Published in final edited form as:

Subst Use Misuse. 2016 July 2; 51(8): 1034–1046. doi:10.3109/10826084.2016.1152497.

PTSD and Pregaming in College Students: A Risky Practice for an At-Risk Group

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Abstract

Background—College students with trauma exposure and PTSD are at risk for problem drinking. This may include more specific hazardous drinking practices such as pregameing (drinking prior to a social event), which is linked to increased alcohol-related consequences.

Objectives—The present study examined the association of pregameing and alcohol consequences and the role of trauma exposure and PTSD in predicting pregameing and alcohol-related consequences in a sample of college students using Multilevel Structural Equation Modeling (MSEM). We also assessed specific risk associated with PTSD relative to trauma exposure alone in relation to our outcomes.

Methods—Participants were categorized into groups based on trauma exposure and PTSD symptoms via diagnostic interview: 1) No Trauma, those who had not experienced a Criterion A trauma; 2) Trauma Only, those who experienced a Criterion A trauma but did not currently have PTSD; and 3) PTSD, those with current full or partial PTSD related to a Criterion A trauma. Alcohol consumption and related consequences also were measured via interview (TLFB, B-YAACQ).

Results—For all participants, nearly 50% more consequences were reported on pregameing days compared to non-pregameing drinking days. Those with PTSD were significantly more likely to pregame than those in the Trauma Only and No Trauma groups. Moreover, students with PTSD reported more consequences on pregameing days relative to the other two groups. In all analyses, the No Trauma and Trauma Only groups did not differ.

Conclusions—PTSD may confer risk both for pregameing and experiencing harmful consequences on pregameing days.

Keywords

PTSD; Alcohol; Pregaming; College Students; Risky Drinking; Alcohol Consequences; Trauma; Pre-party

Introduction

Approximately 2/3 of college students have experienced some kind of traumatic event (Bernat, Ronfeldt, Calhoun, & Arias, 1998; Elhai et al., 2012; Read, Ouimette, White, Colder, & Farrow, 2011; Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008). Among the types of trauma most commonly endorsed by college students are sudden death of a loved one, life-threatening illness, and interpersonal violence (Elhai et al., 2012; Read et al., 2011). Posttraumatic stress disorder (PTSD) is a psychiatric disorder that can develop after exposure to a traumatic event. Though the definition of PTSD has continued to evolve over the years, conceptualizations of PTSD have consistently been comprised of an essential constellation of symptoms that includes re-experiencing of the traumatic event, avoidance of and numbing to reminders of the trauma, cognitive and affective changes following the event, and physiological arousal (APA, 1980, 2000, 2013). Roughly 9–15% of trauma-exposed college students meet diagnostic criteria for PTSD (Borsari, Read, & Campbell, 2008; Bernat et al., 1998; Elhai et al., 2012; Read et al., 2011; Scarpa et al., 2002; Smyth et al., 2008).

College students with trauma exposure and PTSD are at heightened risk for heavier drinking and deleterious alcohol-related outcomes relative to their typical college-attending peers (Kaysen et al., 2014; Read, Wardell, & Colder, 2013; Read et al., 2012; Stappenbeck, Bedard-Gilligan, Lee, & Kaysen, 2013). Despite evidence of elevated general drinking risk among students with trauma exposure and PTSD (for review, see Read, Radomski, & Borsari, 2015), little is known about whether trauma and PTSD is linked to risk for specific hazardous drinking practices. This may be important for informing efforts aimed at reducing risky drinking practices among those with and without PTSD and decreasing risk among trauma-exposed young adults over time. Accordingly, the aim of the current study was to examine one such practice - pregameing - to determine whether this practice disproportionately affects those who have been exposed to trauma and/or have PTSD.

Pregameing is a term commonly used to describe drinking that takes place prior to attending a social event. Other names for this drinking practice include pre-partying, pre-drinking, or pre-loading (Foster & Ferguson, 2014; Reed et al., 2011). Pregameing is a specific type of risky drinking that has been the focus of recent empirical attention (Ahmed, Hustad, LaSalle, & Borsari, 2014; Barnett, Orchowski, Read, & Kahler, 2013; Hustad et al., 2014; Moser, Pearson, Hustad, & Borsari, 2014; Wells, Graham, & Purcell, 2009). Pregameing is considered to be a hazardous behavior in part because heavier drinkers tend to do it (e.g., DeJong, DeRicco, & Schneider, 2010; Haas, Smith, Kagan, & Jacob, 2012) and because it is linked to higher levels of intoxication (Barry, Stellefson, Piazza-Garnder, Chaney, & Dodd, 2013; Borsari et al., 2007; Fairlie, Maggs, & Lanza, 2015) and negative consequences

(Barnett et al., 2013; Kuntsche & Labhart, 2013; Labhart, Graham, Wells, & Kuntsche, 2013; LaBrie & Pedersen, 2008; Merrill, Vermont, Bachrach, & Read, 2013).

Though pregaming has been reported in high school students (Zamboanga et al., 2011), studies suggest that increases in this drinking practice coincide with the transition into college (e.g., Haas, Smith, & Kagan, 2013; Zamboanga et al., 2013b). Indeed, evidence shows that the majority of college drinkers pregame (Barnett et al., 2013; Borsari et al., 2007; DeJong et al., 2010; Hustad et al., 2014; Pedersen & LaBrie, 2007; Read, Merrill, & Bytschkow, 2010; Wei, Barnett, & Clark, 2010; Zamboanga et al., 2013a). Reported reasons for pregaming include enhancing the drinking experience (e.g., “to have fun”), overcoming alcohol accessibility issues (e.g., limited access to public drinking), and facilitating sexual experiences (Bachrach, Merrill, Bytschkow, & Read, 2012; LaBrie, Hummer, Pedersen, Lac, & Chithambo, 2012). Moreover, students tend to report both positive and negative consequences as a result of pregaming (Barnett et al., 2013).

Several empirical efforts have focused on identifying individual characteristics for those who may be more likely to engage in pregaming with the ultimate goal of targeting intervention efforts. For example, college freshmen and students under 21 are more likely to pregame, likely due to legal restrictions and limited drinking locations (Barnett et al., 2013; Read et al., 2010). Additionally, being male, White, and Greek affiliated (Haas et al., 2012; Paves, Pedersen, Hummer, & LaBrie, 2012; Rutledge, McCarthy, & Lendyak, 2014) all have been identified as demographic risk factors for pregaming, though findings with these risk factors have been mixed (Barnett et al., 2013; Borsari et al., 2007; DeJong et al., 2010; Read et al., 2010). Importantly, individual characteristics may predict more than just engagement in pregaming, they may also predict who is more likely to experience consequences from pregaming. For example, some studies have revealed gender differences in pregaming outcomes such as alcohol consumption, BAC, and consequences, though these findings also have been mixed (Barnett et al., 2013; LaBrie & Pedersen, 2008; Merrill et al., 2013; Paves et al., 2012; Read et al., 2010; Zamboanga, et al., 2013a).

Thus far, the pregaming literature has focused on demographic factors that may portend risk. Psychological distress is a known risk factor for alcohol misuse (Mallett et al., 2013; Martens et al., 2008), and thus is an individual characteristic that warrants examination. To our knowledge, no studies have examined psychological distress as a risk factor for pregaming and related consequences. As trauma-exposed college students with PTSD are known to be at increased risk for problem alcohol involvement, it stands to reason that trauma-related distress may be a risk factor for hazardous drinking practices, such as pregaming. Moreover, these students may experience more severe consequences when they do engage in these practices. To date, no studies have examined these associations. This was the objective of the present study.

The Present Study

We used daily-level analyses to link pregaming practices with subsequent consequences. We hypothesized that: (a) pregaming drinking will be associated with more alcohol consequences than non-pregaming drinking; (b) individuals with current (i.e., past 30 day) PTSD will pregame more than comparison groups (those with trauma exposure but no

PTSD, and those without trauma exposure); and (c) on days when pregameing occurs, individuals with PTSD will experience more consequences than comparison groups. Neuroticism was included in these models to test the effects of trauma exposure and PTSD beyond trait-level negative emotionality.

Method

Participants and Procedures

Data for the present study was drawn from a larger experimental examination of information processing in trauma-exposed and non-trauma-exposed college students (e.g., Bachrach, Wardell, Coffey, & Read, 2012). Potential participants were recruited from introductory psychology classes and flyers posted within the community. All eligible participants were 18 to 25 years of age, enrolled full-time at a four-year university, and drank alcohol at least once in the past three months. A trained research assistant assessed initial eligibility over the phone. The University's Institutional Review Board approved all procedures.

Data were collected over two sessions. The first session was a diagnostic clinical interview, and served to further establish study eligibility. In this session, participants reported on lifetime trauma exposure and PTSD symptoms using the Life Events Checklist (LEC; Gray, Litz, Hsu, & Lombardo, 2004) and the Clinician Administered PTSD Scale (CAPS; Blake et al., 1995). All interviews were conducted by doctoral-level clinical psychology graduate students trained by two PhD-level researchers with extensive experience with the CAPS. Participants were compensated for their time with either \$20 cash or course credit through the University's psychology subject pool.

Current PTSD status was delineated as: (a) No Trauma, for those who had not experienced a significant trauma and did not endorse current PTSD symptoms; (b) Trauma Only, for those who had experienced a significant trauma but did not have current PTSD symptoms; or (c) PTSD, for those with significant trauma and with current clinical or subthreshold PTSD. Subthreshold PTSD was defined as the endorsement of at least one symptom in each symptom cluster (i.e., re-experiencing, numbing/avoidance, and hyperarousal). Those who could not be categorized into one of the three groups were deemed ineligible ($n = 159$). These participants may have endorsed PTSD symptoms without having experienced a trauma or may have had PTSD at another point in their lifetime. The experimental session was scheduled roughly one week later. In this session, participants were interviewed about their alcohol use over the past 90 days and completed a computer-based task and self-report questionnaires. Participants were compensated for their time with either \$30 cash or course credit. Of those eligible for the second session, 32 participants did not return for the experiment ($n = 9$ No Trauma, $n = 18$ Trauma Only, $n = 5$ PTSD); these participants did not differ in PTSD status or gender (all $ps > .05$).

The final sample consisted of 600 college students (53% female) who completed both sessions of the study. The sample included 72% White, 10% Asian, 10% African American, and 8% multi-racial/other; six participants did not report on their ethnicity. The average age of participants was 19.49 years ($SD = 1.43$). Participants ranged in their education level (36% freshman, 26% sophomores, 20% juniors, 16% seniors, and 2% other).

Diagnostic Interview (Session One)

Trauma exposure and posttraumatic stress symptoms—PTSD status was assessed using the Clinician Administered PTSD Scale (CAPS; Blake et al., 1995), a clinical interview based on DSM-IV PTSD diagnostic criteria. The Life Events Checklist (LEC; Gray et al., 2004) was used in conjunction with the CAPS. Participants were first presented a list of 17 potentially traumatic events, which included directly experiencing, witnessing, or learning about (i.e., happened to someone close) any of the included events. Participants were then asked to select the top three most distressing events from the LEC. Interviewers then probed events to determine Criterion A status based on DSM-IV PTSD criteria. After establishing Criterion A events, past month PTSD symptoms were assessed with the CAPS (range: 0–17). For each of the 17 PTSD diagnostic criteria assessed, the interviewer must rate that item along two dimensions, “Frequency” and “Intensity.” Symptom counts are derived on this measure through a combination of these two items. Consistent with this, our study used frequency and intensity ratings for scoring. Specifically, a symptom was counted if it occurred at least 1–2 times per week in the past month (score of 2 or greater on CAPS symptom frequency item) and was of moderate intensity (score of 2 or greater on CAPS symptom intensity item). Responses that rose to this level were then dichotomously scored as “present” for the past month. Though scoring conventions for the CAPS vary somewhat, this scoring rule is consistent with more conservative recommendations by measure developers (Blake et al., 1995). The CAPS has demonstrated excellent psychometric properties (Blake et al., 1995). All interviews were audio-recorded and approximately 25% of interviews were reviewed for inter-rater reliability. For every 2 reliabilities completed by a PhD-level consultant who had extensive training with PTSD and the CAPS, one was completed by a doctoral level trainee, under the supervision of the Principal Investigator, Dr. Read (Kappa= .83).

Alcohol Involvement and Other Individual Difference Measures (Session Two)

Demographics—A range of demographic information (e.g., sex, age, ethnicity, Greek organization affiliation, residential status, school year) was assessed.

Personality—Participants filled out the Big Five Inventory (BFI; John & Srivastava, 1999) to assess personality traits. The BFI is a 44-item measure assessing five major domains of personality (neuroticism, agreeableness, extraversion, conscientiousness, and openness). Response options range from 1 (strongly disagree) to 5 (strongly agree). We have used this measure in previous studies with college students, as it provides a strong and brief indication of stable personality (including affective predisposition) traits. The Neuroticism subscale of this measure was included in our analyses to control for general negative emotionality, thus isolating specific effects of PTSD. The range for the Neuroticism scale is 1 through 5 ($\alpha = .82$).

Alcohol use and pregameing behaviors—Alcohol use in the past three months was measured with a modified version of the Timeline Follow-Back interview (TLFB; Sobell & Sobell, 1992). This interview assessed for both pregameing behavior and typical alcohol use over the previous 90 days. The TLFB interview is a calendar-assisted interview that provides a way to cue memory to improve recall accuracy. The TLFB interview has excellent

reliability and validity (Sobell & Sobell, 1992). Participants were asked whether drinking occurred each day, and if so, had they engaged in pregaming. In addition to the frequency of drinking and pregaming, information on quantity of alcohol consumed during regular drinking and pregaming was gathered. Given that our focus involved alcohol consequences, which were assessed for the past 30 days in interview format, the present study used only alcohol consumption over the past 30 days. In data cleaning, improbable values were recoded to 25, which applied to less than .2% of the drinking events.

Alcohol consequences—Following procedures outlined by Merrill et al. (2013), 24 alcohol-related consequences were assessed as part of a Timeline Follow-Back Interview (Brief Young Adult Alcohol Consequences Questionnaire, B-YAACQ; Kahler, Strong, & Read, 2005). For each drinking day reported in the past 30 days during the interview, participants were queried about the 24 consequences, and asked to report on whether any of these had happened as a result of that drinking incident. Administration of the B-YAACQ in this way allows for drinking behavior and related consequences to be linked at the event-level in order to address the stated hypotheses. The B-YAACQ is a briefer version of the original 48-item measure developed by Read et al. (2006). Items on the B-YAACQ represent a continuum of severity (mild to severe) for alcohol consequences in college students.

Analysis Plan

Hypotheses were tested in a Multilevel Structural Equation Modeling (MSEM) framework (cf. Curran, 2003; Mehta & Neale, 2005) to account for the repeated measures design of the data and to allow for simultaneous tests of effects. MSEM represents an advancement over traditional multi-level models which are typically limited to univariate applications (Mehta & Neale, 2005). A MSEM framework allows for multivariate structural equation models with nested data. Figures 1 and 2 present the path diagrams for the MSEM models. Hypotheses 1 and 2 were tested in the model presented in Figure 1 and Hypothesis 3 was tested in the model presented in Figure 2.

In our first model (see Figure 1; Hypotheses 1 and 2), pregaming and alcohol-related consequences were estimated on the within-level (i.e., assessments nested within people) because participants reported whether or not each day of the last 30 days was a pregaming day and reported the number of consequences experienced on each day. Time was not included in the model because our hypotheses did not concern change in pregaming or consequences over the course of the 30 days. Thus, the models use multi-level data to provide a more robust point estimate of the association between pregaming and consequences across 30 days. PTSD status included three categories (i.e., No Trauma, Trauma Only, and PTSD) and was entered on the between-level. Due to the three level categorical nature of this variable, dummy variables were created and all models were run twice to allow for all pairwise comparisons. Because of widely observed gender differences in alcohol use and problems (e.g., Nolen-Hoeksema, 2004; Wilsnack, Vogeltanz, Wilsnack, & Harris, 2000), we controlled for sex in our models. Also as noted, we included trait negative emotionality (Neuroticism) to isolate unique PTSD effects. Sex and Neuroticism were controlled for by adding between-level paths when theoretically appropriate (see Figures 1 & 2). The model presented in Figure 2 (Hypothesis 3) assessed the association

between PTSD status and consequences on pregaming days only. Consequences were again included as a within-subjects effect in this model.

Prior to model building, the distributions of the study variables were examined. The pregaming variable was coded as dichotomous (0= *not a pregaming day*, 1= *pregaming day*) and so paths with pregaming as a dependent variable were logistic regression paths. Although pregaming only occurred on 6% of total days in the past month, logistic regression has been shown to be remarkably robust to this kind of balancing issue when all available data is included in the model (Crone & Finlay, 2012). There also was a high number of zeroes on the consequences variable. We chose to model this variable using a negative binomial hurdle distribution, as all participants in the study were presumed to be at risk for consequences on any given day (Rose, Martin, Wannemuehler, & Plikaytis, 2006). In count regression models, Rate Ratios (RRs) can be calculated by exponentiating the unstandardized regression coefficient and can be interpreted as the percentage change in rate of the dependent variable per unit change in the independent variable (Hilbe, 2011).

Analyses were conducted in Mplus Version 7.2 (Muthén & Muthén, 1998–2012). In MSEM, study variables do not need to be centered, but can be centered to aid interpretation (Preacher, Zyphur, & Zhang, 2010). In the current analyses, only Neuroticism was grand mean centered to allow for the slope parameter to be interpreted as the simple slope at the mean. Maximum Likelihood with Robust Standard Errors and Chi-square (MLR) estimation was used to allow for missing data and non-normally distributed data because ML estimation tends to produce low standard errors and inflated model rejection rates with non-normal data (Enders, 2001; Maas & Hox, 2004; Muthén & Asparouhov, 2002). The current dataset had very little missing data. MLR with negative binomial hurdle variables relies on raw data rather than means, variances and covariances and thus does not produce typical tests of overall model fit.

Results

Trauma and PTSD

Participants were categorized based on PTSD status: PTSD ($n = 136$), Trauma Only ($n = 229$), and No Trauma ($n = 235$). On average, the sample endorsed 1.77 symptoms ($SD = 3.17$). Those in the PTSD group reported an average of 2.17 re-experiencing symptoms ($SD = 1.04$), 2.50 avoidance/numbing symptoms ($SD = 1.54$), and 2.29 hyperarousal symptoms ($SD = 1.14$). See Table 1 for additional descriptive information. Some of the most commonly reported events included transportation accident, physical assault, life-threatening illness or injury, and sudden unexpected death. When those with trauma exposure and/or PTSD were asked to report on the worst or most upsetting event, students most frequently identified a physical or sexual assault ($n = 87$), sudden unexpected death ($n = 64$), and transportation accident ($n = 41$).

Alcohol Use, Pregaming, and Consequences

Consistent with other documented prevalence rates (Barnett et al., 2013; DeJong et al., 2010; Pedersen & LaBrie, 2007; Read et al., 2010), 63% of the sample reported pregaming. On

average, participants drank alcohol on 6.31 days ($SD = 4.74$) in the past month, and pregame on 1.80 days ($SD = 2.19$). That is, 21.3% of the days in the past month were drinking days, and 28.7% of drinking days involved pregame. Participants reported consuming an average of about 9 drinks on a pregame day and 5 on a non-pregame day. Those with PTSD exhibited the most problematic alcohol involvement. Over 10% more of the PTSD group endorsed pregame relative to comparison groups. See Table 1 for additional descriptive information.

Hypotheses Tested

Tables 2 and 3 present the results of the MSEM models used to test the study hypotheses. As mentioned above, selecting MLR estimation to accommodate the skewed count distribution of alcohol consequences as negative binomial hurdle precludes the assessment of overall model fit. Thus, we will report on the direct effects in the model that relate to our hypotheses.

The intraclass correlations (ICCs) were small, but included a sufficient degree of non-independence across level-1 units to warrant using multi-level modeling. Specifically, the pregame variable had an $ICC = .06$ and the consequences variable had an $ICC = .08$. Kreft and Leeuw (1998) note that ICCs as small as .05 are sufficient to invalidate hypotheses and confidence intervals if data are not analyzed in a multi-level framework.

We will report on the direct effects in the model that relate to our hypotheses first, then other significant effects in the model that may be of interest to readers. Our first hypothesis was that pregame would be associated with more alcohol consequences. This hypothesis was tested directly with path b (see Table 2 and Figure 1). The direct path was statistically significant and in the hypothesized direction. Specifically, the RR indicates that individuals report 46% more consequences when pregame.

Our second hypothesis was that individuals with PTSD would pregame more than comparison groups (i.e., No Trauma and Trauma Only). This hypothesis was directly tested with paths a1–a3 (see Table 2 and Figure 1). The odds ratios revealed that those in the No Trauma group were 1.72 times less likely to pregame compared to those in the PTSD group. Similarly, those in the Trauma Only group were 1.47 times less likely to pregame compared to those in the PTSD group. This effect was only significant at the trend level ($p = .06$), but the range of the confidence interval provides evidence that it is more likely that the true OR is below 1 than equal to or above 1. The final comparison showed no difference between those in the Trauma Only and No Trauma groups regarding likelihood of pregame. In summary, those with PTSD reported the most pregame compared to the other two groups.

Our third hypothesis was that on days where pregame occurred, those with PTSD would experience more consequences compared to the other two groups. This hypothesis was tested with paths c1–c3 (see Table 3 and Figure 2). The strongest support for group differences on consequences experienced on pregame days was between PTSD and Trauma Only. Specifically, the RR indicates that those with PTSD experience 22% more consequences on pregame days compared to Trauma Only. Similarly, those with PTSD reported experiencing 23% more consequences on pregame days compared to No Trauma;

however this effect was only significant at the trend level ($p = .07$). Finally, there was no difference between Trauma Only and No Trauma. Taken together, on pregaming days, those with PTSD experienced the most consequences compared to the other two groups.

Examination of the effects not directly associated with our hypotheses revealed that Neuroticism was a significant predictor of consequences, but sex was not. Specifically, in the model that included pregaming as a variable (see Table 2 and Figure 1), a unit increase in Neuroticism was associated with a 22% increase in alcohol-related consequences on days in which consequences were experienced. Males were 1.12 times more likely than females to be in the No Trauma group relative to the PTSD group, 1.07 times more likely than females to be in the Trauma Only group relative to the PTSD group, and 1.20 times more likely than females to be in the Trauma Only group relative to the No Trauma group. Similarly, in the model assessing pregaming only (see Table 3 and Figure 2), a unit increase in Neuroticism was associated with a 23% increase in alcohol-related consequences. Additionally, males were 1.16 times more likely than females to be in the No Trauma group relative to the PTSD group and 1.25 more likely than females to be in the Trauma Only group relative to the No Trauma group. Sex did not predict the likelihood of pregaming. Lastly, those in the No Trauma group experienced 26% less consequences on days in which consequences were experienced compared to those in the PTSD group (see Table 2 and Figure 3).

Discussion

Consistent with prior research (Barnett et al., 2013; DeJong et al., 2010; Fairlie et al., 2015; Pedersen & LaBrie, 2007; Read et al., 2010), pregaming was common in our sample: 63% of students reported pregaming and pregaming occurred on nearly a third of all drinking days of the 30 day assessment. In testing our first hypothesis, we found that pregaming was related to alcohol consequences. More specifically, students reported 46% more consequences on days that involved pregaming. This is in line with a growing literature that highlights risk that is associated with specific drinking practices (e.g., Borsari, 2004; LaBrie & Pedersen, 2008; Merlo, Ahmedani, Barondess, Bohnert, & Gold, 2011; Merrill et al., 2013; Neighbors et al., 2014; Neighbors, Spieker, Oster-Aaland, Lewis, & Bergstrom, 2005). We also examined whether gender predicted pregaming behaviors and found that gender was not associated with pregaming or alcohol consequences. Though some research has identified gender differences in pregaming (Barnett et al., 2013; Hustad et al., 2014; LaBrie & Pedersen, 2008; Merrill et al., 2013; Paves et al., 2012; Zamboanga et al., 2013a), the literature has been mixed, and we did not observe such differences here. Our results were consistent with some previous findings that pregaming is equally prevalent and problematic in male and female college students (DeJong et al., 2010; Haas et al., 2012; Read et al., 2010).

A major aim of the present study was to shed light on trauma and PTSD as they relate to pregaming and risks associated with this practice. Rates of trauma exposure in the current sample were consistent with rates reported in other college student and community samples (Bernat et al., 1998; Breslau et al., 1998; Elhai et al., 2012; Read et al., 2011; Smyth et al., 2008). The most commonly reported traumas included transportation accidents, physical and sexual assaults, life-threatening illness or injury, and sudden unexpected death. Also

consistent with a robust literature showing female gender to be a risk factor for PTSD (Breslau et al., 1998; Breslau, 2001), women were more likely to be in the PTSD group than the other two comparison groups.

Results revealed that those with a PTSD diagnosis were more likely to pregame and experienced more consequences on pregame days in comparison to those without trauma exposure or trauma-exposed without PTSD. Importantly, the comparison groups (No Trauma and Trauma Only) did not differ from one another in pregame drinking or consequences on pregame drinking days. These findings suggest that the association between PTSD and pregame is related to the presence of PTSD symptoms as opposed to trauma exposure. This is consistent with other literature that find PTSD symptoms – rather than trauma exposure per se – to be the mechanism of risk for harmful outcomes (Epstein, Saunders, Kilpatrick, & Resnick, 1998; Read et al., 2012; Stewart & Conrod, 2003). The inclusion of Neuroticism in the models allowed us to determine the effects of trauma exposure and PTSD while taking negative emotionality into consideration. Importantly, PTSD remained a significant predictor above and beyond trait-level negative emotionality, highlighting that PTSD symptoms may confer risk for pregame and related consequences.

Clinical Implications and Future Directions

Identifying risk factors for pregame and associated consequences is important as it relates to interventions aimed at reducing risky drinking patterns among college students. Those who pregame tend to consume more alcohol in general (DeJong et al., 2010), even on non-pregame days (Read et al., 2010). Further, pregame report more alcohol-related consequences, on average, than non-pregame (Haas et al., 2012; Paves et al., 2012; Pedersen & LaBrie, 2007). Already an at-risk group, college students with PTSD are involved in a deleterious pattern of problematic drinking, consequences, and distress (Read et al., 2013). Perhaps pregame is but one instantiation of risky behavior for which those with PTSD may be at risk. Indeed, PTSD may be associated with risk for a variety of risky drinking practices. Other potentially hazardous behaviors also should be explored. In considering why PTSD may confer risk for pregame and consequences, future research should focus on potential mechanisms, and perhaps ultimately intervention.

Drinking motives are robust predictors of alcohol involvement (Cooper, Frone, Russell, & Mudar, 1995; DeMartini & Carey, 2011; Kuntsche, Stewart, & Cooper, 2008; Read, Wood, Kahler, Maddock, & Palfai, 2003; Studer et al., 2014), and a possible mechanism of interest for this population. Drinking to cope specifically has been associated with more problematic drinking patterns in college students (Carey & Correia, 1997; Cooper et al., 1995; Merrill, Wardell, & Read, 2014), and those with PTSD report drinking to cope with negative emotions, which has been linked to alcohol-related consequences (Ullman, Filipas, Townsend, & Starzynski, 2005). The association between PTSD symptoms and drinking is strengthened for those who report drinking to cope (Simpson, Stappenbeck, Luterek, Lehavot, & Kaysen, 2014). However, there is evidence to suggest that those with PTSD also may be drinking with the goal of attaining positive feelings and social conformity (Stappenbeck et al., 2013). Notably, drinking motives specific to pregame have been identified and should be examined in those with PTSD, as they may be one explanation of

increased rates of pregaming and consequences in PTSD groups compared to other individuals (Bachrach et al., 2012; LaBrie et al., 2012).

Limitations

These data were gathered through self-reported, retrospective recall. Assessment of PTSD symptomatology and drinking behavior on the daily level in real time through methods such as ecological momentary assessment would aid understanding of the relationship between specific symptoms and drinking practices. Without data on treatment seeking behaviors, we cannot be certain that treatment does not influence the found associations. Moreover, it is possible that some students were mandated to receive an intervention. If rates of treatment were to be high in this particular sample, we hypothesize that the magnitude of these associations may be underestimated. Moreover, based on study procedures for PTSD status identification, traumatic events that occurred within 30 days of session 1 were not assessed. This limited our ability to examine more severe consequences of pregaming behavior such as exposure to new traumatic events. We also did not examine the influence of specific trauma types on drinking behaviors (e.g., sexual victimization), which may be associated with added risk. Finally, though PTSD was the primary interest of the present study, other potentially relevant psychological disorders such as social anxiety were not assessed.

Conclusion

College students with PTSD are an at-risk group based on their general tendency to drink more and to experience more consequences associated with their consumption. Findings from the present study reveal that, though pregaming as a specific drinking practice is related to negative consequences, those with PTSD are more likely to pregame and experience more alcohol consequences on days when pregaming occurred. Thus, PTSD may be a psychological risk factor for pregaming and related consequences. Identification of risk processes involved in pregaming for this high-risk group is necessary to inform intervention efforts.

Glossary

Pregaming The consumption of alcohol prior to a social event such as a bar, party, or concert

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Figure 1.
Multilevel Structural Equation Model Diagram
Note: Subscript i represents a path that includes a dummy coded variable.

Figure 2.
Multilevel Structural Equation Model, Only for Days When Pregaming was Reported.
Note: Subscript i represents a path that includes a dummy coded variable.

Table 1

Descriptive Statistics for Past 30 Days

	Overall Sample				PTSD Groups (Means & SD)			
	Mean	SD	Min	Max	No Trauma	Trauma Only	PTSD	
PTSD Symptoms								
CAPS	1.77	3.17	0	16	.14 (.40)	.35 (.60)	6.96 (2.91)	
Drinking Behavior								
# Drinking Days	6.31	4.74	0	30	5.50 (3.98)	6.37 (4.82)	7.62 (5.47)	
# Pregaming Days	1.80	2.19	0	12	1.58 (2.02)	1.83 (2.30)	2.13 (2.24)	
Total Drinks	40.70	42.53	0	473	33.84 (31.09)	41.35 (40.76)	51.47 (57.84)	
Avg Drinks Pregaming Days	9.17	4.47	1	25	8.82 (4.35)	9.15 (4.24)	9.70 (4.94)	
Avg Drinks Non-Pregaming Days	5.09	3.16	1	23.75	4.79 (2.71)	5.41 (3.59)	5.06 (3.07)	
Avg Drinks during Pregaming	4.83	2.93	1	22.5	5.05 (3.34)	4.51 (2.57)	4.99 (2.75)	
Total Consequences	9.52	11.58	0	114	6.65 (7.68)	9.60 (10.77)	14.35 (16.08)	
Consequences/Pregaming Day	2.44	2.34	0	16	2.02 (2.21)	2.38 (1.92)	3.10 (2.90)	
Consequences/Non-Pregaming Day	1.29	1.46	0	10	0.99 (1.11)	1.38 (1.61)	1.62 (1.63)	

Note. $N = 600$, No Trauma $n = 235$, Trauma Only $n = 229$, PTSD $n = 136$.

Table 2

Multilevel Structural Equation Model Assessing the Relationship Among PTSD, Pregaming, and Alcohol Related Consequences.

	OR or RR	CI	p-value
Direct Paths			
Within level			
PG → ARC (b)	1.46	1.30, 1.64	.00
Between level			
PTSD1 → PG (a₁)	0.58	0.41, 0.83	.00
PTSD2 → PG (a₂)	0.68	0.46, 1.02	.06
PTSD3 → PG (a₃)	1.17	0.83, 1.65	.36
PTSD1 → ARC (c₁)	0.74	0.59, 0.92	.01
PTSD2 → ARC (c₂)	0.85	0.70, 1.04	.12
PTSD3 → ARC (c₃)	1.00	0.80, 1.25	.99
Neur → ARC (d)	1.22	1.11, 1.33	.00
Sex → PTSD1 (e₁₁)	1.12	1.03, 1.21	.01
Sex → PTSD2 (e₁₂)	1.07	0.99, 1.16	.07
Sex → PTSD3 (e₁₃)	0.83	0.78, 0.89	.00
Sex → ARC (e₂)	1.01	0.87, 1.18	.86
Sex → PG (e₃)	1.07	0.83, 1.39	.59

Note: PG = Pregaming day; ARC = alcohol related consequence; PTSD = post-traumatic stress disorder; Neur = Neuroticism; OR = odds ratio; RR = rate ratios. Path names are labeled in Figure 1. Subscript i represents a path that includes a dummy coded variable. Dummy coding of PTSD variable is as follows: subscript 1 compares Criterion A negative (coded 1) to PTSD Positive (coded 0); subscript 2 compares PTSD Negative (coded 1) to PTSD Positive (coded 0); Subscript 3 compares Criterion A Negative (coded 1) to PTSD Negative (coded 0). Paths predicting the Pregame variable or the dummy coded PTSD variables are OR and paths predicting Consequences are RR.

Table 3

Multilevel Structural Equation Model Assessing the Relationship between PTSD and Alcohol Related Consequences On Pregaming Days Only.

	OR or RR	CI	p-value
Direct Paths			
Between level			
PTSD1 → ARC (c₁)	0.77	0.54, 1.02	.07
PTSD2 → ARC (c₂)	0.78	0.62, 0.99	.04
PTSD3 → ARC (c₃)	1.03	0.81, 1.31	.80
Neur → ARC (d)	1.23	1.10, 1.39	.00
Sex → PTSD1 (e₁₁)	1.16	1.06, 1.29	.00
Sex → PTSD2 (e₁₂)	1.06	0.97, 1.18	.20
Sex → PTSD3 (e₁₃)	0.80	0.73, 0.87	.00
Sex → ARC (e₂)	1.13	0.93, 1.35	.23

Note: PG = Pregaming day; ARC = alcohol related consequence; PTSD = post-traumatic stress disorder; Neur = Neuroticism; OR = odds ratio; RR = rate ratio. Path names are labeled in Figure 2. Subscript i represents a path that includes a dummy coded variable. Dummy coding of PTSD variable is as follows: subscript 1 compares Criterion A negative (coded 1) to PTSD Positive (coded 0); subscript 2 compares PTSD Negative (coded 1) to PTSD Positive (coded 0); Subscript 3 compares Criterion A Negative (coded 1) to PTSD Negative (coded 0). Paths predicting the dummy coded PTSD variables are OR and paths predicting Consequences are RR.