used any other illicit drug in the past 30 days used another substance or binge drank (Gledhill-Hoyt et al., 2000; Wechsler, Lee, Kuo, & Lee, 2000).

A secondary analysis of the 1993 CAS data found that, compared to exclusive binge drinkers (i.e., binge drinkers who used no illicit drugs), binge drinkers who used other drugs were almost twice as likely to smoke daily, engage in unprotected sex, and become hurt/injured because of their drinking during the past year; and almost three times as likely to get drunk at least six times in the past 30 days and have trouble in the past year with police because of substance use (Feilgelman, Gorman, & Lee, 1998).

A secondary data analysis from the 1995 National College Risk Behavior Survey and the Core Alcohol and Drug Survey shows similar findings. Again, current binge drinkers were more likely than nonbinge drinkers to use cigarettes, marijuana, cocaine, and other illicit drugs. The frequency of binge drinking was positively associated with lifetime use of cigarettes, marijuana, cocaine, and other illicit drugs (Bennett, Miller, & Woodall, 1999; Jones, Oeltmann, Wilson, Brener, & Hill, 2001).

Nonmedical use of prescription drugs among college students is a major concern (Gledhill-Hoyt et al., 2000; McCabe, Knight et al., 2005; McCabe, Teter, Boyd, Knight, & Wechsler, 2005; Mohler-Kuo et al., 2003; Wechsler et al., 2002), and is also associated with frequency of binge drinking. Specifically, nonmedical users of prescription stimulants were seven times more likely to frequently binge drink, compared to nonusers. Similarly, nonmedical users of prescription anxiolytics as well as nonmedical users of prescription opioids were four times more likely to binge drink than nonusers (McCabe, 2005).

Purpose of the Present Study

Based on the above review, it is clear that binge drinking is associated with polydrug use in college students. However, alcohol use among college students has almost always been operationalized as “binge drinking.” Therefore, little is known about the differences in the use of other substances that may exist among those individuals categorized as binge drinkers. Moreover, given the high prevalence of “binge drinking” on college campuses, it is likely that a more nuanced measure of alcohol use might be highly informative in this population. In the present study, alcohol use was measured by the typical number of drinks per drinking day during the past year. Our intention was to develop an alternative approach to describing college alcohol use patterns that might provide more fine-grained information on risk for other substance use. To our knowledge, no investigations of drug use in college students have measured alcohol use in this fashion.

Thus, the present study has two main goals: (1) to evaluate the utility of an alternative method of categorizing alcohol use among college students; and, (2) to assess the degree of association between the alternate method of categorizing alcohol use and lifetime and past-year use of other substances, including the non-medical use of prescription drugs.

Methods

Participants

A convenience sample of 520 undergraduate students were recruited from three large (enrollment of more than 100 students) introductory-level classes at a large mid-Atlantic university whose instructors granted permission to administer a brief self-report questionnaire in class during the fall semester of 2004. A total of 462 students provided complete data on demographics and alcohol consumption (a 92.4% response rate). The analysis sample for this study consisted of 411 students who had consumed alcohol at least once in their lives. The college from which the courses were chosen is the largest on campus and all courses chosen satisfy core requirements for an undergraduate degree at the university. Of these 411 students, 171 (41.6%) were first-year students, 161 (39.17%) were sophomores, 60 (14.6%) were juniors,

and 19 (4.62%) were seniors; 215 (52.31%) came from a Criminal Justice and Criminology course; 111 (27.01%) from a Government and Politics course, and 85 (20.68%) from a Sociology course. Thus, all respondents were undergraduates who were enrolled in a general survey class in a social science.

Procedure

A research assistant entered the classroom at the beginning of class and was introduced by the instructor. The research assistant explained that s/he was going to distribute a brief questionnaire regarding health-related behaviors, explained the consent procedure, and then answered any questions.

Because one purpose of the study was to subsequently interview a subsample of students who were experienced drug users, participants were asked to provide their name and contact information on a sheet of paper that was detached from their questionnaire when they returned it to the research assistant. Their name and contact information could be subsequently linked to their questionnaire by a matching procedure. No name or other identifying information was requested on the questionnaire itself. Students were told that if they were selected for participation in the interview portion of the study, they would receive \$20. Students were informed they would be given \$5 in cash for completing the questionnaire, regardless of whether they provided contact information. The study was approved by the University IRB.

Alcohol and Other Drug Use

The questionnaire was intended to survey participants concerning various high school and college activities, most notably, their use of alcohol and other drugs. One set of questions asked the respondent to indicate the age at which they first: "Had a full drink of an alcoholic beverage (include wine, beer, liquor, wine coolers);" "Used tobacco (includes cigarettes, cigars, pipe, and smokeless tobacco);" "Used marijuana (or hashish);" "Used any form of prescription pain relievers (e.g., Oxycontin®, Vicodin®) that were not prescribed for you or that you took only for the experience or feeling they caused;" "Used any form of prescription stimulants (e.g., Adderall®, Ritalin®) ...;" "Used hallucinogens (LSD, acid, mushrooms/shrooms, or PCP);" "Used ecstasy (MDMA, 'E', 'X');" "Used cocaine (powder or crack);" "Used amphetamines or methamphetamine;" "Used heroin;" and/or "Used cadrina." If a respondent had never engaged in the behavior, they could select "Never did this." A second set of questions asked the respondent "During the past 12 months, how many occasions did you use ..." each of the first 9 above-mentioned drugs. Response options included: "Never used;" and "Used, but not in the past 12 months," both of which were scored as 0 for frequency of use in the past year; or, if they had used in the past year, responses were recorded on an 8-point scale, where 1 = "1," 2 = "2 to 5," 3 = "6 to 10," 4 = "11 to 20," 5 = "21 to 40," 6 = "41 to 52," 7 = "53 to 104," and 8 = "105+." Finally, respondents were also asked to indicate: "On days in the past year when you drank alcohol, how many drinks, on average, did you have in a day?" (Underlining in the original questionnaire.)

A fictional drug "cadrina," was included to allow possible elimination of respondents who might somehow feel the need to indicate use of all possible substances. Because no student responded affirmatively to the use of "cadrina," no questionnaires were eliminated from analyses for this reason.

Measurement of Alcohol Use Pattern

Based on their responses to the two questions regarding alcohol use: lifetime use or non-use (based on the past-year use question) and average daily alcohol intake on days when alcohol was drunk in the past year, the primary predictor variable was defined as an Alcohol Use Pattern in which the student consumed: 1 to 4 drinks per day—"light drinkers" ($n = 182$); 5 to 9 drinks

per day—"moderate drinkers" ($n = 173$); or 10 or more drinks per day—"heavy drinkers" ($n = 56$) on those days alcohol was consumed in the past year. The cutpoints (1-4; 5-9; 10+) were based on two decision rules. The initial cutpoint of 5 and above was chosen in order to create an initial category that most closely matched the traditional method of measuring "binge drinking" (keeping in mind that our assessment of drinking was "in a day" rather than "in a row," as occurs with the traditional method of measuring "binge drinking"). Then, the group that was defined by 5 or more drinks in a day was further subdivided into 5-9 and 10 or above by an examination of the frequency distribution of number of drinks in a day.

Control Variables

In addition, Age ($M = 19.1$, $s = 1.30$), Gender (Female $n = 208$, Male $n = 203$), and Ethnicity—respondents were allowed to check all race/ethnicity groups that applied—[White ($n = 289$) and non-White ($n = 122$), where Black/African-American $n = 39$, Asian/Pacific Islander $n = 39$, Hispanic $n = 23$, and Multiracial/Other $n = 21$] were included as additional predictors to control for these three potential confounding factors.

Criterion Measures

This study consisted of three sets of criterion measures. The first set was the age at first use for alcohol and the eight drugs of interest: tobacco, marijuana, nonmedical use of prescription analgesics and/or stimulants, hallucinogens, ecstasy, cocaine, and amphetamines. The second set included the binary variables indicating lifetime use or non-use of the eight drugs. The third set was the frequency of use during the past year for alcohol and the eight drugs.

Heroin was included in the original list of drugs on the questionnaire. However, only two students reported that they had ever used heroin, so analyses were not conducted for heroin use.

Statistical Analyses

Logistic regression was used to analyze the binary criterion variables. Ordinary least squares regression was employed to analyze the age at first use criterion variables. Because the frequencies of use during the past year were discrete variables and assumed to follow a Poisson distribution, Poisson regression analyses were conducted for this set of variables. (To control for under- or over-dispersion in the Poisson models, given the relatively large number of zeros that occurred for some frequency of use variables, a scale factor was included in this model and the standard errors and likelihood ratio tests of significance were adjusted accordingly.)

Interpretation of the logistic regression results focused on the exponentiated regression coefficients [$\exp(b)$], or odds ratios. Interpretation of the ordinary least squares and Poisson regression results focused on the model-derived least squares means (M s); in the case of Poisson regression, these means were exponentiated [symbolized as $\exp(M)$] to return them to their original scale of measurement.

To minimize the cumulative error rate associated with multiple tests of significance, a familywise α of .0167 (i.e., $.05/3$) was used, because there were three sets of outcome variables.

Following detection of a significant effect for the Alcohol Use Pattern effect, tests of the three simple pairwise comparisons were conducted. To control for the cumulative error rate associated with multiple comparisons, a Bonferroni adjustment was used. Because $\alpha = .0167$ for the test of the Alcohol Use Pattern effect, the test of each pairwise comparison was conducted at $\alpha = .0055$ (i.e., $.0167/3$). Thus, 99.44% confidence intervals are used when confidence intervals are reported.

The semipartial r^2 (sr^2) was used as a measure of explained variance for the Alcohol Use Pattern effect in the ordinary least squares regression analyses. Measures of effect size for the logistic and Poisson regression analyses used McFadden's R^2 (1973). [A variety of measures of fit have been proposed for limited dependent variable models such as the cases in which the criterion variable follows a Poisson or binomial distribution (Long, 1997; Veall & Zimmermann, 1996). Because such statistical models do not attempt to maximize explained variance and because many of these generalized coefficients of determination, oftentimes termed pseudo- R^2 s are not (0,1)-bounded, comparisons with R^2 in ordinary least squares regression are not appropriate. However, McFadden's measure has the advantage of providing a measure of fit for any model in which the parameters are estimated by maximum likelihood methods.]

Results

Alcohol Use

In the initial sample of 462 students who provided complete data, only 11.0% ($n = 51$) indicated lifetime abstinence from alcohol, while 49.6% [$n = 229$ (173 + 56, as the sum of the number of moderate and heavy drinkers, respectively)] drank five or more drinks on days that they did drink. Although it is not possible to draw a direct comparison between this figure and the traditional measure of binge drinking since that definition would have required students to specify whether or not the "five or more drinks" had been consumed "in a row," it is notable that our estimate of 49.6% is similar to the prevalence of "binge drinking" reported by others. More importantly, among this "top half" of students, 24.5% (56/229) of these drinkers (representing 12.1% of all drinkers) drank 10 or more drinks/drinking day, or are what we define in this paper as "heavy" drinkers.

The use of illicit drugs was exceedingly low in students who had never consumed alcohol. Four of the 51 students had used tobacco in some form and 1 of these 4 had also used marijuana. Another 2 of the 51 students had used prescription analgesics nonmedically. It is for this reason that students who had never consumed alcohol were omitted from the analyses conducted for the present paper, not only because including a group whose use of drugs other than alcohol was almost nonexistent would present serious problems for both estimation and significance testing in the statistical analyses, but also because the focus was in learning more about the relationship between alcohol use and use of illicit drugs.

Sample Characteristics

Table 1 presents basic demographic information for the total sample and the three Alcohol Use Pattern groups. The three Alcohol Use Pattern groups and the total sample are all approximately 19-years-old, and the age range is relatively restricted, given the fact that the final sample was limited to those who are 18 to 25 years of age. Moreover, the sample is predominantly White; however, there is a substantial proportion of minorities in the total sample, as well as in each group. Finally, the total sample has an approximately equal ratio of males and females; however, males are heavily over-represented in the heavy drinking group.

Lifetime Use of Other Drugs

Lifetime use of the eight drugs other than alcohol can be found in Table 2. It can be seen that lifetime use of tobacco and marijuana in this sample of college drinkers was relatively high, while lifetime use as a percentage of the total sample dropped off markedly for the remaining drugs. However, what is notable about the results are the differences between the Alcohol Use Pattern groups in their lifetime use of all these drugs.

Results of the logistic regression analyses, the odds ratios, and their confidence intervals for the lifetime use variables can be found in Table 3. As is evident, the three Alcohol Use Pattern groups differed in their use for all eight drugs, in some cases markedly. Heavy drinkers were substantially more likely than light drinkers to have used all eight drugs in their lifetimes, with the odds ratios ranging between a minimum of 5.21 for tobacco to a maximum of 10.45 for nonmedical use of prescription analgesics—with six of the eight odds ratios exceeding 8.0. Moderate drinkers were more likely than light drinkers to have used five of the eight drugs, the three exceptions being ecstasy, amphetamines, and cocaine. However, in contrast to the comparisons of the heavy drinkers with the light drinkers, the magnitudes of the odds ratios were uniformly smaller, with values ranging between a minimum of 3.26 for nonmedical use of prescription stimulants to a maximum of 6.82 for use of marijuana. In contrast, heavy drinkers differed from moderate drinkers for only four drugs—ecstasy, amphetamines, nonmedical use of prescription analgesics and stimulants. Based on the magnitudes of the odds ratios, it seems clear that the differences between moderate and heavy users on the latter two drugs were relatively small, with odds ratios of 2.91 and 2.71, respectively, while the odds ratio for amphetamines was somewhat larger at 5.70.

For the control variables, Age was significant for lifetime use of ecstasy [$\chi^2(1) = 8.7, p < .004, b = .35, \exp(b) = 1.42, 99.44\%CI = (1.02, 1.99)$], indicating that subjects were 1.4 times more likely to have used ecstasy for each year increase in age.

Frequency of Use in the Past Year

Results of the Poisson regression analyses and exponentiated least squares means for the frequency of use of alcohol and eight other drugs in the past year are found in Table 4.

Frequency of Alcohol Use in the Past Year

Not surprisingly, heavy and moderate drinkers drank on more days than did light drinkers. Extrapolating from the scale used to measure the number of days of alcohol use, light drinkers drank about 15 days per year. In contrast, moderate drinkers drank less than once a week on average, while heavy drinkers clearly drank more than once a week on average. However, this latter difference between moderate and heavy drinkers was not significant. In part, this failure to find a significant difference may be due to the scale of measurement that was used, which was relatively insensitive to smaller differences at the upper end of the scale. It is also possible that what distinguishes moderate from heavy drinkers is not the frequency with which they drink but the quantity they drink per drinking occasion. Further research would need to support this assertion, but it seems clear that heavy drinkers drink more on each day than do moderate drinkers; and, moreover, they may do so more frequently.

Frequency of Other Drug Use in the Past Year

The Alcohol Use Pattern effect was significant for the remaining drugs besides alcohol. Moreover, the pattern of mean differences is noteworthy: the heavy drinkers' past-year use of seven of the eight drugs is more frequent than is both the moderate and light drinkers' past-year use. The only exception to this generalization is for nonmedical use of prescription analgesics, where the mean differences follow the same pattern as the other seven drugs, but the difference between the heavy and moderate drinkers is not significant. Moreover, for five of the eight drugs, moderate drinkers' recent use was more frequent than was light drinkers—the only exceptions being for ecstasy, amphetamines, and cocaine.

There were a few isolated significant effects for the control variables. For frequency of use of alcohol in the past year, there were significant effects for Age and Ethnicity. Examination of the parameter estimates for frequency of use of alcohol in the past year indicated that there was a small increase in frequency of use in the past year for each yearly increase in age [$b = .05,$

$exp(b) = 1.05$, $\chi^2(1) = 11.1$, $p < .001$], while Whites used alcohol less frequently in the past year than did non-Whites [$exp(M)s = 4.50$ v. 5.40 , $\chi^2(1) = 15.4$, $p < .001$]. Frequency of use of cocaine in the past year increased approximately 1.25 units for each increase in an age of one year [$b = .24$, $exp(b) = 1.27$, $\chi^2(1) = 10.9$, $p < .001$]. Finally, males and females significantly differed on their frequency of use of both hallucinogens and amphetamines in the past year, with males using hallucinogens more frequently than females [$exp(M)s = .28$ v. $.09$, $\chi^2(1) = 18.1$, $p < .001$] while the opposite pattern was true for amphetamines [$exp(M)s = .10$ v. $.35$, $\chi^2(1) = 23.6$, $p < .001$].

Age at First Use

The Alcohol Use Pattern effect was significant for the age of first use of alcohol [$MS_{error} = 3.4$, $F(2, 382) = 27.1$, $p < .0001$, $sr^2 = .12$] and marijuana [$MS_{error} = 4.6$, $F(2, 242) = 6.4$, $p = .0019$, $sr^2 = .05$], but not any other illicit drugs. Bonferroni-adjusted tests of the simple mean comparisons revealed that, for alcohol, the heavy drinkers ($M = 14.2$) began drinking almost a year earlier than the moderate drinkers ($M = 15.1$), and more than two years earlier than the light drinkers ($M = 16.3$), while the moderate drinkers began drinking more than a year earlier than the light drinkers (all $ps < .006$). In contrast, for marijuana use, the heavy drinkers ($M = 15.3$) began marijuana use one year prior to both the moderate ($M = 16.3$) and light drinkers ($M = 16.3$, both $ps < .006$), while age at first use of marijuana did not differ between moderate and light drinkers.

Age at first use for the remaining drugs varied between a minimum of 16.3 for marijuana to a maximum of 17.7 for cocaine, with amphetamines being the only drug besides marijuana with an average age of first use earlier than age 17.

Finally, the only significant effect for the control variables occurred for Ethnicity for age at first use of cocaine, with non-Whites having an age at first use more than 1.5 error standard deviations below that of Whites [$Ms = 15.3$ v. 17.9 , respectively; $MS_{error} = 2.1$, $F(1, 24) = 12.3$, $p < .002$, $sr^2 = .13$] (data not shown in table).

Discussion

The present study contributes to the literature on college drinking in two important ways. First, alcohol use was measured by the typical number of drinks per day on days when drinking occurred during the past year rather than the “standard” approach of defining binge drinking as five or more drinks in a row for males and four or more drinks in a row for females in the past two weeks. Our approach to the measurement of alcohol use provides an alternate method of categorizing alcohol consumption as opposed to the traditional binge drinking definition. Second, in addition to alcohol, tobacco, marijuana, and a variety of other illicit drugs, the nonmedical use of prescription analgesics and stimulants was assessed and their lifetime and past-year use was related to level of alcohol use in college students.

Measurement of Alcohol Use

It is important to note that measuring alcohol using the method employed in the present study yields a measure that appears to have considerable promise, without the potential drawbacks found in measuring “binge drinking” by using a cutoff of between four and five drinks in a row. The present measure showed the ability to reflect a considerable range in alcohol use and the results regarding age of first use of alcohol and the relationship between pattern of alcohol use and polydrug use suggests the measure has reasonable predictive validity. Moreover, the heavy and moderate drinkers—all of whom would be considered binge drinkers by the “standard” approach to measuring alcohol use in college students—were quite different in terms of when they began to drink alcohol, and their lifetime and past year use of other drugs,

strongly suggesting that categorizing college students as simply binge drinker or nonbinge drinkers is simply too coarse an approach in understanding differences in alcohol and drug use in college students.

Age at First Use

The negative relationship between age of onset of alcohol use and amount of daily alcohol use is generally consistent with the literature. Several studies have noted that college students who drink heavily are more likely to have drunk heavily during high school and to have started using alcohol at an earlier age (Digrande, Perrier, Lauro, & Contu, 2000; Feilgelman et al., 1998; Wechsler et al., 1995; Wechsler et al., 2002). The results for the analyses of age at first use for the remaining drugs appear at first glance somewhat surprising, given the failure to find differences for all drugs except marijuana. However, with the exception of tobacco and marijuana, the number of users of each of the remaining drugs was sufficiently small that the failure to detect mean differences may be a result of low power.

Lifetime Use of Other Drugs

The positive relationship between alcohol use patterns and lifetime use of other drugs is generally consistent with previous investigations in college samples (e.g., Jones et al., 2001; Wechsler et al., 1995). In general, the results of the present study indicate that the higher the amount of daily alcohol use, the higher the likelihood that one has tried a greater number of substances. Compared to light drinkers, moderate drinkers were more likely to have used five of the eight drugs—the exceptions being amphetamines, ecstasy, and cocaine—while heavy drinkers were more likely to have used all eight than were light drinkers. In contrast, heavy drinkers, compared to moderate drinkers, were more likely to have tried only four out of the eight drugs, including ecstasy, amphetamines, and prescription analgesics and stimulants nonmedically. Taken together, the results regarding lifetime use suggest that heavy drinkers appear to experiment with a wider number of illicit drugs than do moderate drinkers; and moderate drinkers appear to experiment more than light drinkers.

Frequency of Drug Use in the Past Year

The overall pattern of results, which indicates a positive relationship between heavy drinking and frequency of drug use, is not unexpected. However, a close examination of the results reveals that heavy drinkers used all drugs except alcohol and analgesics more frequently than moderate drinkers; likewise, moderate drinkers used six of the nine drugs (including alcohol) more frequently than light drinkers, the exceptions being ecstasy, amphetamines, and cocaine. This finding of marked differences in frequency of use between the three alcohol use pattern groups is notable, given that the frequency of use of most drugs other than alcohol, tobacco, and marijuana is relatively low. Light drinkers appear to largely avoid use of substances other than tobacco and marijuana, while moderate and heavy drinkers are more prone to “dabble” in illicit substances while in college—the latter to a greater extent. Moreover, and importantly, nonmedical use of prescription analgesics and stimulants was ranked fourth and fifth in terms of frequency of use in the past year by moderate drinkers, while their past-year use trailed only alcohol, tobacco, marijuana, and amphetamines in heavy drinkers. Or, put another way, nonmedical use of prescription analgesics and stimulants was more frequent than hallucinogen, ecstasy, cocaine, and amphetamine use for moderate drinkers; and more frequent than hallucinogen, ecstasy, and cocaine use for heavy drinkers. Whether this phenomenon reflects increasing popularity of analgesics and stimulants on college campuses, ease of access, or some combination of both, is an important question to address in future research.

In summary, heavy drinkers use a greater number of illicit drugs during their past-year use than do moderate drinkers and moderate drinkers appear to use a greater number of illicit drugs than do light drinkers. Moreover, both moderate and heavy drinkers appear to be more likely to

engage in nonmedical use of prescription analgesics and stimulants than they are to use the more “traditional” illicit substances. These results strongly suggest the need to consider polydrug use in heavy drinkers in designing prevention programs and effective interventions on college campuses.

Limitations

There are several limitations to the present study that should be kept in mind. First, the sample was one of convenience, so the degree to which the results of this study would generalize to other college student populations is unknown. Although the classes selected for this convenience sample were large introductory classes in a social science, a more representative systematic sample might have yielded different results. However, while prevalence estimates might differ between this university and others, there is little reason to suggest that the present results regarding the association between heavy drinking and polydrug use would be unrepresentative of what might be found on other college campuses. Second, the scale used to measure the frequency of use may have been too coarse to allow detection of differences at the upper end of the scale. Our intention in devising such a scale is that we wanted to avoid students simply estimating how often they drank in the past year, because we thought it would be difficult for individuals who drank often to do so with sufficient accuracy of recall. However, choosing as one anchor point “41-52” occasions in the past year versus the next anchor point, “53-104” times a year meant that we had not made sufficient distinction around the point at which moderate and heavy drinkers might differ. Finally, the cumulative error rate associated with multiple tests of significance was only partially controlled by the use of a familywise approach; a relatively large number of tests of significance were conducted, and so some (assumedly small) number of tests led to an erroneous rejection of the null hypothesis. It is also possible, of course, that restricting α to such a small value (i.e., .0167) led to a failure to detect significant differences in the population due to insufficient power, given the sample size. Future research can straightforwardly address this issue. The College Life Study, for which the present results served as pilot data, is now examining these relationships with a new large cohort of incoming college freshman. The study will investigate how alcohol consumption and polydrug use might increase risk for adverse consequences such as academic performance problems and dropout, high risk sexual behavior and mental health problems. The longitudinal nature of the study will allow us to better understand the moderating influences of a wide array of risk and protective factors during this critical developmental transition among young adults.

Clinical and Policy Implications

The present findings, together with the existing literature, have important implications in the clinical assessment and treatment of college students in primary care, substance abuse, and mental health treatment settings both on- and off-campus. Because the findings strongly suggest that the quantity and frequency of past-year alcohol use is positively related to polydrug use (particularly the number and frequency of use of other drugs), treatment providers should screen for such use in patients who are thought to be abusing alcohol. Moreover, such screening should include not only commonly used illicit drugs, but also the nonmedical use of prescription drugs, such as stimulants and analgesics. Given the potential physical health consequences of concomitant alcohol and other drug consumption, proper assessment, diagnosis, and treatment of such polydrug abuse is essential.

The policy implications are also evident. Because the findings strongly suggest that heavy alcohol use (on days alcohol is consumed) is associated with an earlier age of first-time alcohol use, sustained primary prevention efforts at the middle and high school level may be crucial. Also, implementation of secondary prevention efforts targeting college students identified as moderate and heavy drinkers may be critical in reducing alcohol and polydrug use. Finally, college administrators should focus on the deleterious effects of combining alcohol with other

drugs like prescription analgesics, as well as enforcement of disciplinary measures intended to limit excessive drinking on college campuses.

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Table 1

Sample Characteristics for the Total Sample and the Three Alcohol Use Pattern Groups

	Total Sample (<i>n</i> = 411)	Light (<i>n</i> = 182)	Alcohol Use Pattern Group Moderate (<i>n</i> = 173)	Heavy (<i>n</i> = 56)
Age	19.09 (1.03)	19.04 (1.5)	19.01 (1.1)	19.16 (1.2)
Gender				
Male	203 (49%)	73 (40%)	87 (50%)	43 (77%)
Female	208 (51%)	109 (60%)	86 (50%)	13 (23%)
Ethnicity				
White	289 (70%)	102 (56%)	138 (80%)	49 (88%)
Black	39 (10%)	32 (18%)	6 (4%)	1 (2%)
Asian/Pacific Islander	39 (10%)	23 (13%)	12 (7%)	4 (7%)
Hispanic	23 (6%)	14 (8%)	7 (4%)	2 (4%)
Multi-Racial/Other	21 (5%)	11 (6%)	10 (6%)	-

Note. Means and (standard deviations) are reported for Age, while frequencies and (percentages) are reported for Gender and Ethnicity. Percentages do not always sum to 100% due to rounding.

Table 2

Frequencies (Percentages) for Lifetime Use of Eight Drugs in the Total Sample and the Three Alcohol Use Pattern Groups

Drug	Total Sample (<i>n</i> = 411)	Light (<i>n</i> = 182)	Alcohol Use Pattern Group	
			Moderate (<i>n</i> = 173)	Heavy (<i>n</i> = 56)
Tobacco	268 (65%)	87 (48%)	134 (78%)	47 (84%)
Marijuana	251 (61%)	65 (36%)	138 (80%)	48 (86%)
Analgesics	70 (17%)	12 (7%)	34 (20%)	24 (43%)
Stimulants	62 (15%)	10 (6%)	31 (18%)	21 (38%)
Hallucinogens	60 (15%)	10 (6%)	29 (17%)	21 (38%)
Ecstasy	39 (10%)	12 (7%)	15 (9%)	12 (21%)
Cocaine	34 (8%)	6 (3%)	15 (9%)	13 (23%)
Amphetamines	27 (7%)	6 (3%)	9 (5%)	12 (21%)

Note. Percentages for Alcohol Use Pattern groups represent the percentage in that group who had used in their lifetime.

Table 3
Tests of Differences between Alcohol Use Pattern Groups for Lifetime Use of Eight Drugs

	χ^2	R^2	Alcohol Use Pattern Group Comparison	Odds Ratio	Confidence Interval
Tobacco	31.7	.10	Light v. Moderate Light v. Heavy	3.53 5.21	1.75, 7.11 1.60, 16.95
Marijuana	62.4	.17	Light v. Moderate Light v. Heavy	6.82 10.11	3.26, 14.31 2.88, 35.46
Analgesics	40.3	.11	Light v. Moderate Light v. Heavy Moderate v. Heavy	3.60 10.45 2.91	1.50, 8.62 3.75, 29.13 1.29, 6.53
Stimulants	31.4	.12	Light v. Moderate Light v. Heavy Moderate v. Heavy	3.26 8.82 2.71	1.28, 8.31 3.00, 25.93 1.16, 6.30
Hallucinogens	22.5	.12	Light v. Moderate Light v. Heavy	3.50 9.40	1.11, 11.02 2.53, 34.86
Ecstasy	14.6	.09	Light v. Heavy Moderate v. Heavy	7.38 4.01	1.67, 32.54 1.08, 14.85
Cocaine	13.3	.11	Light v. Heavy	8.48	1.62, 57.86
Amphetamines	15.2	.10	Light v. Heavy Moderate v. Heavy	9.68 5.70	1.62, 57.86 1.24, 26.13

Notes. Nonsignificant test results are omitted from the table. $n = 411$ for tobacco, marijuana, and nonprescription use of analgesics; $n = 410$ for cocaine, ecstasy, hallucinogens, amphetamines, and nonprescription use of stimulants, due to missing data. Alcohol Use Pattern effect $d^2 = .2$. R^2 is McFadden's pseudo- R^2 , or the likelihood ratio index. $\alpha = .0167$ for the test of the Alcohol Use Pattern effect, while $\alpha = .0055$ for tests of the pairwise comparisons. 99.44% Confidence intervals are reported for the odds ratios associated with significant pairwise comparisons. The odds ratios reflect pairwise comparisons between the respective Alcohol Use Pattern groups in which the reference group is the group that drank the lesser amount.

Table 4
Tests of Differences between Alcohol Use Pattern Groups for Frequency of Past-year Use of Nine Drugs

Drug	<i>n</i>	χ^2	R^2	Light	Alcohol Use Pattern Group Exponentiated Least Squares Means Moderate	Heavy
Alcohol	404	141.9	.36	3.38 ^a	5.62 ^b	6.44 ^b
Tobacco	392	39.6	.13	1.32 ^a	2.62 ^b	4.02 ^c
Marijuana	400	61.4	.19	.80 ^a	2.32 ^b	3.48 ^c
Analgesics	406	23.7	.08	.12 ^a	.33 ^{b,c}	.57 ^c
Stimulants	402	51.5	.15	.09 ^a	.24 ^b	.76 ^c
Hallucinogens	409	49.8	.20	.05 ^a	.18 ^b	.48 ^c
Ecstasy	410	78.8	.20	.05 ^a	.05 ^a	.50 ^b
Cocaine	409	69.4	.18	.05 ^a	.09 ^a	.51 ^b
Amphetamines	410	80.4	.17	.06 ^a	.11 ^a	.86 ^b

Notes. *ns* differ due to missing data. Response options for drug use included "Never used" and "Used, but not in the past 12 months", both scored as 0 for frequency of use in the past year; or, if they had used in the past year, responses were recorded on an 8-point scale, where 1 = "1", 2 = "2-5", 3 = "6-10", 4 = "11-20", 5 = "21-40", 6 = "41-52", 7 = "53-104", and 8 = "105+", Alcohol Use Pattern effect $d^2 = 2$. R^2 is McFadden's pseudo- R^2 , or the likelihood ratio index. $\alpha = .0167$ for the test of the Alcohol Use Pattern effect, while $\alpha = .0055$ for tests of the pairwise comparisons. Means are the exponentiated values of the model-derived least squares means; means that share a common superscript are not significantly different from each other.