Do We Learn from Our Mistakes? An Examination of the Impact of Negative Alcohol-Related Consequences on College Students' Drinking Patterns and Perceptions[*]

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Abstract

Objective—Little research has examined antecedents of specific drinking consequences (vomiting, regretted sex, hangover, blackouts) among college students. This research examined how students' experiences of past consequences relate to their beliefs of experiencing similar consequences in the future and how these beliefs relate to current drinking patterns.

Method—Self-reported past drinking behavior and resulting consequences associated with specific occasions were assessed among 303 (66% women) college students. Students also estimated number of drinks associated with risk of experiencing future similar consequences.

Results—Paired-samples *t* tests indicated that students significantly overestimated the number of drinks it would take to vomit, have unwanted sexual experiences, experience hangovers, and black out in comparison with the actual self-reported number of drinks consumed the last time identical consequences were experienced. In addition, a series of multiple-regression analyses revealed that greater misperceptions between the perceived and actual number of drinks associated with each type of consequence were consistently associated with heavier drinking.

Conclusions—Results suggest that heavier-drinking students do not learn from their mistakes but instead overestimate the amount of alcohol they can consume without experiencing negative consequences. Clinical implications of these findings are discussed in terms of augmenting brief interventions aimed at heavy-drinking college students.

Heavy episodic drinking and alcohol-related consequences continue to be a problem on our nation's college campuses (O'Malley and Johnston, 2002). Several studies have examined the extent to which drinking affects college students and have found that individuals are affected differently by various types of consequences, which consist of physical, legal, academic, interpersonal, and sexual problems (e.g., Abbey et al., 1998; Larimer et al., 1999; Perkins, 2002; Presley et al., 1996; Wechsler et al., 1998). Moreover, previous work has demonstrated a strong association among higher alcohol consumption, blood alcohol concentration (BAC), and negative consequences (e.g., Borsari et al., 2001). Despite the known risks associated with heavy drinking, college students continue to make decisions to engage in risky drinking practices.

College students use both interpersonal and intrapersonal sources of information to make decisions about how much alcohol to consume on a given occasion. Interpersonal information utilized for decision making is based, in part, on an individual's perception of others' drinking behavior and others' attitudes toward drinking. These perceived drinking norms have been shown in a number of studies to be influential in predicting alcohol consumption and alcohol-related problems, in that college-aged drinkers perceive friends and other same-aged peers as drinking more than themselves and typically overestimate the amount of alcohol use and problems experienced by peers (Baer et al., 1991; Borsari and Carey, 2003; Borsari and Carey, 2001; Berkowitz and Perkins, 1986). These overestimations often lead to increased alcohol consumption and experienced consequences by college students and have been targeted by interventions aimed at correcting individual's misperceptions of others' drinking behavior (e.g., Neighbors et al., 2004; Schroeder and Prentice, 1998).

Another type of information individuals use to make decisions about the quantity of alcohol to consume is intrapersonal in nature, including an individual's prior drinking experiences. Oftentimes, individuals draw from past experiences to guide future decisions. For example, if a student drinks to the point of blacking out and wakes up injured and in a strange place, he or she may adjust future drinking to minimize a similar occurrence. On the other hand, if a college student engaged in a night of drinking with friends and had a positive and reinforcing social experience, he or she may feel positive about engaging in the same behavior in the future. Consistent with Social Learning Theory (Bandura, 1969, 1977; Maisto et al., 1999), if college students have positive experiences with alcohol in social settings (e.g., alcohol makes them feel more sociable and/or relaxed) and perceive their friends as having the same experiences (modeling), they are likely to continue to use alcohol in similar types of settings in the future. As a result, individuals will develop expectations about how alcohol will affect them and may develop patterns of use based on these expectations and past experiences. A large amount of research has demonstrated associations between drinking and general positive and negative expectancies (e.g., Adams and McNeil, 1991; Brown et al., 1985; Fromme et al., 1986; Leigh, 1989; Neighbors et al., 2003; Wood et al., 2001). However, individuals' ability to accurately assess the relationship between the *quantity* of alcohol consumed and likelihood of experiencing *specific consequences* has not been previously examined.

Research conducted with adolescent and adult populations has shown that individuals have difficulty making accurate assessments of their BACs. Specifically, past studies have demonstrated individuals make poor estimates of BAC when asked to reflect on past drinking behavior (Carey and Hustad, 2002), while drinking Huber et al., 1976; Lansky et al., 1978), if they have high tolerance to alcohol (Lipscomb and Nathan, 1980), and in response to hypothetical drinking situations (Jaccard and Turrisi, 1987; Turrisi and Jaccard, 1991; Turrisi and Wiersma, 1999). For instance, Turrisi and Jaccard (1991) found that individuals previously convicted of a driving while intoxicated (DWI) offense were more likely to underestimate their BACs, erring on the side of being below the legal limit to drive when in fact they were over the legal limit. Jaccard and Turrisi (1987) found that individuals prone to risk taking and sensation seeking were also more likely to underestimate personal intoxication. Turrisi and Wiersma (1999) identified that teens with a family history of alcohol problems were also more likely to underestimate their BACs in hypothetical situations and, in turn, were more likely to engage in risky drinking behavior and driving after drinking than individuals without a family history of alcohol problems.

Although these studies have shown that individuals who underestimate the amount of alcohol required to become intoxicated (defined as the legal limit to drive) are at increased risk for engaging in risky drinking practices, little research has been conducted with college student populations. Furthermore, widely used alcohol intervention strategies (e.g., Darkes and Goldman, 1993; Dimeff et al., 1999; Fromme et al., 1986; Larimer et al., 2001; Marlatt et al.,

1998) assess individuals' alcohol intake in terms of quantity and frequency as well as the number and types of negative consequences individuals experience; however, the actual amount of alcohol individuals consumed when they experienced specific negative consequences is not addressed. The influence of individuals' prior negative consequences on both the amount of alcohol they perceive they can consume before experiencing negative consequences and on actual drinking behaviors is not well understood and may provide insight into college students' drinking patterns and decisions to drink.

The focus of the current study is to examine the following: (1) how the experience of past consequences relate to individuals' estimations of the amount of alcohol they would have to consume to be at risk of experiencing similar types of consequences in the future and (2) how these estimations relate to current drinking patterns. In addition, the current study evaluates the accuracy of college students' estimations of the number of drinks they would have to consume before experiencing consequences commonly experienced in this population (i.e., vomiting, blacking out, engaging in a regretted sexual experience, and experiencing a hangover as a result of drinking) based upon retrospective and prospective estimates of alcohol consumption and consequences.

Method

Participants

The sample consisted of 303 (66% women) college students recruited from introductory psychology courses at a large, public, northwestern university during the first half of the fall quarter. Participants' average (SD) age was 18.7 (1.4) years old. The sample consisted of 77% freshmen, 13% sophomores, 8% juniors, and 2% seniors. The ethnic distribution of the sample was 48% whites, 43% Asian/Asian Americans, 1% each identifying as Hispanics/Latinos and blacks, and 7% of the sample identified themselves as "other." The distribution of living situation consisted of 17.5% fraternity or sorority, 16.5% off-campus housing, 18% with parents, and 48% residence hall.

Procedure

Potential participants, both drinkers and non-drinkers, were informed they would receive extra credit toward their psychology course in exchange for completing a survey that asked a variety of questions about their beliefs and experiences related to drinking. Individuals completed assessments in groups of up to 20 participants in a classroom setting in a controlled environment on campus. Assessments took place during the fall quarter, took approximately 45 minutes to complete, and were scheduled at various times during the morning and afternoon in order to accommodate individuals' schedules. All procedures used in the study were approved by the university's human subjects review board.

Measures

Alcohol-related problems were assessed using the Young Adult Alcohol Problem Severity Test (YAAPST; Hurlbut and Sher, 1992). The YAAPST provides information about drinking-related consequences experienced during the past year in a college student population. Example items found on the YAAPST consist of the following: "Have you had a headache (hangover) the morning after you had been drinking?" and "Have you awakened the morning after a good bit of drinking and found that you could not remember a part of the evening before?" Response options range on a 10-point scale from "never" to "40 or more in the past year." The YAAPST has demonstrated good test-retest reliability ($r = .73$ past year) and internal consistency with coefficient alphas of .83 (past year; Hurlbut and Sher, 1992). For the purposes of this study, we extended the YAAPST to capture information about drinking practices associated with experiencing these consequences. Specifically, if individuals endorsed an item on the

YAAPST, they were asked to list the number of drinks they consumed and the number of hours over which they consumed them the last time they experienced that consequence.

In addition, to assess individuals' tolerance to the effects of alcohol, the item "Felt that you needed more alcohol than you used to use in order to get the same effect" from the Rutgers Alcohol Problems Index (RAPl; White and Labouvie, 1989) was included. The RAPI addresses negative consequences related to alcohol use that occurred within the past 3 months and response options ranged on a 5-point scale from "never" to "more than 10 times."

Perceptions of intoxication were examined using a newly revised measure for use in the present study, extending prior assessment methods (Jaccard and Turrisi, 1987; Turrisi and Jaccard, 1991; Turrisi and Wiersma, 1999), which examined judgments of intoxication related to driving in adolescent and adult populations. Previous assessment methods asked individuals to predict BACs based upon the legal limit to drive using factorially manipulated scenarios consisting of number of drinks, type of alcohol, and time taken to consume. The new measure of perceptions of intoxication provides a social context for drinking relevant to college students and includes several drinking-related consequences frequently experienced by college students. Participants were given 10 scenarios that asked questions such as the following: "Suppose it is a weekend evening and you are at a party where alcohol is being served. You decide to stay at the location for a period of 4 hours. How many drinks would you have to consume in order to experience a hangover the next morning?" Individuals provided an estimate for the number of drinks from 26 individual response options that ranged from 0 to ≥25. Four items on the perceptions of intoxication measure that directly correspond to items on the YAAPST (e.g., vomit, hangover, unwanted sex, blackout) were chosen for the present study. This was to allow for a direct comparison between individuals' perceptions of the amount of alcohol they would need to consume in order to experience a consequence with the actual amount of alcohol they consumed the last time they experienced the same consequence.

Drinking rates were evaluated using a modified version of the Daily Drinking Questionnaire (DDQ; Collins et al., 1985). Participants filled in seven boxes with numbers representing their typical drinking on each day of the week and seven boxes with the corresponding number of hours spent drinking each day of the week, both averaged over the last 3 months. In addition, participants reported their typical drinking frequency, typical drinking quantity, and the single greatest amount of alcohol consumption (peak consumption) and hours spent drinking on that occasion during the past month on the Quantity-Frequency Index (Dimeff et al., 1999). Response options for the assessment of drinking frequency range on a 7-point scale from "I did not drink at all" to "once a day or more."

Demographic information included age, gender, ethnicity, year in school, residence (eg., fraternity/sorority), academic major, grade-point average, height, and weight.

Results

Descriptive analyses

Ninety percent of participants reported lifetime use of alcohol. Sixty-three percent of participants reported consuming one or more drinks on a typical weekend evening during the past month and 29% of the sample reported consuming four or more drinks on a typical weekend evening. In addition, when asked about consequences experienced during the past year, 53% of participants reported experiencing a hangover, 48% stated they had vomited as a result of drinking, 21% reported a regretted sexual experience, and 31% of participants stated they had blacked out as a result of drinking. The proportion of consequences experienced by participants in the sample is consistent with rates found on other college campuses (Perkins, 2002).

Estimated versus actual number of drinks associated with consequences

Our first objective was to evaluate whether students "misperceive" the amount of alcohol they can consume before experiencing negative consequences. Specifically, we defined "misperceptions" as significant differences between the number of drinks students estimated they could consume before experiencing a particular consequence in the future and the number of drinks they actually consumed the last time they experienced that consequence. Accordingly, a series of paired-samples t tests were conducted to evaluate the difference between estimated number of drinks and actual number of drinks associated with vomiting, unwanted sexual encounters, hangovers, and blackouts. For each consequence, all participants who reported that consequence at least once were included in the analyses. This included 146 students who reported vomiting, 70 students who experienced unwanted sexual encounters, 161 students who experienced hangovers, and 94 students who reported having blackouts. It should be noted that there were no gender differences in the number of reported consequences, which is consistent with previous work (e.g., Larimer et al., 1999). Effect sizes (d) for paired-samples t tests were calculated as the mean difference between estimated and reported drinks divided by the standard deviation of the difference (Cohen, 1988).

Results indicated that students consistently overestimated the number of drinks associated with experiencing consequences. Estimated drinks before experiencing future consequences were higher than reported number of drinks preceding past consequences for vomiting ($t = 5.50$, 145 df, $p < .0001$; $d = .45$), unwanted sexual encounters ($t = 3.83$, 69 df, $p < .0001$; $d = .46$), hangovers ($t = 5.56$, 160 df, $p < .0001$; $d = .44$), and blackouts ($t = 9.30$, 93 df, $p < .0001$; $d = .96$). Figure 1 presents means and standard errors for the actual number of drinks individuals consumed the last time they experienced each consequence compared with the number of drinks they estimated needing to drink to experience the same consequence in the future. We also examined gender as a potential moderator of these misperceptions using repeated-measures analysis of variance (ANOVA). Discrepancies did not differ as a function of gender with the exception that, although both men and women overestimated for hangovers, men (mean = 2.22 [4.77] drinks) had a larger discrepancy than women (mean = 1.08 [2.24] drinks; $F = 4.23$, 1/159 df, $p < .05$).

These results suggest that students do not use past experience in estimating the amount of alcohol that would result in the same consequence in the future. Tolerance might be a potential alternative explanation. Students who can drink more than they used to before experiencing consequences might accurately estimate a greater number of drinks required to experience a consequence relative to the past. To explore this possibility, we examined misperceptions as a function of whether students reported needing to drink more than they used to before experiencing the same effects (i.e., tolerance). Repeated-measures ANOVA was used to examine the discrepancy between numbers of drinks associated with past and potential future consequences as a function of tolerance. Tolerance was not significantly associated with discrepancies for any consequence.

Alcohol consumption as a function of overestimating drinks per consequence

Our second objective was to determine whether misperceptions of the amount of alcohol that can be consumed before experiencing negative consequences were associated with drinking behavior. A series of multiple-regression analyses was conducted for each consequence (vomiting, unwanted sex, hangovers, and blackouts) examining drinking (drinks per week, peak number of drinks in past month, typical number of drinks on a weekend evening) as a function of estimated quantity for a given consequence controlling for actual number of drinks consumed the last time the consequence was experienced. In this context, the test of the regression coefficient for estimated number of drinks can be thought of as a misperception

(i.e., the portion of perception that is independent from and exceeds the number of drinks consumed during the prior actual experience).

Table 1 presents regression results examining alcohol consumption as a function of estimated number of drinks one could consume before vomiting, controlling for actual number of drinks consumed the last time one vomited. Results suggest that the more alcohol students perceived they would have to drink before vomiting, the more alcohol they consumed per week, on their peak occasion, and on typical weekend evenings.

Table 1 also presents results examining drinking as a function of misperceptions for unwanted sexual experiences, hangovers, and blackouts. Results were consistent across consequences. The number of drinks students estimated they could consume before experiencing a consequence, controlling for the number of drinks they consumed the last time they experienced the given consequence, was strongly associated with all three consequences for all three drinking indices. Coefficients for the estimated number of drinks needed to experience a consequence were generally larger than coefficients for actual experience.

It is important to note that students were asked to estimate the number of drinks they could consume before experiencing consequences in the context of a 4-hour period. This raised the possibility that the discrepancy between students' actual experience (not bounded by a 4-hour period) and the number of drinks they estimated they could consume before experiencing a consequence in the future might be due to their actual experience having occurred in a shorter time period. To address this issue, we estimated BACs using the Widmark formula, (Watson et al., 1981) based on weight, number of drinks, time spent drinking, and gender, for the last time they experienced each consequence. Similarly, we estimated BAC for estimated drinks to experience each consequence over a 4-hour period. Thus, past and estimated future consequences were examined in terms of BAC independent of time. We repeated all analyses using these estimated BACs, which implicitly control weight and gender in addition to duration of consumption. The results provided identical conclusions to those presented.

Discussion

In the present study, the impact of negative alcohol-related consequences on college students' drinking patterns and perceptions was examined. Our findings build on past research aimed at understanding individuals' assessments of their BACs in response to hypothetical drinking situations and relationship to drinking patterns. Our data revealed that individuals perceived that they could consume more alcohol before experiencing negative consequences compared with amounts they had consumed in the past in relation to similar types of consequences. Students significantly overestimated the number of drinks it would take to vomit, have unwanted sexual experiences, experience a hangover, and black out compared with the actual self-reported number of drinks consumed the last time identical consequences were experienced. In addition, these individuals engaged in more risky drinking practices. Greater misperceptions between the perceived and actual number of drinks to experience consequences were associated with more risky drinking practices. These two findings have significant implications for health and decision making for college students.

Findings from the current study are consistent with previous research in that individuals who experienced a consequence are at risk of experiencing the same consequence in the future. For example, Turrisi and Jaccard (1991) found that individuals who were arrested and convicted for DWI offenses were more likely to overestimate the number of drinks they could consume before exceeding the legal limit to drive. Furthermore, previous research also found that individuals who overestimated the number of drinks they could consume before exceeding the legal limit to drive were more prone to engaging in risk taking and sensation-seeking behaviors

and were more likely to engage in heavy episodic drinking (Jaccard and Turrisi, 1987; Turrisi and Wiersma, 1999). Similarly, the current study found that individuals who had larger discrepancies between the number of drinks they would have to consume to experience the consequence in the future compared with their past actual experience were more likely to engage in risky drinking practices (e.g., consume more drinks during the week, on a typical weekend, and on peak drinking occasions).

Tolerance may provide a plausible alternative explanation for some of the findings. Perhaps students who develop tolerance may be accurate in estimating that they can drink more than they used to before experiencing specific consequences. It is not uncommon for freshmen to increase alcohol consumption during the first year of college and in turn develop tolerance, which results in needing to drink more alcohol to experience the same effects and related consequences. To evaluate this proposition, we examined whether the magnitude of discrepancies between numbers of drinks associated with past and potential future consequences changed as a function of tolerance. We did not find evidence for tolerance as an explanation. Alternatively, misperceiving the amount one can drink before experiencing negative consequences may lead to heavier drinking patterns, which may further lead to the development of tolerance. The relationship between misperceptions and heavier drinking has direct implications for interventions aimed at preventing the development of tolerance and its sequelae.

The findings from this study can inform prevention and intervention programs on college campuses by identifying drinkers who are at the greatest risk for experiencing harm, those who misperceive the number of drinks it takes to become intoxicated or to experience negative consequences. Potentially, there are multiple ways to address this issue in alcohol interventions for college students. Efficacious brief alcohol interventions aimed at this population have utilized personalized feedback (for reviews, see Larimer and Cronce, 2002; Walters and Neighbors, 2005) and this strategy may also be useful to address students' discrepancies between the perceived versus actual amount of alcohol associated with specific consequences. Simply providing feedback about the increase in the number of drinks students think they can consume before experiencing a consequence compared with what they reported the last time they experienced the identical consequence may facilitate a decrease in risky drinking and perceptions of the number of drinks needed to experience negative consequences. Individuals who are asked to anticipate outcomes associated with past consequences and drinking different quantities of alcohol may in turn avoid risky situations in the future by planning ahead and setting limits to how much they drink (Cronin, 1996).

A related strategy might incorporate education about BACs, specifically linking personal BAC with past consequences and potential future consequences. Oftentimes, individuals start drinking with friends and may focus on only the positive aspects of drinking. Unfortunately, negative consequences tend to happen once individuals are impaired and their cognitive processes are restricted. Educating individuals about how much alcohol they can drink before reaching certain BACs and what consequences are associated with those BACs may result in more planning on their part. Previous research, which has attempted to train individuals in estimating intoxication levels (e.g., Huber et al., 1976; Lansky et al., 1978; Lipscomb and Nathan, 1980), might be useful in guiding this latter approach.

The present result should be evaluated in light of limitations of the data and of the design. First, the present study used retrospective self-reports of students' alcohol use and experienced consequences. Individuals reported the number of drinks they remember consuming, which resulted in the experience of negative consequences. Individuals who engaged in higher levels of consumption may not have been able to accurately remember how many drinks they actually consumed due to cognitive impairment associated with high BACs. However, individuals may

be making a conservative estimate of the number of drinks they actually consumed by reporting the number of drinks they recall drinking prior to experiencing decreased cognition (e.g., losing count). Second, the study did not utilize a random sample. Participants were recruited on a volunteer basis through the psychology department subject pool. Third, individuals were asked to make estimations of the number of drinks they would have to consume before experiencing future consequences while they were sober. This is considered a more conservative approach in that individuals' cognitive abilities were not impaired at the time of the assessment. Nonetheless, understanding the role of cognitive impairment in the decision to continue drinking and the ability to judge whether or not one is intoxicated is an important area to pursue. Future research using alcohol-administration techniques may be warranted to follow up on the survey strategy utilized in the current research. An additional limitation is the restricted age range of the sample, consisting primarily of 18- and 19-year-old students. Results may not generalize to older students. Younger students' lack of experience in drinking may be partly responsible for the inaccuracy of their estimates. This may also make this age group a prime target for interventions aimed at correcting misperceptions.

Future research may also be warranted regarding the examination of individuals' perceptions of the number of drinks they would have to consume in relation to both positive and negative drinking consequences. Individuals presumably engage in risky drinking in order to achieve positive experiences they associate with drinking but fail to recognize potential risks. Therefore, it may be useful to work with the individuals to weigh the pros and cons associated with various BACs to more objectively evaluate the effects (and possible consequences) associated with different BACs. In addition, our findings suggest there is an important mismatch in what students believe and what they experience, indicating that students may not effectively learn from their experiences and that their misperceptions can lead to decision making based on faulty information. One possible explanation for this could be that they attribute the determining factors for experiencing the consequence to something other than the amount of alcohol they have consumed. Future studies may address this issue by further exploring to what college students attribute the cause of experiencing negative consequences and how those attributions influence future decisions to drink.

Past research focusing on consequences experienced by college students has examined different groups at risk for experiencing consequences but never on the misperception of the number of drinks needed for experiencing those consequences. This study indicates that college students who experience negative consequences are at greater risk for participating in risky drinking and experiencing similar adverse consequences in the future. Thus, current interventions aimed at reducing high risk drinking in the college student population may be enhanced by highlighting the risk of experiencing specific negative consequences based on past experiences.

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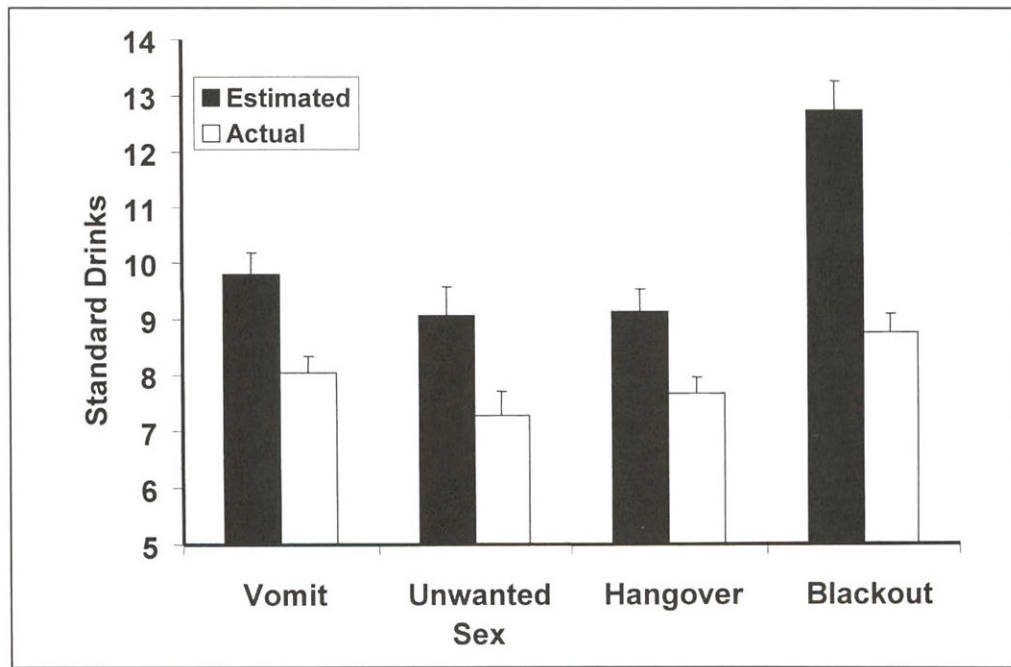
Figure 1.
Estimated versus actual number of drinks associated with alcohol-related negative consequences

Table 1

Alcohol consumption as a function of overestimating drinks for consequences

Outcome	R^2	Actual		Estimated	
		B (SE)	β	B (SE)	β
Vomiting					
Drinks per week	.38	0.46 (0.23)	.16*	1.08 (0.18)	.51‡
Peak consumption	.55	0.47 (0.12)	.29‡	0.66 (0.09)	.53‡
Typical weekend evening	.48	0.26 (0.13)	.19*	0.37 (0.10)	.34‡
Unwanted sex					
Drinks per week	.19	-0.21 (0.42)	-.07	1.24 (0.34)	.47‡
Peak consumption	.36	0.11 (0.20)	.06	0.83 (0.17)	.57‡
Typical weekend evening	.13	0.13 (0.21)	.08	0.39 (0.17)	.30*
Hangover					
Drinks per week	.44	0.87 (0.25)	.30†	0.94 (0.20)	.41‡
Peak consumption	.53	0.47 (0.13)	.29‡	0.61 (0.10)	.49‡
Typical weekend evening	.27	0.14 (0.14)	.10	0.49 (0.11)	.46‡
Blackout					
Drinks per week	.34	1.22 (0.36)	.35†	0.71 (0.24)	.30†
Peak consumption	.55	0.68 (0.16)	.36‡	0.60 (0.11)	.48‡
Typical weekend evening	.26	0.58 (0.19)	.34†	0.28 (0.13)	.24*

*
$p < .05$;

†
$p < .01$;

‡
$p < .001$.