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Occasion-level investigation of playing drinking games: Associations with cognitions, situational factors, alcohol use, and negative consequences among adolescents and young adults

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Abstract

The present study examined occasion-level associations between cognitions (willingness to drink, descriptive norms, and injunctive norms) and situational factors (familiarity with people and locations) with playing drinking games (DGs) among adolescents and young adults. Further, this study tested the associations between playing DGs, the number of drinks consumed, and the negative consequences experienced at the occasion level. Participants were 15–25-year-olds (N = 688; 43% male, 47% White, Non-Hispanic, Mean age = 21.18) who were part of a longitudinal ecological momentary assessment (EMA) study on cognitions and alcohol use. The study design consisted of a 3-week EMA burst design (8 surveys per week) that was repeated quarterly over the 12-month study (up to 2x/day) per participant. Multilevel models showed that occasion-level risks (higher willingness, higher descriptive norms, and less familiarity with people) were associated with playing DGs. When examining the within-person associations between DGs and number of drinks, results showed that playing DGs was associated with consuming more drinks. For consequences, DGs were not uniquely predictive of experiencing more consequences and riding in a vehicle with a driver who had been drinking. This study contributes to the literature by examining associations between cognitions and situational factors with DGs and the role DGs play in experiencing negative consequences among a diverse sample of adolescents and young adults.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Keywords

Drinking games; Alcohol; Consequences; Adolescents; Young adults; Occasion-level

1. Introduction

Drinking games (DGs) are defined as social heavy-drinking activities centered around performing mental and/or physical tasks according to a set of rules (Zamboanga et al., 2013, 2021). Half of all college students in the United States report playing a DG in the past month (Diulio et al., 2014) and 30 % of high school students who consume alcohol at least monthly report playing DGs at least once in the past month (Borsari et al., 2013). These rates are concerning given that playing DGs is associated with greater alcohol consumption and more consequences (e.g., Clapp, Reed, & Ruderman, 2014; Hoyer & Correia, 2022; Ray, Stapleton, Turrisi, & Mun, 2014; Zamboanga et al., 2014, 2021). The majority of DG research relies on reports of most recent drinking occasions and/or typical behavior (e.g., Haas, Lorkiewicz, & Zamboanga, 2019; Hoyer & Correia, 2022; Tomaso et al., 2015). As such, these studies do not assess variation across occasions, and therefore these studies cannot test: (a) whether alcohol consumption and consequences are more likely on days when an individual plays DGs compared to days when the same individual does not, or (b) whether playing DGs on a given day is more likely based on the presence of certain situational or cognitive factors. Although limited, the existing occasion-level research examining DGs indicates that on days when DGs are played, the odds of alcohol use are elevated (e.g., Fairlie et al., 2015, 2016; Pedersen & LaBrie, 2006; Ray et al., 2014). Despite the emerging findings, there is a need for additional research examining event-specific DG predictors and consequences (Zamboanga, Newins, & Cook, 2021). This should include examining particularly risky consequences such as driving while impaired and riding in a vehicle with an impaired driver, which may depend on situational factors (Hultgren, Waldron, Mallett, & Turrisi, 2021). Moreover, these are especially dire consequences associated with alcohol use given that vehicle crashes are the leading cause of death among young adults aged 18–24 in the U.S. (Centers for Disease Control and Prevention, 2020) and that approximately 35 % of vehicle fatalities for young adults occur when the driver is impaired (Administration, 2018).

Understanding what factors are associated with playing DGs or consequences resulting from playing DGs has potential to suggest important intervention targets (Zamboanga et al., 2021). Potential predictors of playing DGs may include an individual's cognitions, such as willingness to drink, descriptive alcohol norms (perceived amount), and injunctive alcohol norms (perceived approval) on a given day. Both cross-sectional and experimental research support perceived drinking norms and willingness as important correlates of DGs (Anderson, Garcia, & Dash, 2017; Moser, Pearson, Hustad, & Borsari, 2014). It is possible that similar patterns between cognitions and playing DGs may emerge at the occasion level. Another potential factor that may be associated with the likelihood of playing DGs at the occasion level is how familiar certain situational cues are, such as the familiarity with both the location and people present on a given occasion. Given that people may play DGs for social reasons, including as a way to meet people (McInnes & Blackwell, 2021), it is

possible that in new (or unfamiliar) locations and with less familiar people, individuals may be more likely to play DGs in order to facilitate social interaction and belonging. Although not specific to DGs, a *meta*-analysis (Fairbairn, 2017) indicated that alcohol significantly enhanced social and emotional experiences among unfamiliar individuals relative to familiar individuals. Alcohol may act as a social lubricant and may be perceived as more important in unfamiliar settings, leading to greater subjective rewards when in unfamiliar locations and/or with unfamiliar people. Thus, individuals may choose to play DGs as a means to meet people in order to increase subjective rewards in novel social settings.

DG research among non-college samples is limited, with 28 out of the 31 studies included in a recent *meta*-analysis being comprised of college or incoming college samples (Zamboanga et al., 2021). Given that adolescents and non-college young adults are at risk for heavy alcohol consumption and consequences (Hingson et al., 2017; Patrick, Terry-McElrath, Evans-Polce, & Schulenberg, 2020), expanding DG research to adolescents and non-college young adults has potential to significantly advance the field. In addition, DGs research has been conducted in predominately White samples (Zamboanga et al., 2014), and only a handful of studies have examined ethnic/racial differences in relation to DGs (e.g., LaBrie, Ehret, & Hummer, 2013; Pedersen & LaBrie, 2006; Wegner, Roy, DaCova, & Gorman, 2019), suggesting a need for research among more diverse samples.

1.1. The current study

This study aims to examine occasion-level associations between cognitions [willingness to drink that evening, descriptive norms (i.e., perceptions about how much their friends will drink that evening), injunctive norms (i.e., friends' perceived approval of drinking to intoxication that evening)] and situational factors (familiarity with people and locations) with playing DGs among adolescents and young adults. In addition, this study will examine whether playing DGs is associated with alcohol use and experiencing negative consequences at the occasion level. First, across drinking days, we expect that when participants report greater than average willingness to drink, descriptive alcohol norms, and injunctive alcohol norms, they will be more likely to report playing DGs (H1a). Moreover, we hypothesize that on days participants are in a less familiar location or with less familiar people when they are drinking, they will be more likely to report playing DGs (H1b). Finally, relative to drinking days when DGs were not played, we expect that on days participants played DGs, they will report a greater number of drinks (H2a) and more negative consequences (H2b), and they will also be more likely to report driving after drinking (H2c) and riding with a driver who had been drinking (H2d).

2. Method

2.1. Participants

Participants were part of an ongoing longitudinal measurement burst ecological momentary assessment (EMA) study reporting cognitions and alcohol use in a 3-week EMA burst design (8 surveys per week) that was repeated quarterly across 12 months, with an additional longer-term assessment at 12-months (N = 688). Key eligibility criteria for the larger study included (1) 15 to 25 years of age; (2) if age 18 or older: drink alcohol at least once a month

(over the last 6 months); if age 15–17: no drinking criteria in order to better capture drinking willingness in addition to drinking intentions among adolescents for the larger study's aims; and (3) reside in Texas.

Data for the current study comes from baseline and EMA Bursts 1–4 with data collection ongoing. The current analytic sample consists of 688 participants (see Table 1 for demographic characteristics) who had completed baseline, completed training, and started Burst 1 (with morning and afternoon surveys). Only drinking days were included in the analyses, and all measures come from the morning survey.

2.2. Procedure

The University's Institutional Review Board approved procedures and no adverse events occurred. Recruitment was conducted in Texas and interested individuals completed a brief online eligibility survey. Individuals 15–17 years old who completed the survey were required to provide contact information for at least one parent. Electronic consent for the teen's participation was obtained from one parent/guardian. Participants could earn up to $408 across all phases of study participation.

The EMA protocol started the first Thursday after completion of a training session. Participants completed 4 EMA bursts that occurred quarterly over 12 months. Each burst consisted of surveys on 3 consecutive weekends plus two random weekdays (up to 8 surveys per week). Participants received email and text messages to complete 2 surveys (morning and afternoon) on both Friday and Saturday, 1 survey (afternoon) on Thursday, and 1 survey (morning) on Sunday. Participants chose a 3-hour window between 6 am-12 pm to complete the morning survey, and the window could differ for weekdays and weekends. The afternoon survey was completed in a 1-hour window that occurred randomly anytime within the designated block of 1 pm to 6 pm. For all three weeks in each burst, participants received a single afternoon survey on a random weekday between Monday and Wednesday, which was always followed by a morning survey the next day.

2.3. Measures

2.3.1. Drinking willingness—Drinking willingness for the upcoming evening was measured with four items on a scale from 0 = *Not at All Willing* to 4 = *Extremely Willing* (Lewis et al., 2020; LoParco et al., 2021). Items asked about willingness to: drink with people you don't know; drink something when you are unsure of what is in it; get drunk; and drink until blacking out (not being able to remember large stretches of time while drinking heavily). A mean score was calculated.

2.3.2. Descriptive drinking norms—A single item assessed descriptive drinking norms: "On this [DAY OF SURVEY, e.g., Friday] night, thinking of your friends, what is the maximum number of drinks you think they will individually consume?" (Lewis et al., 2020; LoParco et al., 2021). Responses ranged from 0 = *0 drinks* to 15 = *15 or more drinks*.

2.3.3. Injunctive drinking norms—Two items assessed injunctive drinking norms (Lewis et al., 2020). Participants indicated: "On this [DAY OF SURVEY] night, your friends

think that: “Getting drunk would be” and “Drinking until blacking out (not being able to remember large stretches of time while drinking heavily) would be” using a response scale from 0 = *Very Bad* to 4 = *Very Good*. A mean of the two items was used for analyses.

2.3.4. Familiarity with locations and people—One item assessed familiarity with locations by asking “How familiar are you with the locations you were at yesterday?” and one item assessed familiarity with people by asking “How familiar are you with the people you were with yesterday?” Both items had response options from 0 = *Not at All Familiar* to 4 = *Very Familiar*. Items were analyzed separately.

2.3.5. Alcohol use yesterday (Number of Drinks)—Each morning, participants were asked “Since the time you woke up to the time you went to sleep yesterday, did you drink alcohol?” with responses 0 = *No* and 1 = *Yes*. On days that participants endorsed drinking, they were asked “How many drinks did you consume yesterday?” with responses from 1 = *1 drink* to 15 = *15 or more drinks*.

2.3.6. Drinking games yesterday—On drinking days, one item asked “Yesterday, did you play drinking games?” with responses 0 = *No* and 1 = *Yes*.

2.3.7. Alcohol consequences yesterday—Twelve items assessed alcohol-related consequences (Lee et al., 2017). On drinking days, participants were asked “Did any of the following things happen to you yesterday while you were drinking or today because of your alcohol use yesterday?” Example items are “I had a hangover” and “I became aggressive.” Participants responded 0 = *No* and 1 = *Yes* for each consequence and a sum score was calculated.

2.3.8. Alcohol-related driving/riding yesterday—Two items assessed alcohol-related driving/riding. First, on drinking days, participants were asked “Yesterday, did you drive a car/motor vehicle within 3 h after drinking alcohol?” with responses 0 = *No* and 1 = *Yes*. Second, every day regardless of their own drinking, participants were asked “Did you ride in a car/motor vehicle with someone who was driving within 3 h after they were drinking alcohol yesterday?” with responses 0 = *No*, 1 = *Yes*, and 2 = *I don’t know*. Days with “I don’t know” (n = 57 days) were removed from the analyses.

2.3.9. Daily covariates—Daily-level covariates were Weekend (coded 1 = *Friday or Saturday* and 0 = *Otherwise*; Merrill, Boyle, Jackson, & Carey, 2019; Thrul, Lipperman-Kreda, & Grube, 2018), Month (coded from 0 = *January* to 11 = *December*), Week in Burst (coded *0–2*), and Burst (coded *0–3*).

2.3.10. Baseline covariates—Participants reported age and biological sex assigned at birth (coded 0 = *Female* and 1 = *Male*). The question for student status asked “Are you currently a student?” with responses 0 = *No* and 1 = *Yes*. Race and ethnicity were recoded into five groups for analyses: White, Non-Hispanic (NH) [reference group]; Asian/Asian American, NH; Black or African American, NH; Hispanic/Latino(a); and Other.

2.4. Analytic plan

As reported in the morning survey, willingness, descriptive norms, and injunctive norms all referenced beliefs about the upcoming evening. Familiarity with people and locations, alcohol use, DGs, and consequences were all in reference to the previous day. These variables were lagged to match drinking, consequences, and context to the prior day's cognitions.

Due to the multilevel data structure of the EMA design where days (Level 1) are nested within people (Level 2), generalized linear mixed models with a random intercept for participants were performed to test each aim. The analytic sample included all days with any alcohol use (4,194 alcohol days nested in 688 people). For Hypotheses 1a and 1b, a mixed effects logistic model was fit to evaluate whether willingness, descriptive norms, injunctive norms, and familiarity with locations and with people were associated with playing DGs (binary outcome). For Hypothesis 2, playing DGs was used as a predictor for four different outcomes: (a) number of drinks estimated with a mixed effects zero-truncated negative binomial model (count outcome starting at 1), (b) number of alcohol consequences estimated with a mixed-effects zero-inflated negative binomial (count outcome with excessive zeros), and (c and d) alcohol-related driving and also riding with someone who had been drinking were both estimated with a mixed effects logistic model (binary outcomes). For each of the latter three outcomes, we estimated models with number of drinks as a covariate to evaluate the effect of playing DGs above and beyond alcohol use.

In each model, at Level 2, the predictors were grand-mean centered, allowing estimates for the effects of changes in participant-level means. At Level 1, the predictors were centered within-person to test daily fluctuations from a participant's own mean (Enders & Tofighi, 2007). Age, birth sex, student status, race/ethnicity, weekend/weekday, week in burst, month, and burst number were included as covariates in all models. Burst was included in models as a control for time, given that the four bursts occurred over the course of 12 months and DG and alcohol use behaviors may have changed in relation to the passage of time. The continuous covariates were mean centered in each model (Brauer & Curtin, 2018).

3. Results

3.1. Descriptive information

Table 1 provides descriptive statistics for all key variables.

3.2. Cognitions and context as predictors of playing drinking games

Table 2 shows the results for Hypotheses 1a and 1b, testing associations between cognitions and context with playing DGs. Across drinking days, within-person results indicated that when participants had elevated (i.e., higher than their own average) willingness to drink and descriptive norms, they were more likely to play DGs. Results also showed that on drinking days with less familiar people, individuals were more likely to play DGs. Injunctive norms and familiarity with drinking location were not associated with playing DGs. Between-

person results indicated that individuals who were younger, had higher willingness, and had higher descriptive norms tended to play DGs.

3.3. Playing drinking games as a predictor of number of drinks

Table 3 shows the results for Hypothesis 2a testing the association between playing DGs and number of drinks consumed. Within-person results indicated that on drinking days that DGs were played and also on weekends, more alcohol was consumed. Between-person results indicated that males, those who reported being Hispanic (compared to White, Non-Hispanic), and those who played DGs more across the study tended to report consuming more drinks.

3.4. Playing drinking games as a predictor of number of negative consequences

Table 4 shows the results for Hypothesis 2b testing the association between playing DGs and negative consequences. At both the between- and within-person level, playing DGs was not associated with experiencing more consequences (i.e., count portion in top half of table and logistic portion in bottom half). Within-person results indicated that on days with higher alcohol use, individuals reported both a lower likelihood of any alcohol consequences (i.e., logistic portion in bottom half of table) and a higher number of consequences (i.e., count portion in top half of table). Between-person results indicated that individuals who had higher alcohol use tended to report more alcohol consequences (i.e., count portion in top half of table); further, individuals who were female, younger, reported being Non-Hispanic Asian, Non-Hispanic Black, or Hispanic (compared to White Non-Hispanic) tended to report more alcohol consequences (i.e., count portion in top half of table).

3.5. Playing drinking games as a predictor of alcohol-related driving and riding

Table 5 shows the results for Hypotheses 2c and 2d testing associations between playing DGs and alcohol-related driving and riding. For the driving outcome, neither the within-person nor between-person effects of playing DGs were significant. Between-person results indicated that individuals who were older tended to drive after drinking. For the riding outcome, between-person results indicated that individuals who were female, Non-Hispanic Black, Non-Hispanic Asian, and Hispanic (compared to Non-Hispanic White) tended to ride in a car with a driver who had been drinking. At both the between- and within-person levels, playing DGs was not associated with riding with someone who had been drinking.

4. Discussion

Overall, findings showed that variability in occasion-level cognitions and situational factors, namely willingness to drink, descriptive norms, and familiarity with people, were each associated with playing DGs. Being with less familiar people was associated with increased likelihood of engaging in DGs, but familiarity with location was not associated with playing DGs. Given that past research suggests people may play DGs for social reasons, including as a way to meet people (McInnes & Blackwell, 2021), and that drinking with unfamiliar people may lead to greater subjective rewards (Fairbairn, 2017), these results are not entirely surprising as individuals in these environments may play DGs as a way to increase social

facilitation and perceived social rewards. Notably, we did not find any effects of familiarity with drinking location.

Consistent with the literature (Fairlie et al., 2015, 2016; Pedersen & LaBrie, 2006; Ray et al., 2014), this study found that days with DGs were associated with greater number of drinks than days without DGs. When controlling for number of drinks consumed, playing DGs was not associated with the number of consequences that day or riding in a vehicle with a driver who had been drinking; however, number of drinks consumed was related to more consequences and with riding with a driver who had been drinking but not driving after drinking. This finding may be in part due either to individuals not being aware of or underestimating the alcohol consumption of their peers, thus making it more likely they would choose to ride with someone else whose alcohol use may not be known attempt to drive themselves. Notably, when it comes to deciding to ride in a car with a driver who had been drinking, it comes down to how much alcohol is consumed, regardless of whether a DG was played.

Results supported that individuals who were younger tended to play DGs. Sex, race, ethnicity, and student status were not associated with playing DGs. These findings suggest that interventions could target individuals starting at a young age to prevent engaging in DGs. Additionally, female individuals and those who were younger tended to report higher number of consequences. This may be due to women generally achieving higher blood alcohol concentrations than men at equivalent consumption levels (Mumenthaler et al., 1999). Moreover, younger individuals may have less experience with alcohol and lower tolerance. Thus, these individuals may be at increased risk for consequences on occasions when they drink heavily due to lower tolerance. Finally, individuals who were older tended to drive after drinking and individuals who were female, Non-Hispanic Asian, Non-Hispanic Black, and Hispanic (compared to Non-Hispanic White) tended to ride in a car with a driver who had been drinking.

4.1. Clinical implications

Individual-level intervention approaches could consider incorporating risk information about cognitions associated with DGs. For example, “Avoid playing drinking games” is often a protective behavioral strategy provided in personalized feedback interventions, thus just-in-time interventions could highlight riskier days (days with increased willingness or descriptive norms) or situations (days drinking with less familiar people) to help individuals decide whether or not to play DGs. As interventions are developed to have greater occasion-level focus and with the development of just-in-time interventions using mobile platforms or applications, the ability to target occasions that have demonstrably more risk is a promising strategy. For example, texting protective behavioral strategy messages targeting not playing drinking games could be done on days with increased willingness and descriptive norms. Moreover, the present findings suggest that the current protective behavioral strategy components typically included in brief interventions should also strengthen their focus on avoiding riding in a vehicle with a driver who has been drinking. Motivations to have a designated driver (e.g., not get in legal trouble) might differ from motivations for not riding in a vehicle with a driver who has been drinking (e.g., stay safe). Further, some

individuals may choose to ride with an intoxicated driver in order to not drive while intoxicated and be at risk for legal consequences. Determining motivations for using and not using a designated driver can help connect the most optimal and personalized motivational messages for individuals at risk for not using a designated driver or riding in a vehicle with a driver who has been drinking. Thus, additional research is needed on interventions that incorporates both person and occasion-level intervention content.

4.2. Limitations and conclusions

While sex, race, ethnicity, and student status were not associated with playing DGs, we know from prior research that these demographic characteristics are associated with alcohol use and consequences. Thus, this should be taken into consideration when comparing the current findings to other samples with different demographic characteristics. In addition, we assessed whether or not participants played DGs, but we did not assess how long DGs were played that day or what *type* of games were played as the daily design of the present study limited the number of questions assessed in order to ease participant burden. Despite limitations, the present study contributes to the literature by examining occasion-level associations between cognitions and situational factors with DGs among adolescents and young adults in a diverse population and the role DGs play in experiencing negative consequences.

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Data availability

Data will be made available on request.

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Table 1

Descriptive Statistics for Key Variables.

Predictor	*N* (days or people)	*M* (*SD*) or n (%)	Range
Daily-Level			
Willingness	4147	0.76 (0.74)	0–4
Descriptive norms	4019	5.82 (3.05)	0–15
Injunctive norms	4046	1.71 (0.78)	0–4
Familiarity with location	4169	3.17 (1.18)	0–4
Familiarity with people	4160	3.42 (0.97)	0–4
Played drinking games (days endorsed)	4159	333 (8%)	0–1
Number of drinks	4136	3.41 (2.65)	1–15
Number of total alcohol consequences	4168	0.58 (1.30)	0–10
Drove after drinking (days endorsed)	4139	662 (16 %)	0–1
Rode in a car with a driver who had been drinking (days endorsed)	4088	572 (15 %)	0–1
Person-Level			
Sex (male biological sex)	688	296 (43 %)	0–1
Age	688	21.18 (2.67)	15–25
Student	683	464 (68 %)	0–1
Race	683		
White, NH		321 (47 %)	
Asian, NH		79 (12 %)	
Black, NH		60 (9 %)	
Hispanic		196 (29 %)	
Other		27 (4 %)	
Willingness	684	0.74 (0.60)	0–2.89
Descriptive norms	674	5.51 (2.81)	0–15
Injunctive norms	675	1.70 (0.70)	0–4
Familiarity with location	685	3.15 (0.84)	0–4
Familiarity with people	684	3.37 (0.73)	0–4
Number of drinks	680	3.21 (2.04)	1–15
Number of total alcohol consequences	685	0.60 (1.03)	0–9

Note. NH = Non-Hispanic.

Table 2

Multilevel Model Testing Associations Between Cognitions and Context With Whether Drinking Games Were Played.

	Odds Ratio	95 % CI *LL, UL*
Intercept	0.02***	0.01, 0.05
Daily-Level		
Weekend	1.85	0.94, 3.62
Month	1.08	0.94, 1.24
Week	1.04	0.91, 1.18
Burst	0.91	0.79, 1.05
Willingness (CWP)	1.81***	1.42, 2.30
Descriptive norms (CWP)	1.08*	1.00, 1.15
Injunctive norms (CWP)	1.03	0.79, 1.33
Familiarity with location (CWP)	1.11	0.96, 1.29
Familiarity with people (CWP)	0.66***	0.56, 0.78
Person-Level		
Male Biological Sex	0.83	0.57, 1.21
Age	0.75**	0.62, 0.91
Student	1.37	0.89, 2.10
Race		
White, NH (reference)	–	
Asian, NH	1.06	0.59, 1.91
Black, NH	0.78	0.39, 1.57
Hispanic	0.87	0.58, 1.29
Other	0.37	0.12, 1.12
Willingness (GMC)	1.38**	1.14, 1.67
Descriptive norms (GMC)	1.37***	1.15, 1.65
Injunctive norms (GMC)	1.11	0.91, 1.36
Familiarity with location (GMC)	1.04	0.84, 1.29
Familiarity with people (GMC)	0.99	0.80, 1.22

Note. Daily-level predictors were centered-within-person (CWP); Person-level predictors were grand-mean-centered (GMC); *LL* = lower limit; *UL* = upper limit; NH = Non-Hispanic; Number of people = 662; Number of days = 3,909. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3

Multilevel Model Testing Associations Between Playing Drinking Games and the Number of Drinks Consumed.

	Rate Ratio	95 % CI *LL, UL*
Intercept	1.47***	1.24, 1.75
Daily-Level		
Weekend	1.43***	1.26, 1.62
Month	1.02	1.00, 1.05
Week	1.01	0.98, 1.03
Burst	1.04**	1.01, 1.07
Played drinking game (CWP)	1.63***	1.51, 1.76
Person-Level		
Male Biological Sex	1.41***	1.27, 1.57
Age	1.01	0.96, 1.07
Student	0.94	0.83, 1.07
Race		
White, NH (reference)		
Asian, NH	1.03	0.86, 1.24
Black, NH	0.90	0.73, 1.10
Hispanic	1.20*	1.06, 1.35
Other	1.09	0.82, 1.46
Played drinking game (GMC)	1.15***	1.11, 1.20

Note. Daily-level predictors were centered-within-person (CWP); Person-level predictors were grand-mean-centered (GMC); *LL* = lower limit; *UL* = upper limit; NH = Non-Hispanic; Number of people = 670; Number of days = 4,075. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4

Multilevel Model Testing Associations Between Playing Drinking Games and the Number of Negative Alcohol Consequences.

	N1 = 670; N2 = 4,073	
	OR/RR	**95 % CI** ***LL, UL***
Negative Binomial Regression Submodel (Count)		
Intercept	0.47 **	0.32, 0.70
Daily-Level		
Weekend	1.01	0.72, 1.41
Month	0.94	0.88, 1.00
Week	1.02	0.96, 1.08
Burst	1.05	0.98, 1.08
Number of drinks (CWP)	1.21 ***	1.18, 1.25
Played drinking game (CWP)	1.08	0.92, 1.27
Person-Level		
Male Biological Sex	0.70 **	0.56, 0.87
Age	0.83 **	0.75, 0.93
Student	0.96	0.76, 1.22
Race		
White, NH (reference)		
Asian, NH	1.45 *	1.06, 1.99
Black, NH	1.70 **	1.15, 2.51
Hispanic	1.22	0.97, 1.54
Other	1.32	0.80, 2.18
Number of drinks (GMC)	1.41 ***	1.28, 1.54
Played drinking game (GMC)	0.95	0.88, 1.03
Logistic Regression Submodel (Likelihood)		
Intercept	0.08	0, ∞
Daily-Level		
Weekend	0.85	0.30, 2.40
Month	0.97	0.75, 1.25
Week	1.05	0.82, 1.35
Burst	1.27	0.99, 1.63
Number of drinks (CWP)	0.34 ***	0.25, 0.46
Played drinking game (CWP)	0	0, ∞
Person-Level		
Male Biological Sex	0.84	0.44, 1.58
Age	1.14	0.87, 1.49
Student	1.09	0.58, 2.04
Race		

	N1 = 670; N2 = 4,073	
	OR/RR	**95 % CI** ***LL, UL***
White, NH (reference)		
Asian, NH	0.37	0.13, 1.01
Black, NH	0.61	0.20, 1.92
Hispanic	0.81	0.43, 1.52
Other	0.70	0.24, 2.09
Number of drinks (GMC)	0.17***	0.09, 0.33
Played drinking game (GMC)	0.07	0, ∞

Note. Total number of negative consequences does not include the two driving-related outcomes. The estimation results of the model in the zero-inflation part was unstable, leading to very large standard errors; therefore, some of the upper limits in the confidence intervals approached infinity (∞). OR = odds ratio for logistic regression submodel; RR = rate ratio for negative binomial regression submodel; Daily-level predictors were centered-within-person (CWP); Person-level predictors were grand-mean-centered (GMC); *LL* = lower limit; *UL* = upper limit; NH = Non-Hispanic; N1 = Number of people; N2 = Number of days. * p <.05, ** p <.01, *** p <.001.

Table 5

Multilevel Model Testing Associations Between Playing Drinking Games and Driving-Related Outcomes.

	Drove after drinking N1 = 670 N2 = 4,053		**Rode in a car with a driver who had been drinking N1 = 665 N2 = 4,002**	
	Odds ratio	**95 % CI *LL, UL***	**Odds ratio**	**95 % CI *LL, UL***
Intercept	0.11***	0.06, 0.17	0.08***	0.05, 0.14
Daily-Level				
Weekend	0.96	0.65, 1.42	1.24	0.80, 1.92
Month	1.04	0.94, 1.15	1.00	0.91, 1.11
Week	1.00	0.90, 1.10	1.04	0.95, 1.15
Burst	1.12*	1.02, 1.24	0.99	0.89, 1.10
Number of drinks (CWP)	1.02	0.98, 1.07	1.16***	1.10, 1.21
Played drinking game (CWP)	1.17	0.79, 1.75	1.13	0.77, 1.66
Person-Level				
Male Biological Sex	1.12	0.82, 1.52	0.70**	0.52, 0.94
Age	1.55***	1.31, 1.84	1.16	1.00, 1.36
Student	0.99	0.71, 1.38	0.93	0.67, 1.28
Race				
White, NH (reference)				
Asian, NH	0.89	0.52, 1.50	2.52***	1.60, 3.96
Black, NH	1.57	0.91, 2.70	1.89*	1.13, 3.18
Hispanic	1.15	0.81, 1.61	1.93***	1.40, 2.67
Other	0.73	0.30, 1.77	1.29	0.59, 2.82
Number of drinks (GMC)	1.10	0.95, 1.29	1.21*	1.05, 1.40
Played drinking game (GMC)	0.97	0.83, 1.13	1.05	0.92, 1.20

Note. Daily-level predictors were centered-within-person (CWP); Person-level predictors were grand-mean-centered (GMC); *LL* = lower limit; *UL* = upper limit; NH = Non-Hispanic; N1 = Number of people; N2 = Number of days. * $p < .05$, ** $p < .01$, *** $p < .001$.