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The event-level impact of one's typical alcohol expectancies, drinking motivations, and use of protective behavioral strategies

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ABSTRACT

Introduction: Much of the past research on the excessive consumption of alcohol by college students has focused on the interplay of individual factors and typical drinking patterns, but this is not adequate to understand behavior as it occurs. The need to understand drinking at the event-level is critical in order to develop event-level prevention. To this end, this study examined a conceptual model of college students' drinking events in order to determine the potential mediating effect of drinking motives and protective behavioral strategies (PBS) in the relationship between alcohol expectancies and event-level alcohol use and consequences.
Methods: An existing data set containing information about 2279 college student drinking events were analyzed for this study. Students completed surveys during the administration of a commercial online alcohol course during 2010 and 2011. A theoretical model was analyzed with structural equation modeling.
Results: Both typical use of PBS and drinking motives mediated the relationship between expectancies and event-level alcohol use and problems. Positive expectancies were associated with greater positive motives, greater motives were associated with less use of PBS, and less PBS use was then, in turn, associated with higher event-level intoxication. Lastly, higher intoxication was associated with more serious consequences during the event.
Conclusion: This is the first study to simultaneously explore the relationship between these factors and event-level drinking. There is a great need to continue to further explore the dynamic nature of drinking at the event-level to illuminate potential leverage points amendable to change.

1. Introduction

The excessive consumption of alcohol by young adults is a major public health concern in the U.S. In national surveys, over 70% of students report consuming alcohol within the past 30 days (Johnston et al., 2011) and approximately 40% of these students have engaged in heavy drinking (i.e., consuming five or more drinks for men or four or more drinks for women in one sitting) during the past two weeks (Johnston et al., 2013). While drinking rates of college students have remained relatively stable over the past two decades, heavy drinking has increased (White and Hingson, 2013) and the consequences of heavy drinking (e.g., assault, vandalism, death) are readily apparent on campuses across the U.S. (Hingson et al., 2009).

Research on college student alcohol use has mostly focused on identifying the etiology of drinking at the individual level. Perhaps problematically, these individual factors (i.e., motivations) are often only compared to typical drinking patterns (i.e., frequency of drinking over a 30-day period), but this provides little insight into how a drinking event may unfold. Virtually all of the problems associated with college student drinking occur either during (e.g., sexual assault, injury, death) or directly after (e.g., hangover, missed work, poor grades) an event. Understanding drinking at the event-level is critical to developing prevention approaches that can be implemented while an individual is drinking. From a prevention standpoint, strategies that may teach students to avoid extreme intoxication make good sense (e.g., presence of food in the stomach can reduce the absorption of alcohol: Cederbaum, 2012; Wilkinson et al., 1977). Nonetheless, to date, no study has examined the mechanisms with which expectancies, motivations, and protective behavioral strategies are related to drinking at the event-level.

During an event, individuals choose to drink alcohol for a variety of interrelated reasons. Individuals have certain notions of what may happen when alcohol is consumed, often defined as their alcohol expectancies (Reich et al., 2010). Alcohol can be associated with internal or external rewards that may facilitate use or negative consequences that inhibit consumption (Goldman et al., 1999). Based on principles of

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Social Cognitive Theory (Bandura, 1977, 1986), individuals develop these beliefs based on their own past experiences, their social experiences, and the dynamical relationship between person, environment, and behavior. One's perception of the effect of alcohol may then inform an individual's intentions, or motivations, to drink at a given moment. At the most basic sense, drinking motives can be defined as the reasons (e.g., to enhance one's mood) an individual decides to consume alcohol (Cooper, 1994). One's expectations for alcohol only influence behavior by their impact on motivations, essentially illustrating that drinking motives are a mediating factor between expectations and drinking behavior (Cooper et al., 1995; Linden et al., 2014; Read et al., 2003).

While it is widely assumed that an individual's drinking behavior is impacted by both expectations and motivations, it is unclear how these factors impact any use of protective strategies. Conceptually, protective behavioral strategies (PBS), or skills an individual can utilize when drinking to mitigate risks, are implemented at the event-level and may mediate the relationship between expectations (Grazioli et al., 2015; Madson et al., 2013), motivations (LaBrie et al., 2011; Martens et al., 2007) and drinking behavior. Strategies can include but are not limited to, eating food, avoiding drinking games, or planning a safe ride home. Excessive drinking will likely occur on college campuses despite prevention attempts (Brower, 2002); therefore, it is practical to teach students to better prepare themselves.

To that end, this study tested a conceptual model that considered the relationship between three main factors (i.e., motives, expectancies, and PBS), potential confounding variables, and event-level alcohol use and problems. The potential mediating role of motivations and PBS in the relationship between expectancies and event-level alcohol-use behaviors were explored. It was expected that expectancies would be associated with event-level alcohol use and problems indirectly through motives which would, in turn, be indirectly related to event-level alcohol use and consequences through typical use of PBS. A visual depiction of the conceptual model is presented in Fig. 1.

2. Material and methods

2.1. Data source and procedure

Data were collected in 2010 and 2011 during the administration of *AlcoholEdu for College* (EVERFI, 2017). More information, including its efficacy, can be found in (Lovecchio et al., 2010; Paschall et al., 2014). Each college self-selected the students who participated in the course. Once the student was introduced to the course, an initial pre-intervention survey was completed. In addition, a supplemental question set (SQS) was available to a randomly selected subgroup of students that instructed participants to recall their last drinking event and to record certain aspects of the event location-by-location (i.e., number of drinks consumed or time spent at each place). EVERFI provided a de-identified data set to the Ohio State University for analysis. Since the analysis was secondary, federal guidelines did not require a full IRB review.

2.2. Sample

The initial data set included 21,760 students who had completed both the baseline survey and the SQS. The goal of this study was to create a large enough data set to test a conceptual model that explained behavior at the event-level and not to describe population norms. Fig. 2 provides a step-by-step depiction of the process which resulted in a final purposive sample of 2279 participants. Participants attended 197 colleges/universities located across 43 states in the U.S. Approximately 42% of the institutions were located in the Northeast, 28% in the South, 16% in the Midwest, and 14% in the West. About two-thirds of the students in this sample (60.82%) attended a public school. Other demographic information is available in Table 1.

2.3. Measures

The survey administered with *AlcoholEdu for College* covers multiple areas, but only the measures/variables used in this study are described below.

2.3.1. Demographics

Age was viewed as continuous and ranged from 18 to 21 years. Since there were few students who identified as an ethnicity other than Caucasian/White (coded as 1), all other categories (i.e., Black/African American, Hispanic/Latino, Asian/Pacific Islander, Native American Indian/Native Alaskan) were combined (coded as 0). Students were also classified as living with their parents (coded as 1), as a member of a Greek organization (coded as 1), or enrolled part-time (coded as 1).

2.3.2. History of drug use

The age when a student first drank to intoxication ranged from 14 to 18 years and was viewed continuously. Participants also provided their past two-week marijuana, tobacco, or other drug (i.e., cocaine, heroin,

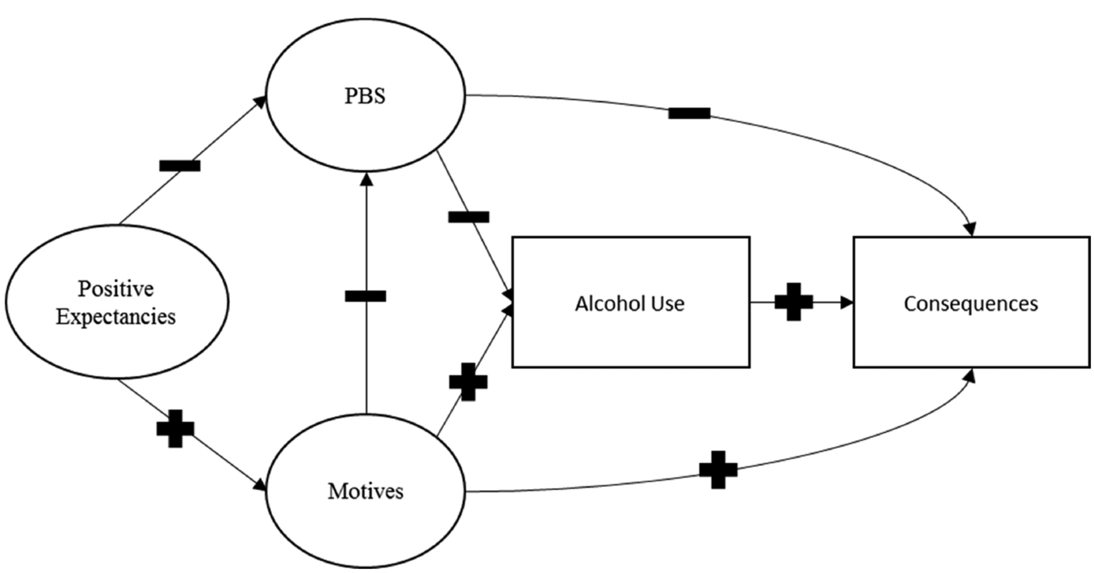

Fig. 1. Conceptual model with hypothesized relationships.
Note: "+" = hypothesized positive relationship; "-" = hypothesized negative relationship.

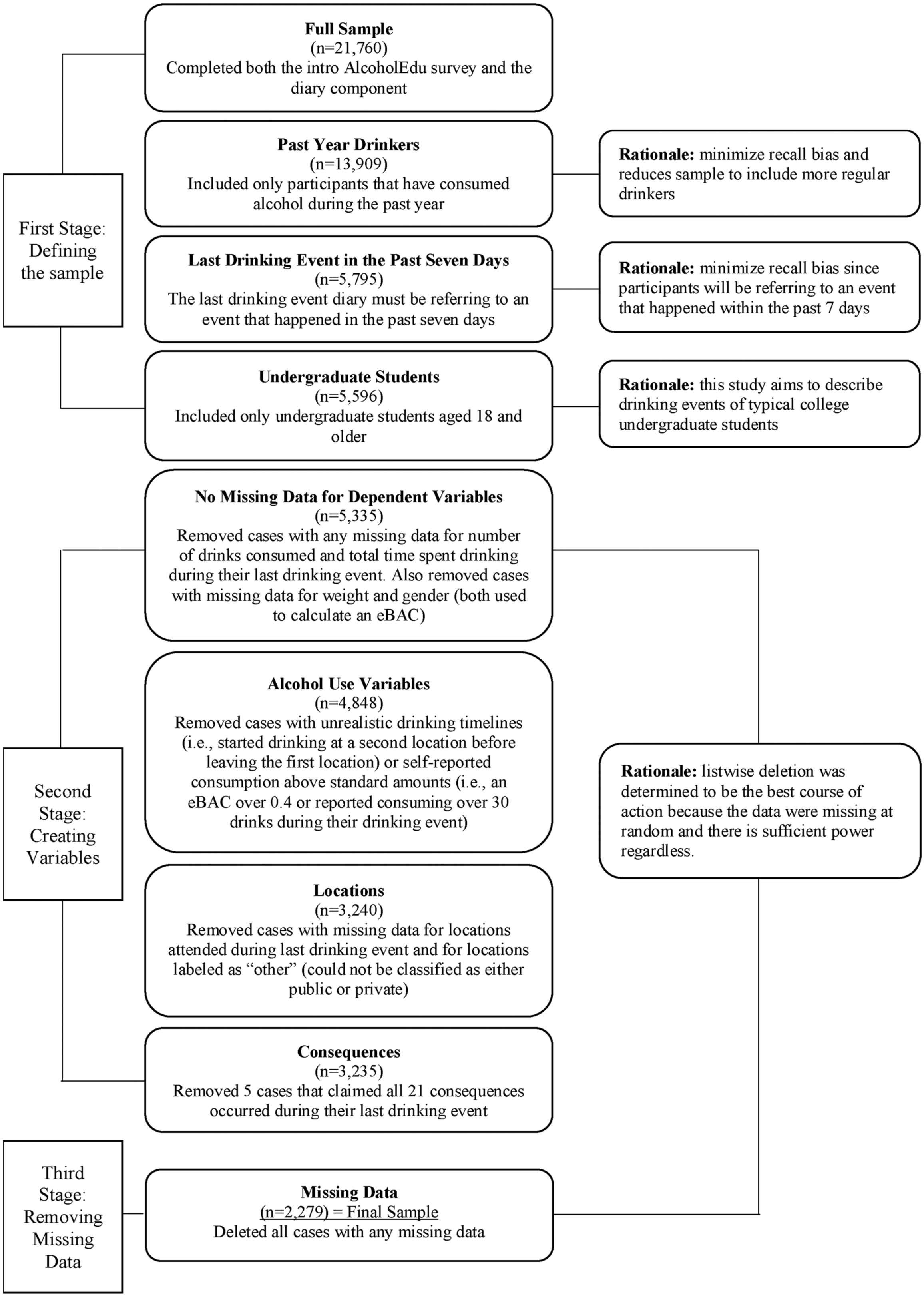

Fig. 2. Reducing the sample.
Note: Steps and rationale to reduce large dataset to desired population.

etc.) use and participants were marked as either consuming one of these drugs (coded as 1) or not (coded as 0).

2.3.3. Genetics

Family history of alcohol use was assessed by counting the number of blood relatives that either classifies as a problem drinker or alcoholic. Responses were heavily skewed towards zero, and therefore responses

Table 1
Variable frequencies for validation sample (n = 1054).

Variable	Frequency (%) / Mean (SD)							
Demographics								
Age *(age)*	18.58 (0.97)							
Age when first drunk *(drunk)*	16.16 (1.31)							
Female *(gender)*	530 (50.3%)							
Caucasian/White *(race)*	921 (87.4%)							
Relatives with alcohol-use issues *(relatives)*	178 (16.9%)							
Greek membership *(greek)*	352 (33.4%)							
Full-time *(enrollment)*	1041 (98.8%)							
Living with parents *(parents)*	57 (5.4%)							
Past two-week tobacco use *(tobacco)*	305 (28.9%)							
Past two-week marijuana use *(marijuana)*	282 (26.8%)							
Past two-week other drug use *(otherdrug)*	88 (8.3%)							
Expectancies ((1) very unlikely to (7) very likely)	1	2	3	4	5	6	7	$\bar{x}$
Feel less stressed *(Expect1)*	83(7.9)	83(7.9)	126(12.0)	212(20.1)	242(23.0)	183(17.4)	125(11.9)	4.42
Feel happy *(Expect2)*	43(4.1)	38(3.6)	93(8.8)	226(21.4)	267(25.3)	227(21.5)	160(15.2)	4.86
Feel more attractive *(Expect3)*	200(19.0)	192(18.2)	191(18.1)	215(20.4)	142(13.5)	74(7.0)	40(3.8)	3.27
Feel more confident or sure of yourself *(Expect4)*	91(8.6)	105(10.0)	151(14.3)	214(20.3)	255(24.2)	153(14.5)	85(8.1)	4.17
Be outgoing in social situations *(Expect5)*	37(3.5)	45(4.3)	92(8.7)	170(16.1)	241(22.9)	260(24.7)	209(19.8)	5.04
Feel connected with the people around you *(Expect6)*	58(5.5)	76(7.2)	125(11.9)	222(21.1)	250(23.7)	220(20.9)	103(9.8)	4.52
Motives ((1) not at all important to (7) very important)	1	2	3	4	5	6	7	$\bar{x}$
Be outgoing in social situations *(Inclusion1)*	165(15.7)	118(11.2)	126(12.0)	190(18.0)	218(20.7)	140(13.3)	97(9.2)	3.94
Feel more attractive *(Inclusion2)*	367(34.8)	212(20.1)	146(13.9)	166(15.7)	97(9.1)	36(3.4)	30(2.8)	2.66
Feel more confident or sure of yourself *(Inclusion3)*	269(25.5)	175(16.6)	149(14.1)	164(15.6)	157(14.9)	94(8.9)	46(4.4)	3.22
Feel connected with the people around you *(Inclusion4)*	185(17.6)	127(12.0)	137(13.0)	210(19.9)	198(18.8)	126(12.0)	71(6.7)	3.73
To celebrate *(Fun1)*	28(2.7)	25(2.4)	82(7.8)	167(15.8)	272(25.8)	303(28.7)	177(16.8)	5.13
To have a good time with your friends *(Fun2)*	30(2.8)	32(3.0)	84(8.0)	153(14.5)	244(23.1)	249(23.6)	262(24.9)	5.22
Protective Behavioral Strategies ((1) never to (7) always)	1	2	3	4	5	6	7	$\bar{x}$
Pace your drinks to 1 or fewer per hour *(Limit1)*	270(25.6)	235(22.3)	194(18.4)	185(17.6)	85(8.1)	52(4.9)	33(3.1)	2.87
Set a limit on how many drinks you'll have *(Limit2)*	217(20.6)	155(14.7)	138(13.1)	174(16.5)	139(13.2)	116(11.0)	115(10.9)	3.64
Alternate non-alcoholic beverages *(Limit3)*	255(24.2)	174(16.5)	161(15.3)	173(16.4)	119(11.3)	71(6.7)	101(9.6)	3.33
Make plans to avoid driving after drinking *(Drive1)*	43(4.1)	29(2.8)	31(2.9)	50(4.7)	62(5.9)	133(12.6)	706(67.0)	6.11
Prevent a friend from driving after drinking *(Drive2)*	42(4.0)	36(3.4)	43(4.1)	65(6.2)	97(9.2)	163(15.5)	608(57.7)	5.90
Use a designated driver *(Drive3)*	36(3.4)	30(2.8)	35(3.3)	65(6.2)	75(7.1)	150(14.2)	663(62.9)	6.05
Last drinking event								
Ratio of time spent at a private location *(private)*	0.91 (0.28)							
Number of locations *(locations)*	1.18 (0.45)							
Estimated blood alcohol content *(eBAC)*	0.08 (0.07)							
Consequences								
None	701 (66.5%)							
Non-serious	205 (19.4%)							
Serious	148 (14.0%)							

for this variable were recoded as categorical and indicated whether (coded as 1) any relative had a problem.

2.3.4. Expectancies

A participant's expectations of alcohol were assessed by asking the participant how likely or unlikely it is that a certain effect would happen if he or she consumed 3 to 4 beverages. Responses were recorded on a Likert scale that ranged from 1 (very unlikely) to 7 (very likely). College students tend to respond more to positive expectancies (Li and Dingle, 2012) and there is not a clear relationship between negative expectancies and alcohol behaviors (Ham and Hope, 2006). Therefore, only seven items that addressed positive expectancies were assessed (less stressed, happy, more attractive, or more confident, being outgoing in social situations, feeling comfortable pursuing an opportunity to have sex, or feeling connected with people around you).

2.3.5. Motives

Motivations for drinking were assessed with the following question: "How important to you is each of the following reasons for drinking alcoholic beverages?" Responses ranged from 1 (not at all important) to 7 (very important). This question included the following twelve items that addressed various motives: to get drunk, because you like the taste, to have a good time with friends, to celebrate, to experiment, to decrease inhibitions, to feel happy, to feel more attractive, to feel more confident, to be outgoing in social situations, to feel comfortable pursuing sex, and to feel connected to people.

2.3.6. Protective Behavioral Strategies (PBS)

Participants checked how often they typically employed a list of twenty PBS. Responses ranged from 1 (never) to 7 (always). PBS can be conceptualized as behaviors that can be implemented before, during, or instead of drinking (Martens et al., 2005). A narrow definition lends itself better to the study of drinking events (Pearson, 2013) and only strategies that are enacted during an event were included such as eating food or pacing drinks, among others.

2.3.7. Peak Estimated Blood Alcohol Content (eBAC)

Blood alcohol content (BAC) reflects the concentration of alcohol in the blood and is measured as grams per deciliter. BACs can be calculated to a close approximation when certain data are available (Hustad and Carey, 2005). The Matthews and Miller (1979) formula was utilized in this study to calculate BAC (see supplementary material). eBACs typically range from 0.0 to 0.3. Participants with an eBAC value over 0.4 were removed from the sample because these values are likely inaccurate and represent dangerous consumption that can be fatal. Values between 0.3 and 0.4 were recoded as 0.3 and any negative values as 0.

2.3.8. Drinking locations

Participants were able to reflect on up to 4 locations attended during the evening. Participants also specified the type of location, and generally, locations can be classified as either private or public. Private locations can be conceptualized as environments with little to no control (e.g., dorm room, Greek house) while public locations have more

Table 2
Exploratory factor analysis for latent variables (exploratory sample n = 216).

Latent variable and observed indicators	Factors	
Motives	Factor 1:	Factor 2:
KMO = 0.75; Bartlett's = χ^2 (15) = 772.37, p < 0.001	Social inclusion	Social fun
Be outgoing in social situations *(Inclusion1)*	0.85	
Feel more attractive *(Inclusion2)*	0.74	
Feel more confident or sure of yourself *(Inclusion3)*	0.98	
Feel connected with people around you *(Inclusion4)*	0.63	
To celebrate *(Fun1)*		0.76
To have a good time with friends *(Fun2)*		0.92
% of total variance	59.65	18.94
Eigenvalue	3.58	1.14
Mean Score (SD)	3.29 (1.53)	5.15 (1.32)
Reliability	α = 0.87	α = 0.81
Protective Behavioral Strategies	Factor 1:	Factor2:
KMO = 0.73; Bartlett's = χ^2 (15) = 335.21, p < 0.001	Safe driving plan	Limit heavy drinking
Pace your drinks to 1 or fewer per hour *(Limit1)*		0.79
Set a limit on how many drink's you'll have *(Limit2)*		0.69
Alternate non-alcoholic beverages *(Limit3)*		0.63
Make plans to avoid driving after drinking *(Drive1)*	0.64	
Prevent a friend from driving after drinking *(Drive2)*	0.75	
Uses a designated driver *(Drive3)*	0.78	
% of total variance	42.87	24.69
Eigenvalue	2.57	1.48
Mean Score (SD)	5.98 (1.37)	3.29 (1.48)
Reliability	α = 0.77	α = 0.71
Expectancies		Factor 1:
KMO = 0.85; Bartlett's = χ^2 (15) = 769.03, p < 0.001		Expectancies
Feel less stressed *(Expect1)*		0.73
Feel happy *(Expect2)*		0.74
Feel more attractive *(Expect3)*		0.71
Feel more confident or sure of yourself *(Expect4)*		0.81
Be outgoing in social situations *(Expect5)*		0.87
Feel connected with the people around you *(Expect6)*		0.75
% of total variance		65.95
Eigenvalue		3.96
Mean Score (SD)		4.27 (1.27)
Reliability		α = 0.86

oversight and alcohol is legally sold (e.g., bar, restaurant, concert) (Clapp et al., 2002). Responses were reclassified as either private or public for analyses based on this distinction. In order to determine the ratio of time spent at a private location instead of a public location, the total time drinking in private was divided by the total time spent drinking.

2.3.9. Consequences

For analyses, consequences during the last event were separated into non-serious and serious domains. Non-serious consequences included hangovers, regretful actions, feeling sick, poor performance on school work or a test, missed work or class, arguments, strained relationships, or embarrassment. Consequences that were deemed to be more serious included passing out, blacking out, injuries, fights, property damage, legal trouble, sexual assault, and driving while intoxicated. An ordinal consequence variable was created based on the responses (i.e., none (0), non-serious (1) or serious (2)) and reflects whether or not a participant experienced any consequence in that domain. Participants that experienced both serious and non-serious consequences were marked as serious only for it is likely that students who experience a serious consequence (e.g., passed out) would also experience a non-serious consequence (e.g., hangover).

2.4. Analysis

The aim of this study was addressed with structural equation modeling. Analyses were performed in three sequential steps: 1) exploratory phase, 2) measurement phase and 3) full structural model. Initially, 10% of the data set (Gorsuch, 1983) was randomly sampled to perform exploratory factor analysis (n = 216). The rest of the sample was then randomly split into two halves. The first half (n = 1009) informed the measurement model and the second half (n = 1054) was utilized as a validation sample to fit the full structural model. Successful randomization was checked with chi-square tests of difference or analysis of variance (Altman, 1985).

All exploratory analyses were conducted in SPSS v.22. In this phase (n = 216), EFA was performed for each latent variable separately utilizing principal axis factoring with an oblique rotation (Promax). The number of factors was determined by scree plot analysis (Cattell, 1966) and eigenvalues with a value over 1 (Kaiser, 1960). Items with loadings less than 0.4 were removed until an adequate and conceptually coherent solution was reached. Data were checked for sampling adequacy using the KMO index (Kaiser-Mayer-Olkin) and Bartlett's test of sphericity. Once a structure was determined to be adequate, the reliability of the latent construct was assessed with Cronbach's alpha.

Structural equation modeling was conducted in Mplus V.7.4. Once potential latent variable factor structure was decided on (based on the EFA results), separate confirmatory factor analyses (CFA) were conducted with each latent variable structure using the measurement sample (n = 1009). In this study, any latent structures with poor fit indices were modified until an appropriate structure was reached. After each separate latent construct had an acceptable fit, all latent variables were thrown into the same CFA without any structured paths or observed endogenous variables. Once adequate, the full SEM was

Table 3
Goodness-of-fit statistics for latent variable measurement model.

Model	Goodness-of-fit indices						
	χ^2	*df*	*p*	RMSEA	RMSEA 90% CI	CFI	TFI
Expectancies							
Initial model	659.11	9	< 0.001	.268	.250–.285	.92	.87
Final model	27.56	6	< 0.001	.060	.038–.083	.99	.99
Motives							
Initial model	387.33	8	< 0.001	.217	.199–.235	.97	.94
Final model	14.83	3	< 0.01	.063	.033–.096	.99	.99
Protective behavioral strategies							
Initial model/ Final model	13.305	8	0.10	.026	.000–.049	.99	.99
Full Measurement Model	718.371	120	< 0.001	.070	.065–.075	.97	.96

analyzed with the validation sample ($n = 1054$). Each main construct or variable was controlled by certain demographic and event-level variables based on prior research. Mediation is evidenced by a significant *indirect effect* (i.e., $p < 0.05$) between the exogenous (i.e., independent) variable and the outcome when the mediating variable is considered but a lack of a significant *direct effect* between the exogenous and outcome variables (Gunzler et al., 2013).

Since normality was an issue and there are categorical indicators, WLSMV (Mean-adjusted weighed least squares) estimation method was utilized. Models were fit with the first indicator variable set to load at 1 (reference variable), and all other variables were freely estimated. Error terms were automatically fixed at 1.0. Though the model chi-square is the standard approach to assess model fit, other fit indices that are more appropriate for this study (i.e., not dependent on sample size or normal distribution) were utilized including the Root Mean Square Approximation (RMSEA), the Comparative Fit Index (CFI), and the Tucker-Lewis Fit Index (TFI). RMSEA values less than or equal to 0.05 represent close fit (Browne and Cudeck, 1993) and CFI and TFI's should have values ideally close to 1 (Hu and Bentler, 1999; Tucker and Lewis, 1973).

3. Results

All exploratory factor analysis results (including retained items) are provided in Table 2.

Goodness-of-fit statistics for the all initial CFAs and the final CFAs are provided in Table 3. More detailed information about the measurement model is provided in the supplementary material.

A visual depiction of the full structural model is available in Fig. 3. The goodness-of-fit indices indicated that the model fit well to the data ($\chi^2 = 1003.80$ (367), $p < 0.001$, CFI = 0.98, TLI = 0.98, RMSEA = 0.041 (90% CI = .038–.044)). Results of the full model are presented in Table 4. Consistent with hypotheses, the endorsement of positive expectancies was positively associated with drinking motives ($\beta = 0.86$, $p \leq 0.001$). Positive motives were related to the less frequent use of PBS ($\beta = -0.62$, $p \leq 0.01$). Furthermore, motives were positively related to event-level alcohol-related consequences ($\beta = 0.19$, $p \leq 0.001$) and typical PBS use was negatively related to event-level alcohol use ($\beta = -0.25$, $p \leq 0.001$). Lastly and as predicted, higher event-level eBAC was positively related to more serious consequences ($\beta = 0.28$, $p \leq 0.001$). Contrary to expectations, positive expectancies were

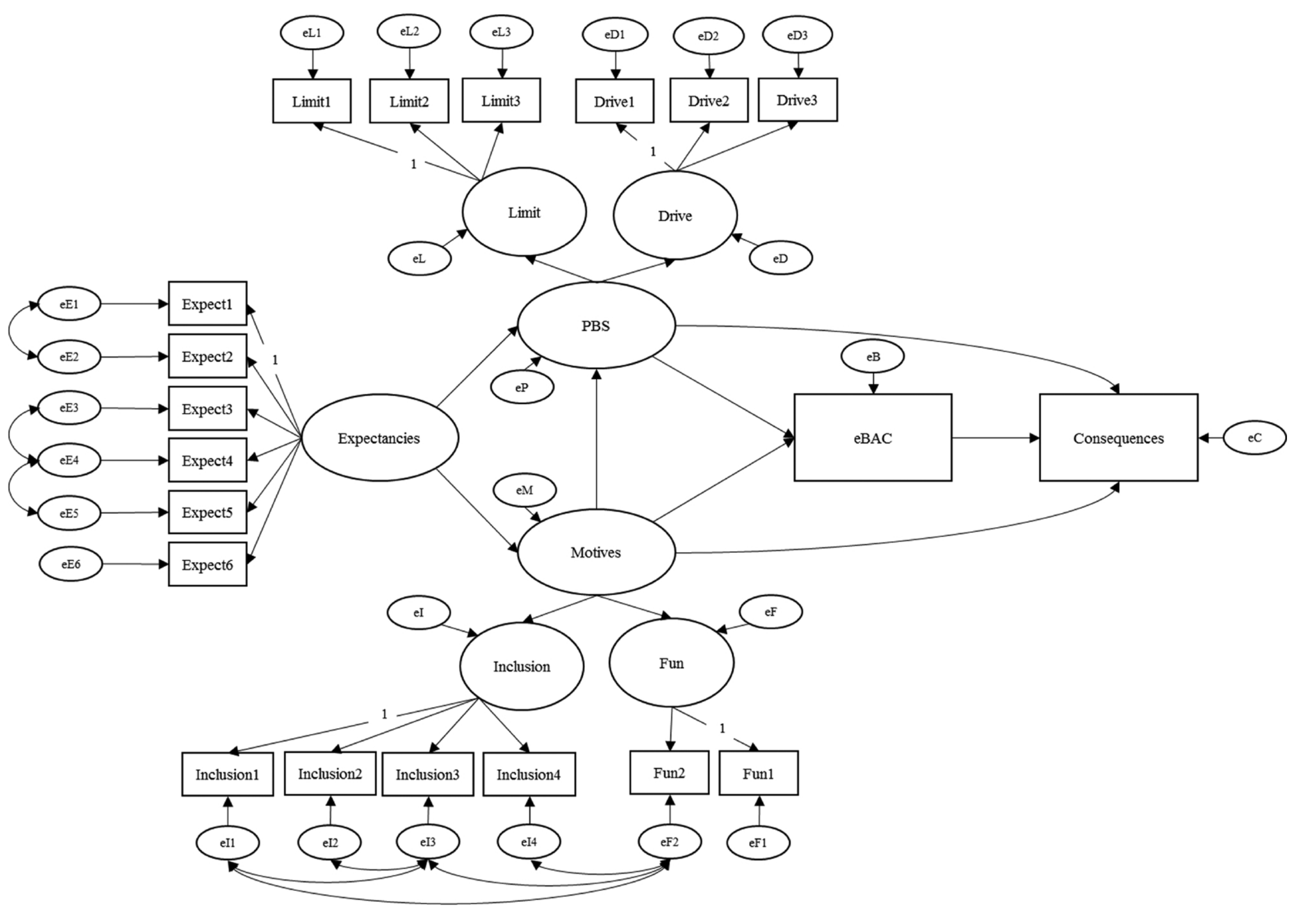

Fig. 3. Full structural equation model.
Note: Covariate relationships are not included.

Table 4
Standardized estimates for full structural equation model (n = 1054).

Parameter	β	SE	p
Latent Variables			
Expectancies			
Expect1	.62	.02	< 0.000
Expect2	.71	.02	< 0.000
Expect3	.70	.02	< 0.000
Expect4	.81	.02	< 0.000
Expect5	.85	.01	< 0.000
Expect6	.81	.01	< 0.000
Social Inclusion			
Inclusion1	.89	.01	< 0.000
Inclusion2	.79	.02	< 0.000
Inclusion3	.86	.01	< 0.000
Inclusion4	.80	.01	< 0.000
Social Fun			
Fun1	.77	.02	< 0.000
Fun2	.94	.02	< 0.000
Limit Heavy Drinking			
Limit1	.77	.02	< 0.000
Limit2	.73	.02	< 0.000
Limit3	.68	.03	< 0.000
Safe Driving Plan			
Drive1	.77	.02	< 0.000
Drive2	.80	.02	< 0.000
Drive3	.92	.02	< 0.000
Motives			
Inclusion	.81	.02	< 0.000
Fun	.60	.03	< 0.000
PBS			
Limit	.91	.12	< 0.000
Drive	.34	.06	< 0.000
Structural Model			
Expect → Motives	.86	.03	< 0.000
Expect → PBS	.46	.20	0.026
Motives → PBS	−.62	.22	0.005
Motives → eBAC	.03	.03	0.380
PBS → eBAC	−.25	.06	< 0.000
Motives → Consequences	.19	.04	< 0.000
PBS → Consequences	−.11	.06	0.063
eBAC → Consequences	.28	.04	< 0.000
Covariates[a]			
Expect			
Age	−.11	.04	0.001
Motives			
Age	−.12	.03	0.001
Gender *(female)*	−.08	.03	0.008
PBS			
Gender *(female)*	.11	.05	0.019
Drunk	.25	.05	< 0.000
Tobacco *(yes)*	−.11	.04	0.012
eBAC			
Age	−.11	.04	0.006
Gender *(female)*	.20	.03	< 0.000
Locations	.40	.02	< 0.000
Consequences			
Marijuana *(yes)*	.10	.04	0.009

[a] only significant covariate parameter estimates are included.

associated with increased use of PBS (β = 0.46, $p \le 0.05$). The indirect relationship between expectancies and event-level consequences was significantly explained by motives, PBS, and eBAC. Specifically, the relationship between expectancies and PBS was mediated by motives, the relationship between motives and eBAC was mediated by PBS, and lastly, the relationship between PBS and consequences was mediated by eBAC. The standardized estimates for the indirect effects are available in Table 5.

Significant paths for both covariate relationships and associations between the main variables are visually illustrated in Fig. 4. Due to our focus on event-level associations, only these are touched on here. Participant's age was negatively associated with eBAC during the last drinking event (β = -0.11, $p \le 0.01$). Female students had significantly higher eBACs during the event (β = 0.20, $p \le 0.001$) than male

Table 5
Standardized estimates for indirect effects.

Indirect	β	SE	p
Effects from Expect to eBAC			
Expect → Motives → eBAC	.02	.03	0.381
Expect → PBS → eBAC	−.12	.06	0.062
Expect → Motives → PBS → eBAC	.14	.07	0.039
Total indirect from Expect to eBAC	.05	.03	0.081
Effects from Expect to Consequences			
Expect → Motives → Consequences	.17	.03	< 0.000
Expect → PBS → Consequences	−.05	.04	0.155
Expect → Motives → eBAC → Consequences	.01	.01	0.383
Expect → PBS → eBAC → Consequences	−.03	.02	0.064
Expect → Motives → PBS → Consequences	.06	.04	0.138
Expect → Motives → PBS → eBAC → Consequences	.04	.02	0.040
Total indirect from Expect to Consequences	.19	.03	< 0.000

$*p < 0.05$, $**p < 0.001$.

students (β = 0.11, $p \le 0.05$). Past two-week marijuana use was positively associated with more serious event-level consequences (β = 0.10, $p \le 0.01$). Lastly, drinking at more locations during a drinking event is positively related to event-level eBAC (β = 0.40, $p \le 0.001$).

4. Discussion

This study examined the mediating influence of motivations and protective strategies on the relationship between expectancies of alcohol use and drinking behavior. Results of this study revealed that both motives and PBS mediate the relationship between event-level alcohol use and behaviors, but each does so in a different manner. While other studies have found that PBS could mediate expectancies and alcohol use (Grazioli et al., 2015; Madson et al., 2013) or that motivations may mediate the relationship between expectations and drinking behavior (Catanzaro and Laurent, 2004; Van Tyne et al., 2012), the results of this study may be at odds with these examples because event-level associations may be inherently different.

In addition to the main causal ordering of the full model, there were a few notable covariate relationships that deserve attention at the event-level. Participants who reported smoking marijuana during the preceding two weeks were more likely to experience severe consequences during their last drinking event. Though this finding is not particularly surprising, there is not a wealth of research that addresses event-level dual substance use. Generally, college students or adolescents who use dual substances are at a higher risk for alcohol and drug problems (Shillington and Clapp, 2006). On the other hand, the association between eBAC and gender was unanticipated. In this study, women had higher event-level eBACs than men. Men tend to report drinking more in the vast majority of research, but recent national data has shown a diminishing trend in the differences between gendered drinking behavior (White et al., 2015). Event-level studies with college students have also found this to be the case (Clapp et al., 2008). The number of locations attended during the drinking event was additionally associated with eBAC. Specifically attending more locations have not been directly connected to eBAC at the event-level in any past studies, but the existence of a relationship makes sense. The time spent drinking during the event is likely increased when an individual switch to multiple locations. If the duration of the drinking period is longer, more alcohol is likely consumed, and thus the individual is more intoxicated.

The results of this study illustrate that it is important to consider the varying nature of these relationships in the context of a single drinking event. In reality, expectations of alcohol may be more stable, but both the type and influence of a motive may fluctuate across events or within events (Smit et al., 2015). New research that focuses on the complex nature of drinking events with computer simulations has begun to provide justification that decision-making (likely based from one's

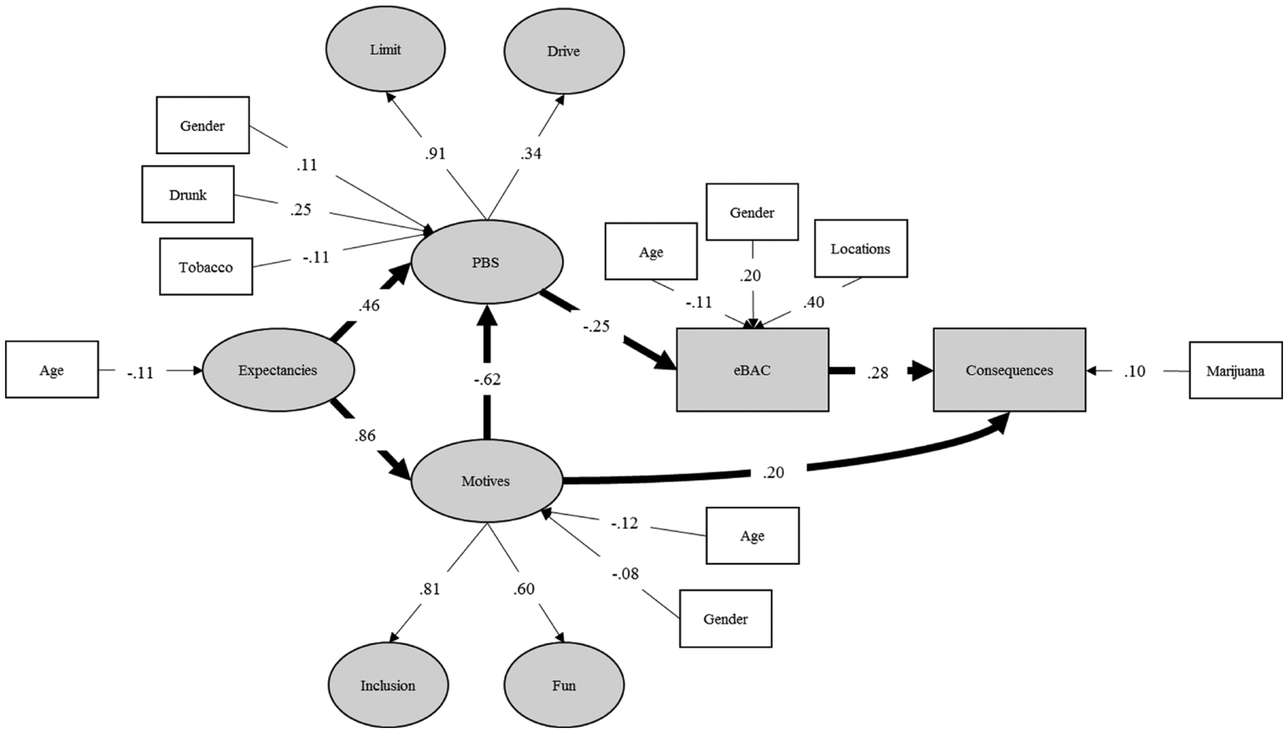

Fig. 4. Significant structural paths.
Note: Relationships found in full model including important covariates.

motivations) during an event is dynamical (Giraldo et al., 2017). Use of PBS during an event may also be dynamic. Due to how alcohol is metabolized, it is often difficult for individuals to subjectively assess their level of intoxication (Martin and Earleywine, 1990) at a given moment. Even if individuals have the best intentions to enact protective strategies, their inability to correctly assess their current intoxication or predict their level of drunkenness for the remainder of the event may preclude the use of protective measures. Unfortunately, it is not possible to determine why participants in this study chose to consume alcohol during their last drinking event, whether motivations fluctuated as the event progressed, or which, if any, protective strategies were utilized. What is apparent, however, is the need to consider protective strategies and their mediating influence between one's intentions and actions. Individuals who tend to use more PBS generally experience less alcohol-related problems, but little is known about how these strategies may be successfully employed in real-time.

There are a number of limitations that should be considered when reviewing these results. Validated scales were not utilized to measure motivations, expectancies, or PBS though such scales do exist. In an exploratory analysis, all factors had acceptable reliability (i.e., a Cronbach's alpha greater than 0.7). Although often quite similar, the items did not mirror those included in more common questionnaires, and results here may be inconsistent due to differences in measurement, even though scales were shown to be reliable in this case (Prince et al., 2013). All survey items included in this study were based on self-report and even though generally reliable and valid (Del Boca and Darkes, 2003), the act of drinking may have impacted a participant's memory. Participants are prone to either overestimate the time spent drinking or underestimate the number of drinks consumed (Sommers et al., 2002). A peak estimated BAC only gives an idea of the level of intoxication a person may have reached and it glosses over the dynamic nature of how alcohol is metabolized (Giraldo et al., 2017). Furthermore, while this study only relied on very recent recall (i.e., an event that occurred in the preceding 7-days), participants may still not adequately remember their actions. Future research in this area should leverage the use of more objective measures of intoxication, such as transdermal alcohol monitors that can provide a near continuous reading throughout an event.

The data additionally missed some important aspects of a drinking event that may impact intoxication. Most notably, there was little available information about the environment in which individuals consumed alcohol. The type of environment was addressed, but no information was requested beyond this detail which ignores the true complexity of context. In order to improve the lack of event-level data in future studies, participants can be repeatedly surveyed while drinking with the use of ecological momentary assessments (EMA). EMA methods can maximize ecological validity and allow researchers to sample important temporal features of risk behavior as it occurs (Smyth and Stone, 2003). Lastly, this study relied on data collected in 2010 and 2011, and although dangerous event-level drinking rates have not declined among college students over the past decade (SAMHSA, 2011), there is a possibility there is a difference in behavior among this population compared to current students.

This study underscores the importance of looking at all cognitive factors in combination in order to understand how behavior may unfold within the context of a single drinking event. We cannot hope to develop real-time interventions unless we know how these factors impact event-level drinking. This is the first study to date that has explored the relationship between typical expectancies, motives, and PBS to drinking at the event-level. The intention to drink and the actual decision to drink are influenced by much more than the presence of alcohol. Future studies should continue to explore drinking events by leveraging new advances in technology and further delving into the dynamic and complex nature of drinking behavior.

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Contributors

Dr. Clapp conceptualized and assisted in designing the study (data reduction and conceptual model). Dr. Madden cleaned and analyzed the dataset as well as drafted the initial manuscript. All authors revised and approved the final manuscript as submitted and agree to be accountable for all aspects of work.

Conflicts of interest

No conflict declared.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.drugalcdep.2018.08.032.

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