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The Role of Posttraumatic Stress and Problem Alcohol Involvement in University Academic Performance

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Abstract

Objective: The present study examines how Posttraumatic Stress Disorder (PTSD) during the first year of university affects academic performance and whether alcohol behavior mediates the relationship between PTSD and poor academic outcomes.

Method: University students ($N = 1,002$; 65% female; $M_{\text{age}} = 18.11$) completed a baseline web survey, and 5 subsequent surveys throughout freshman year assessing variables of interest.

Results: Mediation analyses were not significant; however, students who developed PTSD had a lower grade point average and experienced more alcohol consequences by the end of freshman year. Unremitted PTSD and alcohol consequences were associated with leaving university by year's end.

Conclusions: Findings suggest that assessment of trauma-related symptoms and alcohol behavior might benefit interventions aimed at students with academic difficulties.

Keywords

posttraumatic stress disorder; alcohol use; alcohol consequences; university students; academic performance

For approximately one third of young adults in the United States, the transition to university is the first of many milestones that occur during a developmental phase termed “emerging adulthood” (Arnett, 2005; Arnett & Tanner, 2007). This period is marked by a growing individuation from family and other childhood support systems, greater adult responsibilities, autonomy, and role exploration. These newfound freedoms are exciting, but may also confer risk to these young adults. Two risks in particular known to pose hazard for university students are heavy drinking and trauma. Though each has been the focus of empirical attention in university populations (e.g., Hingson, Zha, & Weitzman, 2009; Read, Ouimette, White, Colder, & Farrow, 2011), there has been little examination of how these two risks together may lead to deleterious outcomes, arguably among the most central of which is academic functioning.

Education Attainment and Achievement in University Students

Approximately 50% of those who graduate high school will matriculate into university, yet of these, *half* will not graduate (U.S. Census Bureau, 2000, 2007). Recent research has found that students who transfer from a 4-year university to another 4-year university are less likely to graduate (Li, 2010). Moreover, those who drop out of university earn far less than their graduated peers, and face a greater likelihood of poverty and other financial burdens (Horn, Berger, & Carroll, 2004; U.S. Census Bureau, 2007). Thus, university completion is an important goal, and the identification of factors that contribute to educational attainment is a necessary endeavor.

A number of demographic variables predict university completion, including high school grade point average (GPA), achievement and aptitude scores, parental socioeconomic status, gender, and ethnicity (DesJardins, Ahlburg, & McCall, 1999; Ting & Robinson, 1998). Year in school is also a significant risk factor; the first year of school is when students are most likely to drop out, and approximately one fourth of students drop out after their freshman year (American College Testing Program, 2001; DesJardins et al., 1999). University academic performance is one of the strongest predictors of university graduation and is a predictor of drop out (DesJardins et al., 1999; Pascarella & Terenzini, 1991, 2005). As such, a focus on academic performance and factors that influence it during freshman year may assist in student retention in the long term.

Other factors that affect academic performance and attrition are psychological in nature (Kessler, Foster, Saunders, & Stang, 1995a). Two important such variables are psychological distress, particularly posttraumatic stress disorder (PTSD; Kessler et al., 1995a), and substance misuse (Braxton, Hirschy, & McClendon, 2004; Breslau, Lane, Sampson, & Kessler, 2008; Daugherty & Lane, 1999; Pritchard & Wilson, 2003; Staff, Patrick, Loken, & Maggs, 2008). Each of these factors, their relevance for university students, and their potential role in academic outcomes is discussed below.

Posttraumatic Stress Disorder in University Students

The current version of the Diagnostic and Statistical Manual for Mental Disorders Fourth Edition, Text Revision (DSM-IV-TR; APA, 2000) defines trauma exposure as experiencing, witnessing, or learning about an extremely stressful event (Criterion A1), accompanied by an emotional reaction comprising intense fear, helplessness, or horror (A2). For some, exposure to such events may be followed by significant psychological distress, including symptoms such as reexperiencing the trauma (Criterion B; need at least one B symptom), avoiding trauma-associated stimuli and/or emotional numbing (Criterion C; need at least three C symptoms), and increased arousal (Criterion D; need at least two D symptoms). These symptom clusters need to be present for at least 1 month (Criterion E) and lead to significant impairment in functioning (e.g., work problems; Criterion F). Together, these comprise the clinical syndrome known as PTSD (APA, 2000).

Though, until recently, little empirical attention had been devoted to Criterion A trauma exposure and PTSD in university students, recent data show that these phenomena are in fact

quite prevalent in this population. Rates of lifetime trauma exposure range from 66%–85% with approximately 9% of university students meeting diagnostic criteria for PTSD (Frazier et al., 2009; Read et al., 2011; Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008; Twamley, Hami, & Stein, 2004; Vrana & Lauterbach, 1994).

PTSD and Academic Outcomes

Despite evidence that PTSD is associated with functional impairment across multiple domains (Filipas & Ullman, 2006; Kessler, 2000), there is a paucity of research on deleterious outcomes—academic performance in particular—which may be associated with PTSD in university students, though at least some evidence suggests the possibility of such a link. For example, Kessler et al. (1995a) found anxiety disorders, in general, and PTSD, in particular, to have deleterious effects on academic attainment. In addition, Duncan (2000) found childhood trauma to predict university attrition, the first year of university being a time of particular vulnerability. Work by DeMeuse (1985) also highlights the relation between psychological distress and academic performance, showing life stress to be inversely linked to grades. Importantly, PTSD symptoms are dynamic, remitting, stabilizing, or worsening over time. Data indicate that persistent, unremitting PTSD symptoms may be especially detrimental to functional outcomes (Read, Brown, & Kahler, 2004); thus, we examine symptom patterns in the present study.

University Alcohol Use

A substantial portion of university students engage in heavy drinking and experience negative consequences (Hingson, Heeren, Winter, & Wechsler, 2005; Hingson et al., 2009; O'Malley & Johnston, 2002; Wechsler & Nelson, 2008). Freshman year in particular is a risky time for these outcomes (Schulenberg & Maggs, 2002; Thompson, Leinfelt, & Smyth, 2006), and, for this reason, many university-based alcohol interventions target first-year students (LaBrie et al., 2009; Lewis, Neighbors, Oster, Kirkeby, & Larimer, 2007; Turrisi et al., 2009).

University Drinking and Academic Outcomes.

Findings regarding associations between drinking and academic achievement are mixed. In at least two national surveys, alcohol has been linked to poor class performance, missing classes, and lower GPA (Engs, Hanson, & Diebold, 1996; Presley, Meilman, Cashin, & Lysterla, 1996). Corroborating these findings are prospective data from Pascarella et al. (2007) and cross-sectional data from Singleton (2007) that show heavy episodic (binge) drinking to be negatively related to GPA, even when controlling for relevant demographic and other variables (e.g., high school grades, aptitude scores, parental education, time studying). Other data convey a more complex relationship. Martinez, Sher, and Wood (2008) found heavy drinking to predict university attrition only when the *type* of drinking event was taken into account (e.g., drinking in bars/clubs predicted attrition whereas drinking at Greek and sporting events did not). Thus, though far from conclusive, there is evidence to suggest that alcohol involvement negatively affects university academic outcomes.

PTSD and Alcohol Use

Trauma and PTSD long have been linked to problem alcohol use in older adults (Keane&Wolfe, 1990; Kessler et al., 1996; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995b). Self-medication models hypothesize that individuals use alcohol to relieve or reduce painful affect states (Conger, 1956; Greeley & Oei, 1999; Khanztian, 1997). At least some data show that PTSD increases the likelihood of alcohol dependence (Breslau, Davis, & Schultz, 2003; Chilcoat & Breslau, 1998; Stewart, 1996), supporting a self-medication model of alcohol use and PTSD.

Self-medication models of PTSD and problem drinking seldom have been tested in university students, yet some recent data do offer support for this process in this population (Read, Merrill, Griffin, Bachrach, & Khan, 2012). Posttraumatic stress and alcohol use commonly co-occur in the general population, and this co-occurrence has been linked to impairment in myriad functional outcomes (c.f. Jacobsen, Southwick, & Kosten, 2001; Read et al., 2004). No studies to our knowledge have sought to test these two risk factors together in a university sample.

The Present Study

As reviewed above, research has begun to examine mental distress as a potentially important predictor of university academic performance. One example of such psychological distress is PTSD. Therefore, the first aim of the present study was to examine whether PTSD at university matriculation was related to two indices of academic achievement: (a) grade point average and (b) university departure. We also sought to examine whether students whose PTSD symptoms persist, remit, or emerge during the first year performed worse academically or were at greater academic risk than students who never developed PTSD. It was expected that both entry into university with PTSD and persistence of PTSD symptoms across the year would be negatively related to GPA and attrition. It was also expected that students who developed PTSD over time would achieve a lower GPA and be more likely to attrit in comparison to their non-PTSD peers. Students whose PTSD symptoms remitted over the course of the year were expected to show a comparable GPA and departure probability to their non-PTSD counterparts.

Moreover, we also sought to understand the relationship between PTSD status, alcohol use, and academics across the first year of school by examining whether there was a temporal association between PTSD and alcohol use and related consequences during the first year of school and whether these alcohol variables mediated the relationship between PTSD and both lower GPA and attrition. The effects of *change* in PTSD status on academic outcomes (via alcohol use and consequences) were also examined. It was expected that both PTSD and change in PTSD status (e.g., unremitted/development of PTSD) would predict an increase in alcohol use and related consequences across the year. It was also expected that alcohol use/ consequences would predict lower GPA and greater likelihood of departure.

Method

Procedure

Data collection for the present study was part of a longitudinal study of associations between trauma, posttraumatic stress, and substance use in university students. In the summer prior to matriculation, all incoming first-year students at two mid-sized public Northern (Site 1; $n = 4,397$) and Southeastern (Site 2; $n = 1,488$) universities were invited by postal and e-mail to participate in an initial screening. A web link to a secure online trauma and PTSD screening survey were sent to these students. A hard copy version of the survey also was sent, and students could choose their preferred mode of participation (online, paper-and-pencil). Recruitment took place in three cohorts: Fall of 2006 (Cohort 1, Site 1) and the Fall of 2007 (Cohort 2, Site 2; Cohort 3, Site 1).

Consistent with other large-scale online surveys using similar methodologies (e.g., Neighbors, Geisner, & Lee, 2008; Larimer, Turner, Mallett, & Geisner, 2004), just under 60% ($N = 3,391$) of the surveys were completed and returned. After data cleaning, and deletion of cases with significant missing data, the final screening sample comprised 3,014 usable cases. This sample was slightly overrepresented by women (our sample comprised 58% females as opposed to 47% averaged across universities) and White students (72% of our sample reported ethnicity as White as opposed to the general first-year classes, which were made up of approximately 62% White students).

From this initial screening sample, a subset ($N = 1,234$) was targeted for ongoing longitudinal follow-up ($n = 969$ from Site 1; $n = 265$ from Site 2). To ensure ample representation of posttraumatic stress symptoms, a portion of these students were targeted because of their trauma status ($n = 649$; experienced a Criterion A trauma and endorsed at least one symptom in each PTSD cluster). The remaining participants ($n = 585$) were chosen randomly and did not meet these symptom criteria. E-mail invitations and a link to the study website and baseline (Time 1 [T1]) survey were sent to this target sample. Approximately 81% ($N = 1,002$; $n = 787$ from Site 1; $n = 215$ from Site 2) completed and returned the baseline survey. This constituted the final longitudinal sample. These participants were assessed at five more time points over their first year of university (Time 2 = October, Time 3 = November, Time 4 = December, Time 5 = February, Time 6 = April), with a retention rate of 90% (with T1 sample as the denominator) at each time point. With the exception of sex (73% female in the trauma group), there were no significant differences between the trauma and non-trauma groups on demographics or on overall level of alcohol use.

Participants

As stated above, 1,002 participants were involved in the present study (651 female, mean [M] age = 18.11, standard deviation [SD] = 0.44). The average reported high school GPA was 3.61 ($SD = .38$) and the average family income reported was approximately \$51,000–\$60,000 ($SD = \$20,000$). Self-reported ethnicity of the sample was as follows: 725 identified as Caucasian (72.3%), 115 as Asian (11.5%), 90 as African American (9%), 33 as Hispanic (3.3%), 35 as Other (3.5%), and four participants did not report ethnicity (<1%). Approximately 652 (65%) participants reported that they consumed alcohol during their

senior year of high school. On average, of those who consumed alcohol, students reported drinking two to three times in the past year. When drinking, participants reported consuming an average of three drinks per occasion ($SD = 2$ drinks) and experiencing four and a half negative consequences on occasions when they drank alcohol ($SD = 4.4$). The most frequently endorsed problems were “said or done embarrassing things while drinking” ($n = 389$) and “had a hangover or got sick to my stomach the morning after drinking” ($n = 386$).

Measures

Demographics.—Participants reported on demographic characteristics including sex, age, ethnicity, and family income.

GPA.—Participant GPA was obtained from university transcripts for the Spring semester of freshman year. Self-reported GPA correlated .78 with transcript GPA. Students tended to slightly overreport GPA (M self-report Spring GPA: 3.15 vs. M transcript Spring GPA: 2.99).

Attrition and transfer.—Participants were asked their “education level” at each time point. Students who endorsed “not currently enrolled in university” at any time point during the first year were considered “attriters.” At each assessment, participants were also asked if they “recently changed universities (transferred).” Students who endorsed this at any time point were considered “transfers.” One hundred and twenty-eight participants (12.8%) endorsed either unenrolling ($n = 14$) or transferring ($n = 114$) by the end of their freshman year, with the vast majority (90%) of these students leaving during or after the Spring semester. Due to the low attrition rate, we created a dichotomous variable that represented students who, for whatever reason, had left the university (1) and students who stayed enrolled at Site 1 or 2 (0). There were no site differences in rates of departure and approximately 40% of students who transferred reported transferring to a community college or technical school.

Trauma exposure.—The Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000) was used to assess lifetime trauma exposure at baseline (T1) and past-month (or “since the last survey”) trauma exposure at all subsequent time points. The TLEQ comprises 23 items that assess a range of traumatic events consistent with the DSM-IV-TR (e.g., transportation accidents, natural disaster, unwanted sexual assault, combat exposure, physical assault, sudden unexpected death of a loved one, life-threatening illness, etc.). Participants first indicated whether or not they had experienced an event (Criterion A1). If participants endorsed a trauma, then they were asked to indicate if they experienced trauma-associated intense fear, helplessness, or horror (Criterion A2). The inclusion of questions assessing both Criteria A1 and A2 allowed for the determination of whether an individual had experienced a Criterion A trauma as defined by the DSM-IV-TR.

Traumatic stress sequelae.—Traumatic stress sequelae were assessed with the 17-item PTSD Checklist-Civilian Version (PCL-C; Weathers, Huska, & Keane, 1991; Weathers, Litz, Herman, Huska, & Keane, 1993), which assesses Criteria B, C, and D of the PTSD construct consistent with the DSM-IV-TR ($\alpha = .93$). The PCL-C has been used in several samples of

university students (e.g., Adkins, Weathers, McDevitt-Murphy, & Daniels, 2008; Hoyt & Yeater, 2010) and has also been shown to correlate strongly with interview assessments of PTSD in university students (Adkins et al., 2008; Read, Farrow, Jaanimagi, & Ouimette, 2009; Ruggiero, Del Ben, Scotti, & Rabalais, 2003). Participants are asked how much they have been bothered by intrusion, avoidance/numbing, and arousal symptoms in the past month. Response options are rated on a 5-point Likert scale, with higher scores reflecting more severe symptomatology.

Participants who had endorsed trauma exposure were instructed to think about the traumatic event while filling out the PCL-C. PTSD status at each time point was established following Blanchard, Jones-Alexander, Buckley, and Forneris's (1996) empirically derived cut scores for creating dichotomously scored symptom counts. This involved scoring each symptom as either a "1" or "0" based on the severity rating that the participant assigned to that item on the 5-point response rating scale. Items rated as 3 or 4 (depending on the item) or higher were scored as a "1." All other ratings were scored as a "0." We then used these counts to determine whether symptom threshold for a diagnosis consistent with PTSD was met (at least 1 reexperiencing, 3 avoidance, and 2 hyperarousal symptoms). Thus, PTSD diagnostic status was based on the TLEQ and the dichotomously scored PCL-C.

PTSD groups.—A categorical variable was created to represent PTSD group status across the first year of university. Four PTSD groups were represented: (a) never developed PTSD ($n = 689$); (b) unremitted PTSD symptoms from T1 through the Spring semester ($n = 36$); (c) PTSD symptom remission by the end of the Spring semester ($n = 78$); and (d) developed PTSD at some time point during the year ($n = 59$; see Table 1 for explanation of how group placement was determined).

Those ($n = 862$) with complete data on all PTSD items across all time points were included in the analysis. Students excluded in these analyses differed from those included on the following baseline variables: high school GPA (lower GPA for those excluded, $M = 3.47$ vs. $M = 3.63$, $t = 4.59$, $p < .01$); high school alcohol use (higher quantity by frequency use excluded, $M = 11.59$ vs. $M = 9.45$, $t = 2.13$, $p = .03$); high school alcohol consequences (students excluded reported slightly more past year consequences, $M = 3.89$ vs. $M = 2.89$, $t = 2.65$, $p < .01$); family income (students excluded reported lower parental income, $M = \$41,000$ – $\$50,000$ vs. $M = \$51,000$ – $\$60,000$, $t = 2.57$, $p < .01$); study site (more Site 2 participants were excluded; 34% versus 20%, $\chi^2 = 14.17$, $p < .01$); and T1 PTSD diagnosis (more T1 PTSD students excluded: 28% vs. 13%, $\chi^2 = 18.9$, $p < .01$). There were no differences on gender or ethnicity.

Alcohol use.—Respondents were given Standard Drink Conversion charts to ensure accuracy in reporting. Participants were asked to indicate whether they had consumed alcohol in the past month. Those participants who endorsed past month use were asked alcohol consumption and consequence questions. Alcohol use was measured with items regarding typical quantity and frequency of alcohol consumption in the past month (Wood, Read, Palfai, & Stevenson, 2001). The frequency question read as follows: "Think of all the times in the past month when you had something to drink. How often have you had some kind of beverage containing alcohol?" The quantity question read: "In the past month, when

you were drinking alcohol, how many drinks did you *usually* have on any ONE occasion?" Higher scores reflected higher frequency and quantity of alcohol use.

For the current analyses, a composite variable of quantity multiplied by frequency across all Year 1 time points was used to capture alcohol use over the first year of university. To accommodate missing values, participant alcohol use was calculated by averaging the quantity by frequency variable over at least three time points (i.e., participants needed to report quantity and frequency at three or more of the 6 time points in order to have alcohol use data; $n = 962$).

Alcohol consequences.—Alcohol consequences were measured with the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong, & Colder, 2006). Participants were asked whether they had experienced any of 48 alcohol-related consequences in the past month (ranging from the relatively minor, e.g., hangover, nausea, to the more severe, e.g., black-outs, drunk driving). Response options are dichotomous (yes/no). For the present study, alcohol consequence total scores were averaged over at least three time points for the year (similar to alcohol use; $n = 961$). Alphas ranged from .93–.95 for each time point. Due to the skewness and kurtosis of the alcohol consequence variables, we used a log transformation to bring them into acceptable range (skewness < 2 , kurtosis < 3).

Data Analysis

Hypothesis 1 (H1).

The first set of analyses examined the nature of associations among PTSD diagnosis at university matriculation, alcohol, and academic performance. A series of mediation models were estimated within a regression framework (Baron & Kenny, 1986). Two outcome variables were examined: academic performance and university attrition. Academic performance was represented by GPA, and university attrition was represented by a dichotomous score reflecting whether the student had departed during the assessment period. Models with GPA as the outcome employed ordinary least squares regression, whereas those predicting departure used binary logistic regression.

The hypothesized mediators of the relationship between PTSD status and academic performance were alcohol use and consequences. In total, four models were run (see Figure 1). Based on prior research examining university alcohol use (e.g., Martinez et al., 2008) and academic performance (e.g., DesJardins et al., 1999; Pascarella & Terenzini, 2005), the following control variables were included in the first step of each model: site, gender, high school GPA, family income, and high school alcohol use/consequences. For models predicting university departure, both high school and current university GPA were entered as control variables.

Following Baron and Kenny (1986), a four-step approach for testing mediation was adopted. First, each academic performance variable was regressed separately on PTSD at matriculation (i.e., does baseline PTSD predict poorer academic performance; path c). Second, alcohol use and consequences were analyzed as outcome variables and regressed separately onto PTSD to determine whether PTSD at matriculation predicted an increase in

alcohol use and related consequences (i.e., testing for an association between the putative mediator and our predictor; path a). Third, alcohol use and consequences were treated as separate predictor variables to determine either negatively predicted GPA or the likelihood of university departure while controlling for PTSD (path b). Last, to test alcohol use and consequences as mediators of this relationship, we examined whether the association between PTSD and academic performance was either no longer significant or significantly diminished (path c').

Hypothesis 2 (H2).

To assess the effects of change in PTSD group status on university academic outcomes, four categorical PTSD symptom groups were created: (a) never developed PTSD, (b) unremitted PTSD, (c) remitted PTSD, or (d) newly developed PTSD. A series of analyses of variance (ANCOVAs) were conducted to examine whether the contrast-coded PTSD group was related to a lower GPA, as well as whether PTSD group was related to increased alcohol use and consequences. Simple contrast effects were examined with "Never developed PTSD" as the referent group. As in H1, four models were run altogether and used site, gender, high school GPA, family income, and high school alcohol use/consequences as covariates. Models predicting university departure employed logistic regression and also controlled for university GPA.

The steps in determining mediation were similar to those laid out in H1. However, in terms of analysis of variance (ANCOVA), if our model revealed a significant omnibus *F* statistic, then contrast analyses were implemented to reveal significant differences between PTSD group status and subsequent outcome variables. Moreover, in the final ANCOVA model (i.e., step 3), alcohol use and alcohol problems were entered as covariates in determining whether either emerged as a significant predictor of a lower GPA while attenuating the PTSD relationship.

Results

Descriptives:

Trauma and Alcohol Use during Freshman Year—Consistent with prior research (e.g., Frazier et al., 2009), at matriculation, 73.4% of our sample reported at least one lifetime Criterion A trauma. The mean number of traumas experienced was 2.3 (*SD* = 2.3). Rates of trauma endorsement broken down by the whole sample and for students who met PTSD criteria are presented in Table 2. Throughout the year (Time points 2–6) the most commonly endorsed traumas for both the whole sample and for students meeting diagnosis for PTSD at T1 were as follows: Experiencing a sudden unexpected death of a close friend/loved one; a loved-one's survival of a life-threatening/permanently disabling accident/assault/illness; being subjected to unwanted sexual attention; and being the victim of stalking.

In terms of alcohol use, participants reported on average drinking one to three times in the previous month at each time point in their freshman year (*SD* = 1.5 days) and typically consuming two drinks per occasion in the previous month at each time point (*SD* = 2

drinks). Participants also reported experiencing an average of three to five alcohol consequences per time point ($SD = 7$).

Cross-Sectional Analyses—We used t-tests to examine the associations among T1 PTSD status, high school GPA, alcohol use and consequences, site, and demographic variables. Results revealed that those entering university with PTSD had a lower high school GPA ($M = 3.55$ vs. 3.62), $t = 2.18$, $p = .03$, and experienced more past-month alcohol consequences than students without PTSD ($M = 7.54$ vs. 4.69), $t = 4.43$, $p < .000$. Students entering university with PTSD had a lower family income ($M = \$41,000$ – $\$50,000$ vs. $\$51$ – $\$60,000$), $t = 2.72$, $p = .007$. Chi-square analysis revealed that a higher percentage of female participants matriculated with PTSD (18% vs. 10.6%), $\chi^2 = 8.95$, $p = .003$. No other baseline differences were observed. See Table 3 for bivariate correlations among untransformed model variables.

Prospective Effects of PTSD at Matriculation, Alcohol Involvement, and GPA—

We first examined whether the association between T1 PTSD and end-of-year GPA was mediated by alcohol use. When end-of-year GPA was regressed onto T1 PTSD, the path was nonsignificant ($B = -.01$, $R^2 = .17$, $p = .93$); however, high school GPA significantly predicted end of year GPA ($B = .80$, $p < .001$). This pattern of autoregressivity was consistent throughout all models tested (i.e., past academic performance significantly predicted current academic performance). The second step in Baron and Kenny's (1986) method was conducted here and for all hypothesized mediated associations (Shrout & Bolger, 2002). First-year alcohol use was regressed onto T1 PTSD status. This was also nonsignificant ($B = .26$, $R^2 = .67$, $p = .56$); however, high school alcohol use significantly predicted current university use ($B = .60$, $p < .001$). Thus, we found no evidence for mediation of the PTSD–GPA relation by alcohol use. Similar results were found when end-of-year alcohol consequences was used as the mediator.

Prospective Effects of PTSD at Matriculation, Alcohol Involvement, and University Departure—

To examine mediation by alcohol use over the first year of university, first-year attrition/transfer was regressed onto T1 PTSD status. This path was nonsignificant (odds ratio [OR] = 1.58, 95% confidence interval [CI], .88–2.85, $p = .13$). In this model and all subsequent models with university departure as the dependent variable, university GPA significantly predicted leaving university (estimated OR = .49, 95% CI, .38–.64, $p < .001$). As discussed above, path a was nonsignificant, again precluding mediation.

Similar analyses tested whether alcohol consequences over the first year of university mediated T1 PTSD status and first-year attrition/transfer. As reported earlier, T1 PTSD status did not predict the likelihood of leaving university during the first year, nor did it predict end-of year consequences. However, when both T1 PTSD status and Year 1 alcohol consequences were entered into the model, both predicted (PTSD trending toward significance at $p = .08$) the probability of leaving university during the first year (estimated OR for PTSD = 1.69, 95% CI, .92–3.08, $\eta^2 = .02$; estimated OR for yearly alcohol consequences = 1.55, 95% CI, 1.07–2.24, $p = .02$, $\eta^2 = .01$), although effect sizes were small. Thus, T1 PTSD and experiencing more alcohol consequences in the first year increased the log of the odds of university departure.

End-of-Year PTSD Group Status, Alcohol Involvement, and GPA—We first examined whether PTSD group status by the end of the first year predicted end-of-year GPA and whether this relationship could be accounted for by first-year alcohol use. As hypothesized, significant effects of PTSD group status emerged, $F(3, 805) = 3.60, p = .01$. Contrast analyses showed that, relative to participants who never had PTSD, those who developed PTSD over the course of the year (i.e., new cases) had lower end-of-year GPA ($M = 2.67$ v. 3.04 ; contrast estimate = $-.33, p = .001$). Although the unremitted and remitted groups both had lower average GPAs than participants who never had PTSD ($M_s = 2.9$), this was not significantly different than 3.04 . The next ANCOVA tested whether PTSD group status was associated with first-year alcohol use. This effect was nonsignificant, $F(3, 840) = .36, p = .78$. For exploratory purposes, a third ANCOVA was conducted with both PTSD group status and first-year alcohol use as covariates. PTSD group status remained a significant predictor of end-of-year GPA, $F(3, 804) = 3.71, p = .01$, while the influence of yearly alcohol use on predicting GPA trended toward significance, $F(1, 804) = 3.27, p = .07$. Therefore, PTSD group status seemed to be a robust predictor for year-end GPA, while alcohol use might have also played a role in this relationship.

Parallel analyses to those reported above for alcohol use were conducted to examine the role of first-year alcohol-related consequences in the PTSD–GPA association. The effect of PTSD group trended toward significance, $F(3, 840) = 2.35, p = .07$. Follow-up contrast analyses showed that, again, relative to participants who never developed PTSD, those who developed PTSD over the course of the year experienced more alcohol consequences ($M = 6.24$ v. 3.33 ; contrast estimate = $.18, p = .03$). Although students with unremitted PTSD symptoms also reported more alcohol consequences ($M = 6.35$), this contrast was not significant. This is possibly due to low sample size in this group ($n = 35$). In a final ANCOVA model with PTSD group and first-year alcohol consequences entered as predictors, the effect of PTSD group on end-of-year GPA remained significant, $F(3, 804) = 3.37, p = .02$. There was a trend towards an effect of Year 1 consequences, $F(1, 804) = 3.70, p = .06$.

End-of-Year PTSD Group Status, Alcohol Involvement, and University

Departure—To examine the role of first-year alcohol use in the PTSD–university departure relationship, university departure was regressed onto PTSD group status (controlling for high school alcohol use). The overall model was significant, $\chi^2(9) = 24.72, p < .01$. Contrast paths revealed that, compared with never developing PTSD, unremitted PTSD predicted the likelihood of departure by the end of freshman year (estimated OR = 2.83 , 95% CI, 1.07 – $7.48, p = .04$). Moreover, compared with never developing PTSD, there was a trend for remitted PTSD students to depart (estimated OR = 1.92 , 95% CI, $.92$ – $4.03, p = .08$). As with our ANCOVA models, PTSD group was not associated with first-year alcohol use.

Similar analyses were conducted with alcohol consequences, with university departure being regressed onto PTSD group status (controlling for high school consequences). The overall model was significant, $\chi^2(9) = 24.63, p < .01$. Contrast paths again revealed that unremitted PTSD predicted the likelihood of university departure (estimated OR = 2.81 , 95% CI, 1.06 – $7.48, p = .04$). Likewise, compared to never developing PTSD, remitted PTSD marginally predicted the likelihood of departure (estimated OR = 1.92 , 95% CI, $.91$ – $4.04, p = .09$).

Next, as found in our previous ANCOVA models, the effect of PTSD group status trended toward significance when predicting alcohol consequences over the first year, $F(3, 840) = 2.35, p = .07$.

Thus, even though true mediation could not be established in this model, we entered both PTSD group and alcohol consequences as predictors in the same model to assess the unique contribution of each on university departure. This overall model was significant, $\chi^2(10) = 29.62, p < .01$. While alcohol consequences significantly predicted the likelihood of university departure (estimated OR = 1.62, 95% CI, 1.10–2.20, $p = .02$), the contrast path for unremitted PTSD versus never having PTSD was reduced to nonsignificance (estimated OR = 2.60, 95% CI, .97–6.98, $p = .06$). Thus, accounting for alcohol consequences diminished the relationship between unremitted PTSD and university departure (see ORs in Table 4).

Discussion

The present study examined associations between PTSD and academic performance in the first year of university, and alcohol's role in this relationship. Interestingly, we found that it was end-of-year PTSD group status that was most relevant to academic outcomes and drinking, rather than simply whether students had PTSD at matriculation. Counter to our expectations, relations between PTSD and academic outcomes were not mediated by drinking variables. Yet alcohol did play other potentially important roles in GPA and university departure.

There was no main effect of PTSD status at matriculation on GPA, alcohol use, or related consequences. Auto regressivity in both high school GPA and alcohol behavior may have obscured these associations. T1 PTSD status did, albeit marginally, predict the likelihood of departure, but only when alcohol consequences were included in the model. Thus, rather than the mediated effect that we anticipated, we observed instead modest evidence for a suppression effect. We interpret this effect to suggest that entering university with PTSD exerts a relatively small prospective influence on academic outcomes, one that can be detected only when other, stronger influences are accounted for.

We saw a different picture when we looked at PTSD more dynamically, taking into consideration group status over time. PTSD group status exerted a clear influence on GPA, departure, and alcohol outcomes by the end of the year. This suggests that early on student functioning looks similar, irrespective of PTSD symptoms. Differentiation appears only as time passes. Moreover, though effect sizes were not large, analyses controlled for past academic and alcohol behavior, suggesting these findings are of theoretical importance to understanding the role PTSD plays among university students.

Importantly, these data are the first to show that developing PTSD during the first year of university can lead to harmful functional outcomes (i.e., academic performance), as PTSD group status predicted a lower GPA, with newly developed PTSD emerging as the significant contrast. The emergence of PTSD in students already simultaneously attempting to manage a new environment, new expectations, more rigorous academic challenges, and, likely, fewer familiar social and familial resources might present particular vulnerability for impaired

academic performance. In contrast, students who had unremitted and remitted PTSD may have learned to cope with their symptoms, possibly due to the “practice” they have had managing symptoms over time. It is also possible that new trauma symptoms were (or were perceived) as more frequent and/or intense, which could also have contributed to poorer academic functioning.

Students who developed PTSD at some point over freshman year reported (marginally) more alcohol consequences than their non-PTSD peers. However, the contrast between the unremitted PTSD group and the non-PTSD group was not statistically significant. This may have been due to statistical power; fewer students continually met for PTSD. Alternatively, there may be

something unique about the new or recent emergence of symptom that is deleterious (see above). However, students who developed PTSD did not report greater alcohol use. These findings are in line with past research that demonstrated that individuals experiencing greater negative affect might not necessarily drink more, but they do drink more problematically (Camatta & Nagoshi, 1995; Kushner, Sher, Wood, & Wood, 1994). This distinction is important for assessment and intervention applications; trauma-exposed students may drink like their nonexposed peers, but they more often experience alcohol-related consequences when drinking.

PTSD group status and alcohol consequences (marginally) uniquely and together predicted lower GPA. As noted, past research assessing the alcohol-GPA relationship has yielded mixed findings (e.g., Pascarella et al., 2007; Paschall & Freisthler, 2003; Singleton, 2007; Wood, Sher, Erickson, & DeBord, 1997). In the present study, alcohol behavior uniquely predicted lower university GPA, above and beyond PTSD. This offers further evidence for alcohol’s role in negative academic outcomes. Further, the PTSD-GPA relationship found here corroborates prior data showing an influence of anxiety on academic performance (Breslau et al., 2008; Rosenthal & Wilson, 2003), and is the first to show an influence of PTSD specifically.

PTSD group status also predicted the likelihood of university departure by the end of freshman year. Specifically, those in the unremitted and remitted PTSD groups were most at risk for leaving school. This implies that even students whose symptoms remit to subclinical levels are still somewhat impaired in important, functional areas (i.e., academic success). In fact, by the end of the year, students in the remitted group still reported experiencing some avoidance ($M = 1.15$, $SD = 1.56$) and hyperarousal ($M = 1.17$, $SD = 1.42$) symptoms, although not as severe reexperiencing symptoms ($M = .88$, $SD = 1.32$). It also is possible that these students had decided to leave school prior to their symptoms remitting.

These findings diverge somewhat from results looking at PTSD group status and GPA. Those with newly developed PTSD had lower GPAs than their non-PTSD peers but were not more likely to leave school. Students in the unremitted PTSD group did not differ from their non-PTSD peers on GPA, though they were more likely to depart. This may reflect a lagged effect; because symptoms were newer, they had not yet begun to affect grade outcomes. These students may eventually leave school, just not by the end of their freshman year. Continued assessment of these students as they progress through school will help to support

or rule out this possibility. Another possible explanation lies in the extent to which GPA and departure represent two distinct constructs. The bivariate correlation between GPA and end-of-year departure was $-.18$, suggesting that the two are related but not the same. Students may leave school for a variety of reasons, not just poor academic performance. It is a limitation of the present study that specific reasons for drop out or transfer were not assessed.

The present findings are only somewhat consistent with self-medication theory. Other work also has found mixed support for a prospective pathway between PTSD and alcohol behavior (e.g., Miller, Vogt, Mozley, Kaloupek, & Keane, 2006; Read, et al., 2012). Still, it may be that finer grained symptom tracking would reveal a link (e.g., Ouimette, Read, Wade, & Tirone, 2010) or that autoregressivity of high school behavior overshadowed this relationship.

Some limitations of the present study should be noted. As discussed above, we combined and analyzed together the attrition and transfer variables. Among students who transferred, approximately 40% went to a community or technical school while the remaining attended other 4-year institutions. Where students transfer to and how this might be affected by PTSD is a potentially interesting question. However, the specific type of university departure that may be accounted for by PTSD or alcohol behavior was not determined in this study. Small sample size precluded us from assessing this question in more depth. However, as mentioned earlier, both transfer and dropout students are less likely to eventually graduate and are therefore at risk for deleterious real-world outcomes (e.g., Li, 2010).

Another limitation involves missing data. Participants with missing PTSD data at any time point were excluded from group categorization. As those excluded were more rather than less severe in their PTSD status, alcohol behavior, and GPA, the likelihood is good that effects observed here would be stronger had these individuals been counted in the analysis. Still, this is merely speculation, and the impact of these excluded participants cannot be known. Moreover, though the specific effects of trauma type and/or revictimization as potential predictors of alcohol behavior and academic performance were beyond the scope of the present article, this could be an interesting avenue of investigation in future work. For example, it is possible that certain traumas (e.g., death of a parent) play a more substantial role in predicting university dropout than others (e.g., car accident). However, past research has found that it is posttrauma distress, rather than trauma exposure per se, that is most likely to exert an influence on behavioral outcomes (Lepore, 1997; Stewart & Conrod, 2003).

Measures in this study were chosen for their strong convergence with validated PTSD clinical interviews. Further, study procedures (e.g., assurance of confidentiality, de-identified data) were implemented to maximize truthful reporting (Dillman, 2000), and data screening procedures (monitoring survey completion time, careful examination of improbable responses or patterns) were designed to confirm careful and accurate completion of measures. Still, structured clinical interview is the gold standard of psychological assessment, and, as such, our self-report approach may not have fully captured the complexities of the PTSD diagnosis.

Conclusions

In summary, the present findings point to PTSD symptom change as a potentially important risk factor for both alcohol problems and academic impairment during the first year of university. Student retention and graduation are priorities for most universities. Routine assessment of trauma history, PTSD symptoms, and alcohol use during freshman year may help to identify vulnerable students, and thus prioritize them for intervention.

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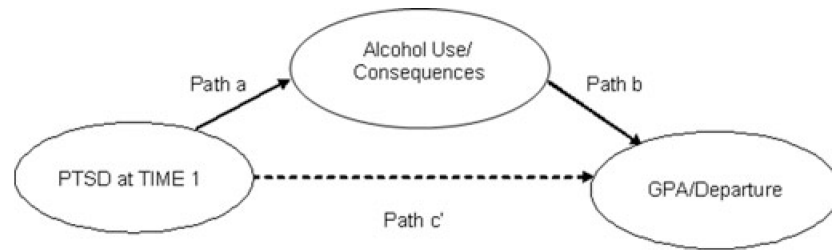


Figure 1. Model assessing the relationship between PTSD at T1 and end-of-year GPA/departure mediated by alcohol use/consequences over the first year of college.

Table 1

PTSD Group Placement at Time 6

PTSD groups	T1	T2	T3	T4	T5	T6
Never PTSD	No	No	No	No	No	No
Unremitted PTSD	Yes	Y/N	Y/N	Y/N	Yes	Yes
Remitted PTSD	Yes	Y/N	Y/N	Y/N	No	No
New PTSD	No	Y/N	Y/N	Y/N	Y/N	Y/N

Note. T = Time; PTSD = posttraumatic stress disorder; Yes = met PTSD criteria; No = did not meet PTSD criteria.

To fall into the “Unremitted” group, participants needed to meet PTSD diagnostic criteria for at least 4 time points, one of which had to be either T5 or T6. To fall into the “Remitted” group, participants could not meet PTSD criteria at both T5 and T6. To fall into the “Newly developed” group, participants had to develop PTSD at *any* time point during the year (except T1).

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Table 2

Percentage of Frequently Endorsed Criterion A Traumas at Matriculation

	Entire sample	PTSD met at Time 1
Sudden unexpected death of close other	46.5%	71%
Illness/disabling assault or accident of close other	31%	46.7%
Witness to domestic violence	20%	46.7%
Unwanted sexual attention (touching, cornering, etc.)	12.8%	27%
Was threatened to be killed or seriously harmed	12.2%	30.3%
Was stalked, causing concern for safety	12%	30.3%
Natural disaster (flood, hurricane, earthquake, etc.)	11%	17.8%
Car accident involving serious injury or death	10.8%	14.5%
Physically punished growing up (bruises, burns, etc.)	10.6%	21.7%

Note. Entire sample $N = 1,002$; PTSD met at Time 1 $N = 152$.

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Table 3

Bivariate Correlations, Means, and Standard Deviations of Model Variables

	1	2	3	4	5	6	7	8	9	10	11	12	M	SD
1. Gender	1												.35	.48
2. H.S. GPA	-.10**	1											3.61	.38
3. Income	.10**	.14**	1										6.04	2.46
4. Site	-.19*	-.14**	-.12**	1									1.21	.41
5. PTSD T1	-.10**	-.07*	-.09**	.06	1								.15	.36
6. PTSD Yr	-.14**	-.05	-.09**	.05	.54**	1							.43	.92
7. H.S. Ale.	.12**	-.03	.19**	-.14**	.02	.05	1						9.75	11.05
8. H.S. Cons.	-.01	-.03	.13**	-.08*	.13**	.14**	.70**	1					3.03	4.2
9. University	-.03	.39**	.12**	-.14**	-.05	-.10**	-.08*	-.07*	1				2.95	.85
GPA														
10. Departure	-.04	-.04	-.02	-.02	.07*	.04	.01	.04	-.18**	1			.13	.33
11. University	.15**	-.01	.25**	-.14*	.02	.02	.81*	.66**	-.08*	.01	1		7.47	8.54
Ale.														
12. University	-.03	-.01	.13**	-.06	.12**	.15**	.58**	.81**	-.06	.05	.71**	1	3.94	5.82
Cons.														

Note. H.S. GPA = high school grade point average; Site = site of study location; PTSD T1 = posttraumatic stress disorder met at Time 1; PTSD Yr = post-traumatic stress disorder group placement at end of first year; H.S. Ale. = typical alcohol quantity-frequency during senior year of high school; H.S. Cons. = consequences experienced during senior year of high school; Departure = attrition/transfer during first year; University Ale. = typical alcohol quantity-frequency during first year; University Cons. = consequences experienced during first year.

* $p < .05$,

** $p < .01$.

Table 4

Likelihood of First-Year University Departure

Predictors	University departure: ORs	95% CI
Unremitted vs. never PTSD	2.6 [‡]	.97–6.98
Remit vs. never PTSD	1.95 [‡]	.92–4.12
New vs. never PTSD	.81	.30–2.23
University Alc. consequences	1.62 [*]	1.09–2.4
High school Alc. consequences	.92 [‡]	.84–1.01
High school GPA	1.68	.80–3.54
Site	.77	.39–1.52
Income	1.00	.90–1.12
Gender	.69	.39–1.21
University GPA	.55 [*]	.41–.74

Note. OR = odds ratio; CI = confidence interval; PTSD = posttraumatic stress disorder; Alc = typical alcohol quantity-frequency; GPA = grade point average.

^{*} $p < .05$,

[‡] $p < .10$.