Have I Had One Drink Too Many? Assessing Gender Differences in Misperceptions of Intoxication Among College Students*

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ABSTRACT. Objective: The present study extends the literature on factors involved in college students' drinking tendencies by examining differences between men and women in their ability to accurately estimate personal intoxication. The study also assessed whether men and women who typically consume large quantities of alcohol when they attend parties have more difficulty accurately assessing intoxication compared with lighter drinkers. **Method:** The research used the external cueing approach (ECA) of Turrisi and colleagues as the informational paradigm to examine 3,707 college students' gender, typical drinking at parties, and how they relate to perceptions of intoxication. **Results:** The study revealed that approximately 20% ($n = 710$) of participants underestimated their blood alcohol concentration using the ECA. Among participants who made underestimation errors, gender differences were

observed in that women made significantly more underestimation errors in the scenarios that contained four to five drinks and men made more underestimation errors in the scenarios that contained six to seven drinks. In addition, a three-way interaction revealed that female students who reported typically drinking larger amounts of alcohol in party settings were more likely to make errors when estimating their intoxication for moderately high numbers of drinks (e.g., four to five drinks). **Conclusions:** The results are discussed in terms of examining the importance of college student drinking, gender, typical alcohol consumption at a party, and estimation of intoxication. Implications of gender effects in relation to high-risk drinking activities (i.e., pregameing and drinking games) as well as prevention efforts are discussed. (*J. Stud. Alcohol Drugs* 70: 964-970, 2009)

COLLEGE STUDENTS ARE AT A HEIGHTENED risk for heavy episodic drinking and experiencing consequences related to drinking (Abbey et al., 1998; National Institute on Alcohol and Alcoholism, 2007; O'Malley and Johnston, 2002; Perkins, 2002; Turrisi et al., 2006; Wechsler et al., 1998). Students are often encouraged to drink moderately and responsibly, and are inundated with slogans such as "know when to say when" and "drink responsibly." In addition, numerous campus-based interventions have emerged with a focus on educating college students on actual drinking norms and practices that occur on their campus (e.g., Lewis and Neighbors, 2006; McNally and Palfai, 2003; Neighbors et al., 2004; Walters et al., 2007). Although these programs attempt to reduce normative pressure to drink heavily by

emphasizing quantity limits (such as "students drink four or fewer drinks"), they have been criticized for decontextualizing the amount of consumption from the drinking event and the drinker. Thus, what might be a safe quantity of alcohol for one individual under some circumstances could lead to intoxication for another drinker under different circumstances. Although some college interventions provide skills training about how to safely estimate personal intoxication (Barnett et al., 2007; Borsari and Carey, 2005; Fromme and Corbin, 2004; Larimer et al., 2001; Marlatt et al., 1998), few address the intrapersonal processes that are related to accurate and inaccurate estimations. This may be partly because of the absence of information available from studies examining perceptions of personal intoxication in college samples.

Research suggests that individuals can use two types of cues to estimate personal intoxication. The first type consists of internal cues, made up of physiological and psychomotor sensations experienced by an individual and interpreted as symptoms of intoxication (e.g., not able to walk normally, feeling dizzy). The second type of cue is external and refers to aspects of the drinking environment that indicate intoxication (e.g., number of drinks consumed in a given time frame). Although research suggests internal cues are less reliable (Schuckit, 1980; Werch, 1990), there is evidence that drinkers can use external cues more accurately (Turrisi and Jaccard, 1991; Turrisi et al., 1993). For example, Turrisi and Jaccard and Turrisi et al. have used an informational

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paradigm based on information integration theory and function measurement methodology (e.g., Anderson, 1981, 1982) to assess accuracy in response to external cues (external cueing approach [ECA]). The ECA presents individuals with factorially manipulated information on types of drinks, numbers of drinks, and consumption times (e.g., five beers in 2 hours, four glasses of wine in 1 hour) and asks them to estimate their intoxication based on these cues to each situation. These estimates are then used to assess the accuracy of individuals' self-reported assessments of intoxication by comparing their estimations to projected blood alcohol concentrations (BACs) based on gender, number of drinks, and time to consume across the varied situations. Using the ECA, Turrisi and Jaccard (1991) found that the highest numbers of underestimation errors were observed in individuals who had been convicted of multiple driving-while-intoxicated offenses when compared with individuals who had one or fewer driving-while-intoxicated convictions. Turrisi and Wiersma (1999) observed that adolescents with a family history of alcohol abuse were more likely to underestimate intoxication and subsequently to engage in heavy episodic drinking behavior and drive after drinking.

Although college students are at an increased risk for engaging in heavy episodic drinking, studies have not thoroughly examined their ability to accurately assess personal intoxication. Research has shown that college students have difficulty correctly identifying standard drink sizes and often drink more alcohol than they realize (White et al., 2003, 2005). In addition, a significant portion of college-age individuals who reported experiencing specific alcohol-related consequences and the number of drinks they consumed during the most recent occurrence of the consequence estimated they could consume more alcohol before experiencing the same consequence in the future (Mallett et al., 2006). Research has also demonstrated that college students tend to believe their peers drink equal or greater amounts of alcohol than themselves (Borsari and Carey, 2001, 2003; Perkins and Berkowitz, 1986), and women who were classified as heavy drinkers did not see themselves as such potentially because they viewed the drinking practices of their heavy-drinking male peers as normative (Jackson, 2008). Taken together, it is plausible that students' errors about their levels of personal intoxication could potentially reinforce false beliefs about what are acceptable and safe consumption practices, which may also contribute to risky drinking behaviors.

Although research has demonstrated that underestimation errors often result in risky drinking and related behaviors, it is unclear what differences exist among men and women and how individuals vary based on typical alcohol consumption patterns in higher risk settings. The previous literature on perceptions of intoxication using the ECA has neglected to examine the effects of gender on underestimations of personal intoxication. Factors such as size, metabolism, and socialization with alcohol (e.g., Wilsnack et al., 1997) are

likely to result in different memories of internal sensations of intoxication experienced during past drinking events. Studies have shown that women and men tend to drink similar amounts of alcohol when playing drinking games (Borsari, 2004; Nagoshi et al., 1994); however, women experience more consequences than men as a result of participating in competitive drinking activities (Johnson and Stahl, 2004; Pederson and LaBrie, 2006). Furthermore, women and men also equally participate in pregaming activities, which are associated with higher BACs (Borsari et al., 2007). Given that women tend to drink in the same manner as men and, in doing so, achieve higher BACs and experience more consequences than their male counterparts, more attention to gender differences in the analysis of BAC estimation and high-risk drinking seems warranted.

Previous research using ECA has not evaluated whether responses to the informational cues are influenced by individual differences with respect to typical alcohol consumption in party settings, which is where a substantial amount of risky drinking behavior occurs among college-age individuals (O'Hare, 1997). Because of the lack of training that individuals have with ECA, it is likely they will draw on memories of internal sensations of intoxication (internal cues) they experienced during past drinking events to make assessments of intoxication in hypothetical scenarios. Interesting theoretical prospects emerge when considering the effects of prior drinking events on perceptions of intoxication using the ECA approach. First, individuals who typically drink lower amounts of alcohol will have fewer memories of the internal sensations of intoxication and, thus, may make more errors as a result of their inexperience with the internal cues, whereas individuals who have a history of heavy drinking may make fewer experiential-based errors. An equally plausible competing hypothesis is that, because of the relative inaccuracy of internal sensations and/or the effects of tolerance, individuals who typically engage in heavy-drinking patterns might make errors as a result of a combination of their inaccurate sensory recall and potential use of internal cues, which can be influenced by tolerance.

Therefore, the focus of the present study was twofold. First, differences between men and women in their ability to accurately estimate personal intoxication were examined. The study also assessed whether men and women who typically consume large quantities of alcohol when they attend parties have more difficulty accurately assessing intoxication compared with lighter drinkers.

Method

Participants

A random sample of 3,707 college students from three northwestern college campuses completed measures of typical drinking at parties, demographic information, perceptions

of intoxication, and acute alcohol consequences as part of a larger battery of measures for a multisite longitudinal study examining social norms and college drinking. Participants were randomly selected from a pool of students drawn from the registrars' database on each campus, and both drinkers and nondrinkers were eligible to participate. The students were mailed invitations to participate in the study along with a consent form that detailed the procedures, including confidentiality, answers being encrypted to protect their privacy, and their rights as a participant. Participants completed the measures either via a secure site on the World Wide Web or by completing a paper-based version of the survey. Participants were given their choice of two movie passes, a \$10.00 check, or entry into a drawing for a \$1,000 gift certificate to the store of their choice in return for completing the survey.

The sample was composed of 66% women and 34% men. Seventy-nine percent of the sample described themselves as white, 12% as Asian/Pacific Islander, 2% as Latino/Latina, 1% as black, 1% as Native American, and 4% as "other." The class standing of the respondents was represented fairly equally, with freshmen comprising 27% of the sample, sophomores 19%, juniors 24%, and seniors 30%. The average response rate for the three campuses was 25%. In comparison with the population on each campus, the sample was demographically representative with the exception of women being slightly overrepresented on one of the campuses. We also observed that 20% of the sample reported being abstainers on both measures of peak consumption over the past month and frequency of consumption. These drinking outcomes for our sample are comparable to those of other national published reports (e.g., Wechsler et al., 1998). The mean (SD) age of the respondents was 21.4 (5.2) years. All measures and procedures were reviewed and approved by the human subjects review boards on each campus.

Measures

Typical drinking at parties. Individuals were asked, "When you go to a party, how many drinks are you most likely to drink?" The number of drink response options ranged from zero to eight. The average number of drinks participants reported typically consuming when they attend a party was 2.88 (2.38).

Demographics. Participants provided information about their gender and weight to calculate estimated BACs. The average weight for men was 173 (31.5) lbs, and the average weight for women was 141 (27.7) lbs.

Perceptions of intoxication. Using the ECA, participants were asked to make estimates of intoxication in response to different scenarios that factorially manipulated the number of drinks and time taken to consume them. For example, individuals were presented with items similar to: "If you went to a party from 10:00 PM until 1:00 AM, how much

above or below the legal limit would you be if you drank 5 drinks?" Intoxication was defined as the legal limit to drive, which is .08 in the state where the study was conducted. Participants responded on an 11-point scale ranging from extremely below the legal limit to extremely above the legal limit. Methodology was chosen that has been shown to yield reliable and valid scores from past research in this area (Jaccard and Turrissi, 1987; Turrissi and Jaccard, 1991; Turrissi and Wiersma, 1999). In the study by Turrissi and Jaccard (1991), reliability was examined by having individuals make perceptions of intoxication two times within approximately 1 week using the same scenarios. The test-retest correlation between the scores for the total numbers of errors was reasonably high (e.g., $r = .87$). Discriminant validity was also assessed comparing correlations between the measure and scores from the Good Impression scale from the California Psychological Inventory (Gough, 1957), which were also nonsignificant, suggesting that there was no relationship with socially desirable responding. Finally, Jaccard and Turrissi (1987) examined the relationship between personality constructs and perceptions of errors using structural equation modeling. In the study, assessments were made of each construct three times separated by 1 week. In the measurement model examining perceptions of errors, reliability coefficients between the observed and estimated latent variable ranged from .86 to .94, suggesting high internal consistency. The number of drinks and time frames used in the scenarios were based on the work of Turrissi and colleagues (Turrissi and Jaccard, 1991; Turrissi and Wiersma, 1999) and data collected from college student focus groups. Drink amounts ranged from four to eight, and the time frames ranged from 3 to 4 hours, yielding 10 scenarios in all (e.g., four drinks in 3 hours, five drinks in 3 hours, six drinks in 3 hours, and so on).

Results

Analytic strategy

The results are divided into two segments. The first segment evaluated participants' accuracy with regard to estimating their intoxication using the Perceptions of Intoxication measure. The second segment examined the effects of gender and typical alcohol consumption at a party on underestimation errors. Therefore, only individuals who made underestimation errors were included in the second set of analyses. Because of the categorical nature of the independent variables (e.g., number of drinks, time to consume, familiarity with drinking events, and gender), factorial analyses of covariance (ANCOVAs) were used to examine statistical significance of the main effects and higher order interactions of the factors on total number of underestimation errors. Based on the recent independent recommendations of Wilkinson (1999), Jaccard (1998), and Turrissi (2001), Tukey's honestly significant difference (HSD) pairwise comparisons were used

to decompose significant higher order interactions and control for experiment-wise errors. This strategy has been shown to be beneficial in the interpretation of interaction effects and avoidance of statistical redundancies associated with simple interaction comparisons, simple main effects, and pairwise comparisons. These analyses are discussed in turn.

Evaluating accuracy of individuals' perceptions of intoxication

Using the Widmark formula that uses an individual's weight, age, gender, and alcohol content (from the information on number of drinks and the time taken to consume in the 10 scenarios), BACs were calculated for each of the 10 scenarios for each individual (Watson et al., 1981; Wilkinson, 1980). The resulting BACs were then compared with individuals' perception of intoxication for each of the 10 scenarios and classified into one of four categories used in our previous research (Turrissi and Wiersma, 1999): (1) correct perception of being above the legal limit, (2) correct perception of being below the legal limit, (3) incorrect perception of being above the legal limit, and (4) incorrect perception of being below the legal limit (i.e., underestimation error). The analyses focus on underestimation errors because they have the most potential to result in risky drinking practices. Individuals who overestimate their intoxication (believe their BAC is above the legal limit when, in fact, it is below) are erroneous but in a conservative way. Because these individuals believe they are intoxicated, they might not continue drinking and/or might not engage in risky behavior such as driving. On the other hand, individuals who underestimate their intoxication (believe their BAC is below the legal limit when it is, in fact, above it) have an increased risk for harm as demonstrated in previous studies (Turrissi and Jaccard, 1991; Turrissi and Wiersma, 1999).

A total underestimation error score for each individual was derived by summing the number of incorrect perceptions of being below the legal limit across the 10 scenarios. Twenty percent of the sample ($n = 710$) made underestimation errors. Approximately 11% of the sample made one to two errors, 5% made three to four errors, and 4% made five or more errors. It is important to point out the zero-inflated and skewed nature of this variable. To reduce the likelihood of Type I errors, the analytic strategy we used was consistent with past work (Jaccard and Turrissi, 1987; Turrissi and Jaccard, 1991; Turrissi and Wiersma, 1999) using more stringent probability levels to determine significant findings (e.g., $p < .01$ vs $p < .05$).

Perceptions of intoxication and gender effects

The first analyses examined the number of underestimation errors as a function of scenarios and gender. A $2 \times 5 \times 2$ (Gender $\times$ Number of Drinks $\times$ Time) mixed measures

ANCOVA was conducted on the number of underestimation errors made by individuals using sphericity corrections to the degrees of freedom as suggested by Jaccard and Ackerman (1985) on the effects involving the repeated measure. Weight was included as a covariate in the analyses to account for the fact that lighter individuals had more chances to make errors than heavier individuals. Table 1 compares the BACs of two men, one weighing 150 lbs and one weighing 220 lbs, for each of the scenarios presented in the ECA. The 220 lb man has one situation in which his BAC is above the legal limit, allowing him the possibility of making one underestimation error. In contrast, the 150 lb man has five situations in which his BAC would be above the legal limit. ANCOVA was used to examine the processes underlying underestimation errors while removing the variance associated with weight. In addition, gender will also interact with weight because men tend to weigh more than women. Again, removing the variance accounted for by weight allowed us to differentiate gender effects independent of weight. The strongest effect was the significant interaction between gender and number of drinks ($F = 67.60$, $1/3,529$ df, $p < .001$; $\eta^2 = .019$). Based on the recommendation of Jaccard and others (e.g., Jaccard, 1998; Turrissi, 2001; Wilkinson, 1999), Tukey's HSD pairwise comparisons were conducted to compare differences between men and women for a given number of drinks (e.g., four) and to control for experiment-wise errors (see Table 2). Tukey's HSD pairwise comparisons ($p < .05$, critical difference [CD] = .02) revealed that women made significantly more underestimation errors in scenarios that contained moderately high levels of alcohol (four to five drinks) and men made more underestimation errors in the scenarios that contained higher levels of alcohol (six to eight drinks; see Table 2).

Perceptions of intoxication and typical drinking at parties

The second set of analyses examined the relationships between gender, drinks, time, and number of underestimation

TABLE 1. Comparison of blood alcohol concentration (BAC) between a 150 lb man and a 220 lb man

Blood alcohol concentration given no. of drinks and time for a man weighing 150 lbs					
Hours drinking	No. of drinks				
	4	5	6	7	8
3	.052	.077	.102 ^a	.127 ^a	.152 ^a
4	.036	.021	.061	.086 ^a	.111 ^a
Blood alcohol concentration given no. of drinks and time for a man weighing 220 lbs					
Hours drinking	No. of drinks				
	4	5	6	7	8
3	.020	.037	.054	.071	.088 ^a
4	.004	.021	.038	.055	.072

^aIndividual's BAC above legal limit (.08) where the potential exists for making an underestimation error.

TABLE 2. Mean underestimation errors made by men and women (standard deviations in parentheses)

Gender	No. of drinks presented in scenarios				
	4	5	6	7	8
Men	.00 (.06)	.05 (.21)	.08 ^a (.27)	.07 ^a (.25)	.04 ^a (.19)
Women	.12 ^b (.33)	.09 ^b (.29)	.05 (.22)	.03 (.18)	.02 (.15)

^aDenotes significantly more errors made by men; ^bdenotes significantly more errors made by women.

errors when the variable "typical drinking at parties" was included as an additional predictor. A $2 \times 5 \times 2 \times 9$ (Gender $\times$ Number of Drinks $\times$ Time $\times$ Typical Drinking at Parties) mixed measures ANCOVA was conducted on the number of errors made by individuals (with sphericity corrections and weight included as a covariate). The three-way interaction between gender, number of drinks, and typical drinking at parties was significant, indicating that gender moderated the relationship between number of drinks and typical drinking at parties on underestimation errors ($F = 3.20$, $1/3,462$ df, $p < .05$; $\eta^2 = .007$; Tukey's HSD: $p < .05$, $CD = .02$). Table 3 contrasts the mean underestimation errors of men and women who typically consume one drink at a party versus those who typically consume eight drinks. For women, the number of errors decreased as the number of drinks consumed increased. However, the difference was greater when their drinking pattern was heavier (e.g., eight drinks at a party). Women who typically consumed a high number of drinks tended to underestimate intoxication more so at moderately high numbers of drinks (four and five drinks). This pattern was not observed for men. Regardless of whether men's typical drinking pattern was low or high, they tended to make

TABLE 3. Underestimation errors made by men and women in relation to the extreme number of drinks typically consumed at parties and number of drinks presented in the scenarios

No. of drinks in scenario	No. of drinks participants reported typically consuming when they attend a party		<i>p</i>
	1 Mean (SD)	8 Mean (SD)	
Women			
4	.12 (.23)	.23 (.31)	<.01
5	.07 (.25)	.20 (.40)	<.01
6	.06 (.23)	.07 (.23)	NS
7	.04 (.19)	.02 (.15)	<.05
8	.02 (.15)	.02 (.15)	NS
Men			
4	.00 (.00)	.01 (.06)	NS
5	.05 (.21)	.04 (.17)	NS
6	.06 (.23)	.12 (.33)	<.01
7	.08 (.23)	.12 (.32)	<.01
8	.05 (.21)	.07 (.25)	<.05

Notes: ns of subgroups are as follows: Women who typically consume one ($n = 225$) and eight ($n = 46$) drinks when they attend a party and men who typically consume one ($n = 71$) and eight ($n = 133$) drinks when they attend a party. NS = not significant.

more errors at higher numbers of drinks (e.g., six or seven drinks).

Discussion

The current work extends the research on the ECA by evaluating gender differences in perceptions of intoxication and the relationship between typical drinking at parties and underestimation errors. Overall, 20% of the sample made one or more errors underestimating their level of intoxication. The results of the study also demonstrated important gender differences in the pattern of these underestimation errors. Specifically, higher numbers of underestimation errors by women were related to moderate to high levels of alcohol consumption (four to five drinks), whereas higher numbers of underestimation errors by men were related to higher drinking levels that consisted of six and seven drinks.

A second focus of this study was to examine the relationship between gender, underestimation errors, and typical drinking at parties. Results indicated that reports of heavier typical drinking at parties were related to higher errors in perceptions of intoxication when the scenarios featured five to eight drinks. Gender moderated the relationship between typical drinking at parties and underestimation errors, with women who typically drink larger quantities of alcohol at parties being particularly likely to make errors when estimating drunkenness at moderately high (i.e., four to five drinks) doses of alcohol. This finding is somewhat alarming given the significant risks for women of engaging in heavy drinking and risky behaviors such as drinking games and pre-gaming (Borsari, 2004; Borsari et al., 2007; Nagoshi et al., 1994). The pattern of errors for men was not as consistently related to typical drinking at parties. Although men who typically consumed more alcohol at parties made slightly more errors at higher levels of alcohol consumption on the ECA, the effect was not dramatic.

There are several practical implications from the study that should be addressed. First, men and women are at risk of making underestimations of personal intoxication at different quantities of alcohol. Interventions could benefit from incorporating and highlighting these gender differences and identifying the number of drinks that are associated with underestimation errors for men and women. Second, drinking experience does not increase accuracy in estimating BAC; in fact, it was associated with more errors for women. Based on previous work, we know that individuals who make more underestimation errors are more likely to engage in risky behaviors such as heavy episodic drinking (Turrisi and Wiersma, 1999) and driving after drinking (Turrisi and Jaccard, 1991) and to experience other types of consequences (Mallett et al., 2006). If we know the point at which men and women have the most potential to make errors, we can explore ways to improve and tailor individual-based intervention efforts to help students identify where errors may

occur and reduce these chances. In addition, other types of interventions such as social-norms marketing campaigns that advertise "most students drink four or fewer drinks when they party" might be sending the message that four drinks is a safe upper limit. Although a large number of students would not be intoxicated after consuming four drinks (assuming they are spread out over time), a substantial portion of female students would be intoxicated. In these instances, the information delivered in a social-norms marketing campaign may, in fact, be harmful to individuals who are unable to remain below a safe BAC after consuming four drinks. It would seem important, then, to help such students identify personally safe upper limits to drinking, which could be done through individual interventions and training on internal and external cueing information.

Despite the important findings of this study, it is not without limitations. One limitation of the study includes potential difficulty generalizing results to different populations and ethnic groups, considering that approximately 80% of the participants identified themselves as white. Although the sample was representative of the surveyed population, future studies with greater ethnic diversity may provide more insight to the generalizability of these findings. Second, asking college students to assess personal intoxication at the legal limit to drive could be considered conservative, and may not be getting at some of the riskier drinking patterns of college students who engage in very heavy drinking. Third, one could argue that respondents' estimates may not be the same in hypothetical as opposed to actual situations. For example, the perceptions of intoxication in response to the ECA were made when respondents were concentrating on the task and were sober. Further research needs to examine how responses vary under differing conditions (e.g., with intoxicated participants). Despite this limitation, the cognitive processes and the situations that we assessed (sober individuals and hypothetical scenarios) are similar to what might be expected if individuals were being educated in the classroom or motivational-interview setting on how to use external cues. Thus, even under these "optimal" situations, approximately one in five individuals made errors.

It should also be noted that drinkers and nondrinkers were included in the study. Prevention efforts target nondrinkers as well as drinkers, and it is important to appropriately address nondrinkers' and light drinkers' perceptions to reduce harm in the event they initiate alcohol use. In addition, research has shown that alcohol interventions can be efficacious in delaying initiation among abstainers (Larimer et al., 2007); therefore, it is important to understand abstainers' perceptions about drinking if they are potential recipients of prevention and intervention efforts. Last, although students who have never consumed alcohol may not have personal drinking experience to use for predicting their intoxication level in response to the scenarios, they most likely have a great deal of observational experience. By the time stu-

dents reach college, they have been exposed to numerous situations in which they have observed others (e.g., friends, family) consuming alcohol and have had the opportunity to make sober observations about how alcohol affects the body. Our data from the present study demonstrate that personal consumption experience does not improve accuracy. Therefore, experience does not *help* either men or women, and this is something that needs to be incorporated into prevention efforts.

Finally, there may be several plausible explanations for some of the findings we observed that warrant future research. For instance, impulsive individuals might be prone to making underestimation errors because they tend not to reflect back on their experiences or use external cues relevant to the number of drinks they consume and behave more in accord with immediate internal sensations (Jaccard and Turrisi, 1987). Similarly, executive cognitive function deficits (e.g., working memory) could also potentially account for some of the variability in underestimation errors. For example, research has identified that young drinkers meeting criteria for alcohol abuse or dependence showed similar higher order cognitive deficits as older alcohol-dependent clinical samples (Sher et al., 1997). Such deficits in functioning could clearly be responsible for misperceptions of intoxication. Although tolerance is also a plausible explanation, findings from prior work showed evidence that perceptions of intoxication measures, similar to the one used in the current study, assessed a unique construct independent of physical tolerance (Mallett et al., 2006; Mallett et al., 2009). That being said, tolerance (behavioral as well as physical) is a complicated phenomenon that should be further explored in a longitudinal study assessing relationships between college students' drinking patterns over time, development of tolerance, and its relative impact on individuals' perceptions of intoxication. Finally, using results from the present and future studies, education strategies may be enhanced with the goal of teaching individuals how to make accurate assessments of intoxication using external cues (e.g., standard drink sizes, number of drinks consumed, time taken to consume) and, in turn, reduce risky drinking behaviors and the potential experience of acute drinking consequences.

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