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Differential Utility of Three Indexes of Risky Drinking for Predicting Alcohol Problems in College Students

Brian Borsari, **Dan J. Neal**, **Susan E. Collins**, and **Kate B. Carey**
Brian Borsari, Dan J. Neal, and Susan E. Collins, Department of Psychology, Syracuse University; Kate B. Carey, Department of Psychology and Center for Health and Behavior, Syracuse University.

Abstract

This study evaluated the relationship between alcohol-related problems and 3 indexes of risky drinking in college student drinkers: number of drinks consumed per week, frequency of binge drinking, and estimated blood alcohol levels (BALs). Use of 2 independent samples (N_1 = 204, N_2 = 181) allowed a cross-validation of obtained associations. Results indicated that neither binge drinking frequency nor BAL were more highly related to alcohol-related problems than was weekly drinking. Furthermore, BAL did not provide unique explanatory power in accounting for alcohol-related problems; mixed results were obtained regarding the relationship of binge drinking estimates with problems.

Three self-report indexes are commonly used to statistically predict alcohol-related problems experienced by college students. First, quantity indexes of personal alcohol use evaluate the number of drinks consumed over a certain time period (e.g., week, month, past year; Saltz & Elandt, 1986). However, such measures are not sensitive to the episodic drinking commonly encountered in the college environment. Such pattern variations—heavy episodic versus spaced drinking—have long been identified as posing challenges for quantity measurement (Cahalan, Cisin, & Crossley, 1969). Second, the measurement of the frequency of binge drinking has emerged as an index of high-risk consumption in both large-scale surveys (Wechsler, Lee, Kuo, & Lee, 2000) and intervention studies (Borsari & Carey, 2000; Marlatt et al., 1998). *Binge drinking* is usually defined as having five or more drinks on a single occasion, although some have modified this amount for women to four or more drinks per occasion (Wechsler et al., 2000). The use of binge drinking as a criterion for high-risk drinking also has limitations. Specifically, this criterion does not take into account body size or length of time of the drinking episode. Third, the calculation of blood alcohol levels (BALs) has recently emerged as a promising index of risky alcohol use in college students (Lo, 1996). BALs can be determined at the time of intoxication or retrospectively by means of formulas. The use of BALs is promising because (a) BALs provide a personalized index of intoxication that accounts for weight, gender, and length of drinking episode; (b) distinguishing between typical and peak BALs takes into account the contextual aspects of alcohol use; and (c) BALs provide an intoxication index that is directly interpretable.

The three methods of assessing risky alcohol use in college students also vary in the complexity of data collection. Quantity measures require students to count the number of drinks they have consumed over a given time period. Binge drinking assessment requires more cognitive effort: Both the definition of binge drinking and the frequency of meeting this criterion must be

Correspondence concerning this article should be addressed to Brian Borsri or Kate B. Carey, Department of Psychology, 430 Huntington Hall, Syracuse University, Syracuse, New York 13244−2340. Electronic mail may be sent to beborsar@psych.syr.edu or to kbcarey@syr.edu..

considered. The most complex index of alcohol use is the retrospective calculation of BALs, which requires students to provide four pieces of information (number of drinks consumed, duration of consumption, body weight, and gender) and then make a computation. In light of the variable complexity of these three techniques, it is uncertain whether the extra effort adds value in the statistical prediction of alcohol-related problems. To evaluate the utility of each risky-drinking index in predicting alcohol-related problems in college students, we addressed two questions. First, are estimates of binge drinking frequency or BALs more highly related to problems than a standard quantity measure of weekly drinking? Second, do binge drinking frequency or BAL estimates provide unique explanatory power over weekly drinking in the modeling of alcohol-related problems?

Method

Participants

Students in Introductory Psychology were recruited over two successive semesters for a study on "Alcohol Use at SU," and they received credit toward their research requirement. This course is the largest on campus and attracts students from all majors. Samples differed slightly in age ($M_1 = 18.5$, $SD_1 = 0.9$; $M_2 = 18.9$, $SD_2 = 1.0$) as would be expected in data collected over a single academic year, $F(1, 389) = 20.5$, $p < .0001$.

Measures

All participants completed a demographics questionnaire in which they provided their age, gender, class, ethnicity, residence, Greek membership, and weight. A drinking behavior measure yielded quantity estimates (in standard drinks) for both a typical week and a peak week in the past month. Binge drinking frequency was assessed as a continuous measure of how many times men had consumed 5 or more drinks, or women had consumed 4 or more drinks, on one occasion in the past month. A frequency–quantity measure (Borsari & Carey, 2000) provided, for the past 30 days, (a) average and peak quantities consumed, (b) time spent consuming alcohol on these two occasions, and (c) number of drinking days. BALs were estimated with the following equation: BAL = [(consumption / 2) × (GC / weight)] − (0.016 × hours), where *consumption* = number of drinks consumed in the drinking session, *hours* = number of hours over which the drinks were consumed, *weight* = weight in pounds, and *GC* = gender constant (9.0 for women and 7.5 for men). We used this equation to compute both a BAL for typical (tBAL) and peak (pBAL) consumption (Dimeff, Baer, Kivlahan, & Marlatt, 1999). We used the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) to assess the number and intensity of alcohol-related problems experienced in the past 30 days.

Results

Sample Comparisons

Comparison of the two samples ($N_1 = 204$, 62% female, 84% Caucasian; $N_2 = 181$, 49% female, 80% Caucasian) revealed a significant discrepancy in Greek membership, most likely because Greek rush had not started when the Sample I data were collected. Sample differences were also evident for peak drinks per drinking day: Participants in Sample 2 reported consuming more on the heaviest drinking day in the last month than participants in Sample 1 did. Gender comparisons revealed that, in both samples, men reported more alcohol use than women on all measures except pBAL, tBAL, and binge drinking frequency; in Sample 2, men and women did not differ on number of drinking days and RAPI scores.

Correlations Between Alcohol Consumption Measures and the RAPI

Bivariate correlations revealed that the variables assessing alcohol consumption and alcohol-related problems were correlated, but not perfectly so. Excluding the variables with both typical and peak forms (week and BAL), intercorrelations in Sample 1 ranged from .31 to .68, and in Sample 2 they ranged from .47 to .70. There were strong correlations between typical and peak weekly consumption (.94 and .86) and tBAL and pBAL (.73 and .72). Thus, we did not use variables assessing typical and peak alcohol use in the same analyses.

Alcohol Consumption and Negative Consequences

Regression analyses evaluated whether BAL estimates or binge episodes were more associated with alcohol-related problems than was weekly drinking. Gender and Gender × Consumption interactions were also included in each model to account for gender differences in alcohol use. Exploratory analyses indicated a curvilinear relationship between alcohol-related problems (RAPI) and each measure of consumption (typical quantity, peak quantity tBAL, pBAL, and number of binge episodes). As alcohol consumption increased, so did reported problems. The curvilinear pattern in the data necessitated the comparison of quadratic and natural log models to clarify the relationship between consumption and alcohol-related problems.[1] In both samples the best predictors of alcohol-related problems were typical (Sample 1: R^2 = .32, Sample 2: R^2 = .39) and peak (Sample 1; R^2 = .32, Sample 2: R^2 = .37) quantity consumed per week, followed by binge drinking frequency (Sample 1: R^2 = .24, Sample 2: R^2 = .35), peak BAL (Sample 1: R^2 = .22, Sample 2: R^2 = .32), and typical BAL (Sample 1: R^2 = .15, Sample 2: R^2 = .28).

Unique Explanatory Power of Consumption Variables

We performed a series of hierarchical regression models to evaluate whether binge episodes or BAL estimates have unique explanatory power at predicting alcohol-related problems above and beyond quantity measure.[2] For each sample we built four models using peak week and pBAL variables. Then we built a comparable set using typical week and tBAL. First, alcohol-related problems were regressed onto peak weekly consumption. Second, problems were regressed onto both peak weekly consumption and number of binge episodes. Third, problems were regressed onto peak weekly consumption of alcohol and pBAL. Then we compared the second and third models with the first model to test for significant increases in R^2. The fourth model regressed alcohol-related problems onto all three drinking indexes and compared Models 2 and 3 to test for significant increases in R^2. In each comparison, any significant increase in R^2 indicated unique explanatory power of the added variable. Because gender and gender interactions were not significant contributors to any of the models, we omitted these variables from the final models.

The results of the four models for peak weekly drinking and pBAL are presented in Table 1. In Sample 1 the first model was significant, $F(1, 202) = 92.78$, $p < .0001$, $R^2 = .31$. In the second and third models neither number of binge episodes nor pBAL led to a significant increase in the overall predictability of the model, Fs(1, 201) = 0.85 and 0.52, *ns*, respectively. The fourth (full) model did not produce a significant increase in R^2 compared to either Model 2, $F(1, 200) = 1.13$, *ns*, or Model 3, $F(1, 201) = 0.81$, *ns*. A slightly different pattern emerged

[1]The various regression models could not be compared directly against each other because they are not nested and cannot be tested as a part of the general linear hypothesis. In addition, although all of the models showed a significant degree of heteroskedasticity, exploratory analyses conducted with robust regression seem to indicate that the estimates of the betas in the regression models are relatively stable, even with overdispersion of the residuals at higher values of the carriers.

[2]We conducted regressions using the natural log transformation of the five indexes of alcohol use for three reasons. First, the natural log models are more parsimonious. Second, although the quadratic models showed consistently higher R^2 values compared to the other two models, the natural log models were nearly as robust. Third, the quadratic models all showed negative regression coefficients for the quadratic terms. This suggests a counterintuitive decrease in alcohol-related problems at higher levels of consumption.

in Sample 2: The first model was significant, $F(1, 179) = 98.24$, $p < .0001$, $R^2 = .35$. In the second model, entering number of binge episodes into the regression equation led to a significant increase in the overall predictability of the model, $F(1, 178) = 5.66$, $p < .05$, an increase in R^2 of .02. In the third model, adding pBAL to peak week led to a marginally significant increase in the overall predictability of the model, $F(1, 201) = 3.83$, $p = .052$. Again, as in Sample 1, the fourth model did not account for more variance in RAPI scores when compared with Model 2, $F(1, 177) = 3.58$, *ns*, or with Model 3, $F(1, 177) = 1.68$, *ns*. A nearly identical pattern was obtained when typical weekly drinking and typical BAL were used (full model R^2 for Sample 1 = .32 and for Sample 2 = .39).

Discussion

Measures of weekly drinking (both typical and peak week) were more strongly associated with alcohol-related problems than with either binge drinking frequency or BAL. Thus, it appears that the simplest and most commonly used approach to assessing college drinking accounts for the most variance in the statistical prediction of alcohol-related problems. This finding is consistent with population-based research that identified quantity measures (e.g., per capita consumption) as the strongest predictor of alcohol-related problems (Smart, Suurvali, & Mann, 2000). We also performed analyses to evaluate whether binge drinking frequency or BAL estimates contributed unique explanatory power over and above the simpler quantity measures. These results were mixed. Whereas binge drinking frequency did emerge as a significant predictor of alcohol-related consequences in Sample 2, in neither sample did BAL predict significant amounts of variance above and beyond quantity consumed per week.

Some limitations of this study should be noted. First, the emergence of binge drinking frequency as a significant predictor of alcohol-related problems may have been the result of the manner in which students met binge criteria. In this study a binge episode was registered whether a student had 5 drinks or 9 drinks; thus, the cutoff may have been too low to establish a consistent relationship between consumption and problems. Further examination of the relationship between different cutoffs for binge drinking and alcohol-related consequences would allow for the identification of drinking levels uniquely associated with increased risk of experiencing alcohol-related problems. Second, undetected cohort effects (e.g., Greek membership, selection biases) may account for the variable relationship between binge drinking frequency and problems. Finally, generalization of these findings to other populations should be made with caution, as opportunities to experience alcohol-related problems may be considerably less for college students.

These findings suggest that binge drinking frequency might contribute to the statistical prediction of alcohol-related consequences; however, BAL does not contribute unique explanatory power regarding alcohol-related problems when used in conjunction with other simpler, more commonly used indexes of drinking. Whereas situations that require direct comparison of male and female intoxication levels (e.g., Lo, 1996) would be well served by calculating BAL, the use of typical quantity measures may be more prudent if participant burden and time are of concern.

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Table 1

Hierarchical Regression Models Predicting Alcohol-Related Problems in Two Samples

	Sample 1				Sample 2			
Predictor variable	R^2	ΔR^2	*B*	*p*(*B*)	R^2	ΔR^2	*B*	*p*(*B*)
				Peak consumption				
Model 1: Peak week	.31	.31**	2.91	<.001	.35	.35**	3.19	<.001
Model 2	.32	.01			.37	.02*		
Peak week			2.55	<.001			2.20	<.001
Binge			0.56	.36			1.59	<.05
Model 3	.32	.00			.37	.00		
Peak week			3.19	<.001			2.43	<.001
Peak BAL			−5.04	.47			12.40	.052
Model 4	.32	.00			.38	.01		
Peak week			2.85	<.001			1.85	<.01
Binge			0.65	.30			1.31	.06
Peak BAL			−6.21	.38			8.57	.20
				Typical consumption				
Model 1: Typical week	.31	.31**	2.99	<.001	.37	.37**	3.20	<.001
Model 2	.31	.00			.39	.02		
Typical week			2.50	<.001			2.40	<.001
Binge			0.76	.21			1.31	.053
Model 3	.31	.00			.38	.01		
Typical week			3.20	<.001			2.82	<.001
Typical BAL			−7.56	.43			12.06	.21
Model 4	.32	.01			.39	.00		
Typical week			2.71	<.001			2.23	<.001
Binge			0.77	.20			1.17	.09
Typical BAL			−7.94	.40			8.04	.42

Note. Sample 1, $N = 204$. Sample 2, $N = 181$. BAL = blood alcohol level.

*$p < .05$.

** $p < .001$.