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Age of alcohol use initiation and psychiatric symptoms among young adult trauma survivors

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Abstract

Alcohol use disorder (AUD) evidences high rates of comorbidity with a range of psychiatric disorders, particularly within high-risk populations, such as individuals exposed to physical or sexual violence. Increasing efforts are focused on understanding the role of early alcohol use (e.g., during adolescence) on emotional and psychiatric functioning over time, as well as sex differences in these associations. The aim of the current study was to evaluate patterns of association between age of initiation of regular alcohol use and posttraumatic stress disorder (PTSD), anxiety, and depressive symptoms as a function of sex. Participants were 269 college students with a history of interpersonal trauma and alcohol use who completed a battery of questionnaires regarding alcohol use and emotional health. Neither bivariate correlations nor results from structural equation models covarying for key factors showed a relationship between age of alcohol use initiation and current psychiatric symptoms among men ($n = 63$). Results of a structural equation model supported an association between earlier age of alcohol use initiation and greater levels of current PTSD ($\beta = -0.14$), anxiety ($\beta = -0.15$), and depression symptoms ($\beta = -0.16$) in the female subsample ($n = 202$), after controlling for covariates, as well as intercorrelations among criterion variables. Statistical support for sex as a moderator of these associations was not detected. The current study provides preliminary evidence for potential sex differences in the role of early

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Contributors

Dr. Berenz designed the current study, led the primary data collection for this project, and served as lead author writing the manuscript. Ms. McNett contributed to literature searching, descriptive analyses, and writing/editing of the manuscript. Dr. Rappaport ran the primary models and wrote the SEM results and table. Drs. Vujanovic and Viana contributed to the writing of the manuscript. Dr. Dick oversaw the data collection for the “parent study” on which this “spin-off” study was based and provided edits to the manuscript. Dr. Amstadter mentored Dr. Berenz on the data collection and design of this research study and provided edits to this manuscript.

Conflict of interest

The authors have no conflicts to disclose.

alcohol use in the development of psychiatric symptoms and highlights the need for systematic longitudinal research.

Keywords

Alcohol; Posttraumatic stress disorder; Anxiety; Depression; Alcohol use disorder; Drinking

1. Introduction

Individuals with alcohol use disorder (AUD) are likely to meet criteria for a range of comorbid emotional disorders, including posttraumatic stress disorder (PTSD), major depression, and anxiety disorders (Blanco et al., 2013; Grant et al., 2015), with psychiatric comorbidity being associated with poorer AUD treatment response (Kranzler, Del Boca, & Rounsaville, 1996; Kushner et al., 2005; Read, Brown, & Kahler, 2004). Three primary explanations for the comorbidity of AUD with emotional disorders have been offered. The most widely studied and supported explanation is the self-medication model, whereby individuals are presumed to be at heightened risk for AUD due to the use of alcohol to cope with psychiatric symptoms (Khantzian, 1997). A second well-studied explanation is that of shared liability, or the notion that AUD and emotional disorders are related due to common familial risk (i.e., genetic factors and shared environment). Shared liability accounts for a portion of the co-occurrence of AUD with PTSD (Xian et al., 2000) and other emotional disorders (Kendler, Prescott, Myers, & Neale, 2003). Finally, a third model posits that alcohol use and AUD play a causal role in the onset of psychiatric symptoms, in part due to an increased risk for stressful and traumatic life events (e.g., susceptibility hypothesis; Brady, Back, & Coffey, 2004). This model is less well-studied, with the exception of established associations between problem drinking and increased risk for traumatic events, which in turn may predispose individuals to emotional disorders (Kaysen, Neighbors, Martell, Fossos, & Larimer, 2006).

Further study of the role of AUD and related phenotypes in the onset of psychiatric symptoms (defined in the current study as PTSD symptoms, depressive symptoms, and anxiety symptoms) in trauma-exposed populations is warranted, given emerging literature implicating AUD as a potential risk factor for the development of negative emotional outcomes. For example, in the largest, nationally representative investigation of PTSD-AUD comorbidity to date, AUD was found to precede PTSD more often than the reverse association for trauma-exposed women, an effect not accounted for by increased exposure to lifetime trauma (Berenz et al., 2017). A clear role of risky alcohol use and AUD also has been identified with respect to risk for major depression onset (Boschloo, Van den Brink, Penninx, Wall, & Hasin, 2012; Brière, Rohde, Seeley, Klein, & Lewinsohn, 2014). Further understanding alcohol risk pathways for the development of psychiatric symptoms in young adulthood is needed, however, particularly given the bias in the literature for self-medication models of comorbidity.

Studies evaluating preclinical alcohol phenotypes (e.g., alcohol consumption) in relation to psychiatric risk are particularly useful for evaluating etiological risk, given that AUD status

is comprised of heterogeneous combinations of symptoms. Available research supports a link between various alcohol phenotypes and psychiatric risk. Cross-sectional studies have identified links between heavy alcohol use in adolescence and depressive symptoms (e.g., Fidalgo, Silveira, & Silveira, 2008). Longitudinal studies also suggest that heavy alcohol use during adolescence predicts the development of major depression later in adolescence and in young adulthood (see Pedrelli, Shapero, Archibald, & Dale, 2016 for a review). With regard to anxiety, human laboratory studies have found that adolescents who use alcohol regularly exhibit greater panic reactivity in the laboratory, compared to experimental users and non-users (Blumenthal, Leen-Feldner, Knapp, Bunaciu, & Zamboanga, 2012). Furthermore, basic research (e.g., neuroimaging studies, animal studies) has extensively evaluated the negative impact of adolescent alcohol use on a range of neurodevelopmental outcomes relevant to the experience and management of negative affective states, such as reward learning (see Guerri & Pascual, 2010 for a review), impulsivity, and risk preference (McMurray, Amodeo, & Roitman, 2016; Sanchez-Roige, Peña-Oliver, Ripley, & Stephens, 2014; White et al., 2011).

However, it is not clear whether the timing of alcohol exposure (e.g., age of initiation of alcohol use), as opposed to any heavy use or AUD symptoms during adolescence, is important for understanding risk for emotional disorders. Early age of alcohol use initiation is well-established as a risk marker for AUD (e.g., King & Chassin, 2007) and other substance use disorders (e.g., Behrendt et al., 2012), but the impact of age of alcohol use initiation on the development of psychiatric symptoms is not well understood. Clarification of these distinctions is important not only for informing etiological models of AUD comorbidity, but also for guiding adolescent public health initiatives. If age of alcohol use initiation emerges as an important factor in risk for the development of psychiatric disorders, screening and brief intervention efforts might be best spent assessing and delaying the onset of any alcohol use, as opposed to focusing solely on problem drinking metrics.

Another outstanding question is whether there are sex differences in the association between adolescent alcohol use and the development of emotional disorders in trauma-exposed individuals. General associations between alcohol use phenotypes and anxiety and depression symptoms (e.g., Pedrelli et al., 2016; Poulin, Hand, Boudreau, & Santor, 2005), as well as PTSD (Berenz et al., 2017; Kachadourian, Pilver, & Potenza, 2014), are stronger for women compared to men. In a prospective, population-based study of adolescents, Edwards et al. (2014) found that frequency of alcohol use during early adolescence was associated with greater odds of depression in late adolescence for boys and girls, but greater odds of anxiety in late adolescence for girls only.

In light of the evidence supporting a link between adolescent alcohol use and psychiatric risk, it is surprising that basic associations between adolescent alcohol use initiation and psychiatric symptoms have not been widely evaluated. One study by Carbia, Corral, García-Moreno, Cadaveira, and Caamaño-Isorna (2016) found that earlier age of alcohol use initiation was associated with greater anxiety and depression symptoms in a sample of college freshmen in Spain, an effect that was stronger for women compared to men. The Carbia et al. (2016) study was informative; however, the study was limited in a number of ways. First, the authors did not evaluate associations between age of alcohol use initiation

and PTSD symptoms, which are highly comorbid with AUD (Berenz et al., 2017; Brown, Stout, & Mueller, 1999). The examination of an association between age of alcohol use initiation and PTSD symptoms would necessitate a trauma-exposed sample of young adults in order to ensure a significant finding was specific to PTSD symptoms, as opposed to trauma exposure more generally. Second, the study was conducted in a relatively healthy sample of college students. College students are at greater risk for AUD compared to their non-college peers (Carter, Brandon, & Goldman, 2010), but future studies would benefit from examining these associations in a higher-risk subset of the college population to capture clinically meaningful variability in psychiatric symptoms. Trauma exposure is associated with greater risk for a broad range of psychiatric disorders (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Interpersonal trauma in particular, compared to accidental trauma (e.g., illness, injury), is associated with the greatest psychiatric risk (Kessler et al., 1995) and affects a significant proportion of college students (Edwards et al., 2015). Finally, given that familial factors account for significant variation in age of alcohol use initiation (Sartor et al., 2009; Ystrom, Kendler, & Reichborn-Kjennerud, 2014), AUD (Agrawal & Lynskey, 2008), and emotional disorders (Hettema, Neale, & Kendler, 2001; Sullivan, Neale, & Kendler, 2000; True et al., 1993), controlling for familial risk (i.e., family history) of AUD and anxiety/depression may strengthen confidence in significant findings.

Taken together, the aim of the current study was to evaluate sex-specific associations between age of alcohol use initiation and symptoms of PTSD, anxiety, and depression in a sample of young adults endorsing a lifetime history of interpersonal trauma (e.g., sexual assault, interpersonal violence). It was hypothesized that earlier age of alcohol use initiation would be significantly associated with greater PTSD, anxiety, and depression symptoms for women but not men, above and beyond the covariates of lifetime trauma history, family history of AUD, and family history of anxiety and/or depression.

2. Method

2.1. Participants

Participants were 269 undergraduate students (74.7% women) participating in a university-wide, study of environmental and genetic risk for various health behaviors conducted at a large, urban, public university in the Mid-Atlantic region (see Dick et al., 2014 for study overview). Participants who endorsed lifetime interpersonal trauma exposure (e.g., sexual or physical assault) and lifetime alcohol use at one or more “parent” study time points (see Procedure) were included in the current analysis. Please see Table 1 for a summary of participant characteristics.

2.2. Measures

The Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000) is a 23-item self-report measure assessing whether and when participants experienced a range of traumatic events (e.g., natural disaster, assault, accidents, illness/injury) and how many times each event occurred. The TLEQ has evidenced good test-retest reliability and good convergent validity with interview assessments of trauma (Kubany et al., 2000). The TLEQ was used in the current study to confirm the presence of a history of interpersonal trauma, defined as

lifetime history of directly experiencing or witnessing physical assault, sexual assault, or unwanted sexual experiences (see Table 1 for a list of interpersonal traumatic events included in the current study). The current study also utilized a sum of the interpersonal trauma categories as a measure of lifetime interpersonal trauma exposure.

The PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013) is a 20-item self-report measure used to assess PTSD symptoms for individuals' "most traumatic" interpersonal event. Each item corresponds to the symptom criteria for PTSD in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (*DSM-5*; American Psychiatric Association, 2013). Participants indicated the degree to which they have been bothered by a specific symptom (e.g., "repeated, disturbing dreams of a stressful experience from the past") in the past 30 days on a scale ranging from 0 (*not at all*) to 4 (*extremely*). The PCL-5 evidences good reliability and validity in young adult college samples (Blevins, Weathers, Davis, Witte, & Domino, 2015). The current study utilized the PCL-5 total score as a measure of PTSD symptoms ($\alpha = 0.94$), and used a cut-off score of 33 to indicate a positive PTSD screen for descriptive purposes (Blevins et al., 2015).

A subset of 24 items from the *Symptom Checklist-90* (SCL-90; Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974), including abbreviated anxiety and depression subscales, was administered to participants annually in the parent study. Empirically-based methods for abbreviating the SCL-90 are reported previously (Dick et al., 2014). The SCL-90 is a questionnaire designed to assess a wide range of psychiatric symptoms in both clinical and research settings. Participants indicated how much they have been bothered by each symptom in the past 30 days (e.g., "nervousness or shakiness inside," "feeling blue") on a 5-point Likert-type scale ranging from "not at all" to "extremely." The anxiety ($n = 7$ items; range of α 's = 0.83–0.87) and depression ($n = 11$ items; range of α 's = 0.79–0.85) total scores (highest endorsed during the course of the parent study) were utilized as criterion variables in the regression models.

Alcohol use history was assessed via multiple items querying lifetime and recent history of alcohol use. Age of regular alcohol use initiation was assessed with a single item (i.e., "At what age did you begin to drink regularly?"). Participants were informed that "regular drinking" in this study referred to alcohol use occurring at least one time per month for a period of six months or longer (Dick et al., 2014). Participants' self-reported age of regular alcohol use initiation (in years) served as the primary predictor variable in the regression models.

The Alcohol Use Disorders Identification Test (AUDIT; Babor, De la Fuente, Saunders, & Grant, 1992) is a 10-item self-report screening measure developed by the World Health Organization to identify individuals with alcohol problems. There is a large body of literature attesting to the psychometric properties of the AUDIT (e.g., Saunders, Aasland, Babor, De la Fuente, & Grant, 1993). A score of 8 or higher for men and 7 or higher for women indicated at least "moderate" alcohol problems (Babor et al., 1992). The current study utilized the AUDIT as a descriptive measure of alcohol-related problems ($\alpha = 0.80$).

A series of four items was administered to gauge the presence or absence of a family history of alcohol use disorder. Specifically, participants indicated (yes/no) whether they were aware of first- or second-degree biological family members (i.e., mother, father, aunt/uncle/grandparent, sibling) having had “a drinking problem.” A positive family history of alcohol use disorder was defined as endorsement of a drinking problem in one or more biological family members.

Similarly, a series of four items was administered to assess the presence or absence of a family history of anxiety or depression (i.e., “problems with depression or anxiety”) in first- or second-degree biological family members. A positive family history of anxiety/depression was defined as endorsement of one or more family members having these difficulties. Family history of alcohol use problem and anxiety/depression were included as covariates in the regression models.

2.3. Procedure

The current study recruited participants from the first three cohorts of the parent study ($N=7603$; 61.1% women; 50.2% Caucasian, 19.5% Black, 16.3% Asian, 14% other), who enrolled between 2011 and 2013. Full details on the parent study methods are published elsewhere (Dick et al., 2014). Study data for the parent study and current study were collected and managed using REDCap (Research Electronic Data Capture), hosted at Virginia Commonwealth University (Harris et al., 2009). REDCap is a secure, web-based application for collecting and storing data. Potentially eligible participants received an email via REDCap from the parent study registry staff, introducing the current study (e.g., brief study description, link to study website) and requesting permission to be contacted by the research team. Of the 3570 individuals initially contacted, 21.1% ($n=755$) made contact with the research team by completing a form indicating their interest in learning more about the study. Interested participants were sent a link to the online consent form, brief screening item (i.e., “Have you had one or more alcoholic drinks (e.g., beer, wine, liquor) in the past 30 days?”), and survey enrollment link. Seventy-four percent of interested individuals ($n=557$) endorsed current alcohol use and consented to participate. After completing online informed consent procedures, they completed a battery of self-report and behavioral measures online via REDCap. Of the individuals who consented, 86.8% ($n=501$) of the sample completed the online survey. Participants were compensated \$20.

Individuals ($n=269$) who endorsed one or more interpersonal traumas (e.g., sexual or physical assault) and lifetime alcohol use were included in current study analyses. The sample size for PTSD analyses was slightly smaller ($n=261$) due to missing data on the PCL-5. The Institutional Review Board at Virginia Commonwealth University approved all study procedures.

2.4. Data analytic plan

SPSS Statistics 22 was used to compute descriptive statistics and zero-order correlations, which were examined separately for men and women. Structural equation models were fit using Mplus version 8 (Muthén & Muthén, 1998–2017). Three structural equation models were fit to examine the influence of age of initiation of regular alcohol use on i) PTSD

(PCL-5 total score), ii) anxiety (SCL-90 anxiety subscale), and iii) depression symptoms (SCL-90 depression subscale) while adjusting for the intercorrelation of PTSD, anxiety, and depression symptoms. Models were run as multigroup by sex to investigate differential associations of age of initiation with internalizing symptoms as a function of participant sex. The covariates of lifetime trauma load (i.e., total number of traumatic event categories endorsed), family history of AUD, and family history of anxiety/depression were entered in the first model. Age of initiation of regular alcohol use was then added to the second, final model (see Fig. 1). Structural equation models were computed with full information maximum likelihood (FIML) estimation and 10,000 bootstrap draws to compute 95% confidence intervals. FIML estimation is robust to data missing conditionally at random (Little, Jorgensen, Lang, & Moore, 2014). Six (1.97%) participants did not report on PTSD symptoms. Participants who did not provide any responses on the PTSD assessment were not significantly different regarding age of alcohol initiation, anxiety symptomatology, depression symptomatology, sex, family history of an alcohol use disorder, or family history of a mood disorder (p 's > 0.61). However, participants who did not provide PTSD data reported more prior lifetime trauma exposure ($M = 8.33$) than those who provided PTSD data ($M = 5.41$), $t(5.29) = -3.27$, $p = .02$; lifetime trauma exposure was included as a covariate in all subsequent analyses. As solely path models, both structural equation models were fully saturated, $\chi^2(0) = 0$, RMSEA = 0, CFI = 1; fit was not estimated.

3. Results

3.1. Descriptive statistics and correlations

See Table 1 for sample characteristics. Participants endorsed an average of 5 types of lifetime traumatic events, with 38% of men and 47% of women screening positive for PTSD. Alcohol use problems, as assessed with the AUDIT, were quite prevalent. Correlations among study variables are presented in Table 2. Among men, age of alcohol use initiation was not significantly correlated to the variables of interest. Among women, younger age of alcohol use initiation was significantly related to higher lifetime interpersonal trauma exposure, PTSD symptoms, anxiety symptoms, and depression symptoms.

3.2. Age of alcohol use initiation and PTSD symptoms

Overall, the final model explained 9% and 19% of the variance in PTSD symptom severity among male and female participants, respectively. Among female participants, elevated PTSD symptom severity was significantly associated with greater trauma load and younger age of alcohol use initiation (see Table 3). PTSD symptoms were not significantly related to age of initiation of alcohol use among men.

3.3. Age of alcohol use initiation and anxiety symptoms

Overall, the final model explained 5% and 12% of the variance in anxiety symptom severity among male and female participants, respectively. Among female participants, family history of anxiety or depression, as well as trauma load, was associated with elevated anxiety symptoms. Similar to findings for PTSD, elevated anxiety symptom severity was significantly associated with younger age of alcohol use initiation among female

participants. Anxiety symptoms were not significantly related to age of initiation of alcohol use among men.

3.4. Age of alcohol use initiation and depression symptoms

Overall, the final model explained 4% and 10% of the variance in depression symptom severity among male and female participants, respectively. Similar to findings for anxiety, among female participants, elevated depression symptoms were significantly associated with family history of anxiety or depression, trauma load, and younger age of alcohol use initiation. Depression symptoms were not significantly related to age of initiation of alcohol use among men.

3.5. Statistical tests of sex differences

Comparison of 95% empirical confidence intervals permits examination of differential associations of age of alcohol use initiation with symptom indices as a function of participant sex. Across all three symptom indices, while findings are statistically significant for female participants, confidence intervals overlap with those for male participants, which indicates no evidence of differential associations as a function of participant sex.

4. Discussion

The current study examined the relationship between age of alcohol use initiation and PTSD, anxiety, and depression symptoms in a sample of college students exposed to one or more interpersonal traumatic events. Consistent with hypotheses, younger age of alcohol use initiation was associated with greater PTSD, anxiety, and depression symptoms for women, but not for men, even after controlling for lifetime trauma load and familial risk. This study replicates and extends the work of Carbia et al. (2016) to a sub-set of young adults exhibiting a greater range of psychiatric symptoms. Indeed, over a third of men and almost half of women in the sample screened positive for PTSD, and levels of interpersonal trauma were high (Table 1). These rates of PTSD are higher than those observed for survivors of interpersonal trauma in general college samples (Read, Ouimette, White, Colder, & Farrow, 2011), a phenomenon that is likely due to the current study participants being recruited specifically on the basis of interpersonal trauma history and alcohol use. With respect to initiation of alcohol use, men and women in the current study indicated having initiated regular alcohol use around age 12, which is younger than the average age of 15–16 years reported in past studies of trauma-exposed individuals (Sartor et al., 2018; Werner et al., 2016). Prior work also has found, however, that the greater the number of trauma exposures, the more likely an individual is to endorse alcohol use initiation in early adolescence (Dube et al., 2006); given that this sample endorsed an average of 5 trauma types, it is possible that the high interpersonal trauma load explains the earlier age of initiation.

The primary pattern of findings is partially consistent with basic research suggesting that adolescent alcohol use may be more detrimental to women compared to men (Caldwell et al., 2005; Medina et al., 2008; Squeglia et al., 2012; Squeglia, Schweinsburg, Pulido, & Tapert, 2011). It is possible that disruption of healthy neurodevelopment in regions relevant to the experience and regulation of negative affect (e.g., prefrontal cortex) increases risk for

psychiatric symptoms. Available research has documented that alcohol exposure during adolescence leads to abnormalities in brain development (e.g., cortical thickness; Squeglia et al., 2012) and fear conditioning processes (Bergstrom, McDonald, & Smith, 2006), and that associations between alcohol use and these phenotypes appear to differ as a function of sex (e.g., Squeglia et al., 2012). Further research is needed that explicitly tests the effects of human adolescent alcohol exposure on cognitive-affective development, as damage to such processes could place teens at greater risk for maladaptive responding to traumatic and other forms of stressors. Sex differences in the effects of alcohol on the adolescent brain may inform our interpretation of findings from epidemiological research that suggest sex differences in associations between alcohol use disorder and PTSD (e.g., Berenz et al., 2017; Kachadourian et al., 2014), as well as other internalizing disorders.

Alternatively, earlier age of alcohol use initiation could increase psychiatric risk for women by way of increased risk for sexual or physical assault. A longitudinal study of interpersonal trauma and alcohol use in adolescent girls found that alcohol use predicted victimization but not the reverse (Buzy et al., 2004). Earlier age of alcohol use initiation was, in fact, modestly correlated with increased lifetime trauma load in the current study. Future work focused on risk for specific types of events as a function of age of initiation of alcohol use and sex would be useful. Additionally, it is possible that the study findings could be explained in the context of self-medication models of alcohol use and psychiatric comorbidity. We were not able to covary for child and adolescent psychiatric symptoms; therefore, it is possible that participants' psychiatric risk preceded their initiation of alcohol use, which could have served an affect management function for them. Similarly, it is possible that other early markers of anxiety and depression risk, such as neuroticism or anxiety sensitivity, drove early alcohol use from a self-regulation perspective. Finally, it is possible that early initiation of alcohol use is not a risk factor for psychiatric disorders in young women, but rather an artifact of common genetic and environmental risk for psychopathology more broadly. We attempted to control for familial risk by covarying for family history of both AUD and anxiety/depression symptoms; however, we cannot completely rule out this alternate interpretation.

Importantly, comparison of confidence intervals between men and women in this study did not support a sex difference, in spite of patterns of results differing as a function of sex. Therefore, we cannot rule out the null hypothesis, that associations between age of alcohol use initiation and psychiatric symptoms in emerging adulthood are not influenced by sex. However, it is worth noting that the effect sizes observed in the female sub-sample were considerably larger than those in the male sub-sample for all types of symptoms evaluated. The relatively small sample size of men in this study likely produced less precise effect estimates, as demonstrated by larger confidence intervals, which precluded an ability to detect significant sex differences.

Results should be interpreted in the context of study limitations. First, the study relied exclusively on self-report measures of the variables of interest, and thus, the effects of shared method variance should be considered. Second, information regarding psychiatric diagnoses was not collected on study participants. Future studies should incorporate multimodal assessment strategies, such as interview-based symptom evaluations and

experimental paradigms (e.g., mood evocation, trauma and alcohol cue reactivity). Third, the study utilized a cross-sectional design and retrospectively queried about alcohol use initiation, thus subjecting results to recall bias. Fourth, the current database had a limited range of adolescent alcohol use variables; therefore, we were unable to determine whether observed associations between age of alcohol use initiation and psychiatric symptoms are better accounted for by other patterns of adolescent alcohol use, and whether the most reliable indicators differ for boys versus girls. Frequency of alcohol use or binge drinking in adolescence, for example, could be more relevant to onset of psychiatric risk. Clarification of which alcohol phenotype(s) in adolescence have the greatest predictive value with respect to psychiatric risk is critical for informing etiological models of comorbidity, as well as public health interventions geared towards ameliorating alcohol and related risk during adolescence. Finally, it is possible that this study was under-powered to detect sex differences in the observed associations, due to the relatively small number of men enrolled in the study. Future efforts need to oversample for men with interpersonal trauma histories to enhance an ability to evaluate sex differences in alcohol use and its consequences. In particular, longitudinal research in larger samples of at-risk adolescents could better inform our understanding of the potential impact of age of alcohol use initiation on young adult psychiatric risk through multiple pathways, including cognitive-affective risk pathways as well as through alcohol risk pathways (e.g., patterns of alcohol consumption in young adulthood).

Overall, this investigation represents a clinically meaningful step towards understanding associations between age of alcohol use initiation and psychiatric symptoms in young adulthood. Results indicate that younger age of alcohol use initiation may be especially related to symptoms of PTSD, depression, and anxiety particularly for young women, as compared to young men. Pending replication and extension, this line of inquiry has the potential to inform transdiagnostic clinical intervention and prevention efforts for at-risk adolescent and young adult women. For example, it may be the case that efforts geared towards delaying the initiation of regular alcohol use in adolescent girls could improve mental health outcomes beyond those related to AUD risk. Similarly, evaluation of interventions to decrease the quantity or frequency of alcohol use in adolescent girls who have initiated alcohol use early could be beneficial from a cognitive and affective developmental standpoint.

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HIGHLIGHTS

- Earlier age of initiation of alcohol use associated with greater psychiatric symptoms
- Age of initiation of alcohol use associated with symptoms for women but not men
- Association between age of initiation and symptoms not accounted for by trauma load

Fig. 1. Age of alcohol use initiation in relation to psychiatric symptoms. Note: “FH AUD” = Family history of alcohol use disorder (0, 1); “FH internalizing” = Family history of anxiety and/or depression (0, 1).

Table 1

Sample characteristics.

	Mean (SD) or %	
	Men (n = 63)	Women (n = 201)
Age	18.63 (0.50)	18.36 (1.99)
Race/Ethnicity		
White	66.60%	58.42%
Black / African American	15.87%	18.81%
Asian	6.35%	7.92%
Hispanic / Latino	6.35%	6.93%
> 1 Race	3.17%	6.93%
Native Hawaiian	0%	0.50%
Interpersonal traumatic events		
Armed robbery	17.46%	5.94%
Physical assault by stranger	30.16%	4.95%
Witnessed physical assault by stranger	33.33%	14.36%
Threatened death or serious injury	53.97%	30.69%
Physical abuse growing up	20.63%	16.83%
Witnessed family violence growing up	22.22%	35.64%
Physical assault by intimate partner	15.87%	19.31%
Childhood sexual assault before age 13	9.52%	23.76%
Childhood sexual assault ages 13–17	6.35%	24.26%
Sexual assault as adult (18 or older)	7.94%	22.28%
Number of lifetime traumatic events	5.30 (2.62)	5.67 (2.52)
Family history of alcohol use disorder	73.02%	83.17%
Family history of anxiety or depression	76.19%	83.67%
Age of alcohol use initiation (years)	12.89 (1.26)	12.51 (1.74)
Positive alcohol use problem screen	71.43%	61.20%
PTSD Checklist for DSM-5 total score	20.16 (18.49)	24.58 (17.73)
Positive PTSD screen	38.10%	47.52%
SCL-90 anxiety symptoms	8.30 (3.95)	8.89 (3.98)
SCL-90 depression symptoms	11.19 (4.48)	11.78 (3.90)

Note: Age = participant age upon initial parent study enrollment; Number of lifetime traumatic events = Number of trauma types endorsed on the Traumatic Life Events Questionnaire (Kubany, 2000); Positive alcohol use problem screen = score of 8+ on the Alcohol Use Disorders Identification Test (Babor, de la Fuente, Saunders, & Grant, 1992); Positive PTSD screen = score of 33+ on the PTSD Checklist for DSM-5 (Weathers et al., 2013); SCL-90 = Symptom Checklist-90 (Derogatis et al., 1974).

Table 2

Zero-Order (Bivariate) Correlations for Study Variables.

Variables	Men (<i>n</i> = 63)						
	1	2	3	4	5	6	7
1. Family history of AUD	-	0.50**	-0.05	-0.17	0.15	0.10	0.10
2. Family history of anxiety or depression	0.27**	-	-0.18	-0.20	0.19	0.18	0.16
3. Number of lifetime traumatic events	0.09	0.18**	-	0.02	0.18	-0.05	-0.07
4. Age of alcohol use initiation	0.00	-0.05	-0.18*	-	0.01	-0.04	-0.02
5. PTSD Checklist for DSM-5	0.12	0.13	0.43**	-0.20**	-	0.36**	0.39**
6. SCL-90 Anxiety Symptoms	0.14*	0.25**	0.28**	-0.23**	0.56**	-	0.87**
7. SCL-90 Depression Symptoms	0.10	0.21**	0.24**	-0.18*	0.55**	0.68**	-

Women (*n* = 201)

Correlations for women are presented on the bottom half of the table, whereas correlations for men are presented on the top half; AUD = alcohol use disorder; Number of lifetime traumatic events = number of lifetime traumatic events endorsed on the Traumatic Life Events Questionnaire (Kubany et al., 2000), PTSD Checklist for DSM-5 (Weathers et al., 2013), SCL-90 = Symptom Checklist-90 (Derogatis et al., 1974).

**
p < .01.

*
p < .05.

Table 3

Regression estimates from structural equation models: Age of alcohol use initiation with PTSD, anxiety, and depression, symptoms. associations with $p < .05$ are bolded.

Predictor	Male			Female		
	Step 1	Step 2		Step 1	Step 2	
	β (95% CI)	β (95% CI)	p	β (95% CI)	β (95% CI)	p
PTSD						
Family History of AUD	0.02 (-0.20, 0.22)	0.84 0.02 (-0.21, 0.22)	0.87	0.04 (-0.10, 0.19)	0.05 (-0.09, 0.19)	0.51
Family history of anxiety or depression	0.2 (-0.04, 0.41)	0.08 0.21 (-0.04, 0.42)	0.08	0.02 (-0.11, 0.15)	0.02 (-0.12, 0.15)	0.77
Number of lifetime traumatic events	0.25 (-0.01, 0.50)	0.05 0.25 (-0.01, 0.50)	0.05	0.41 (0.28, 0.53)	0.39 (0.26, 0.51)	< 0.001
Age of alcohol use initiation	-	-0.01 (-0.23, 0.20)	0.95	-	-0.14 (-0.26, -0.03)	0.01
R ²	0.08	0.09		0.18	0.19	
Anxiety						
Family History of AUD	0.01 (-0.32, 0.31)	0.96 0.004 (-0.31, 0.31)	0.98	0.07 (-0.06, 0.18)	0.07 (-0.06, 0.20)	0.27
Family history of anxiety or depression	0.18 (-0.15, 0.46)	0.24 0.17 (-0.17, 0.43)	0.28	0.18 (0.08, 0.27)	0.17 (0.08, 0.27)	0.001
Number of lifetime traumatic events	0.02 (-0.25, 0.28)	0.9 0.02 (-0.25, 0.28)	0.9	0.21 (0.07, 0.35)	0.19 (0.06, 0.32)	0.003
Age of alcohol use initiation	-	-0.11 (-0.28, 0.07)	0.22	-	-0.15 (-0.29, -0.02)	0.03
R ²	0.03	0.05		0.10	0.12	
Depression						
Family History of AUD	0.05 (-0.25, 0.33)	0.75 0.05 (-0.25, 0.34)	0.75	0.02 (-0.12, 0.16)	0.03 (-0.11, 0.16)	0.7
Family history of anxiety or depression	0.15 (-0.16, 0.43)	0.33 0.13 (-0.18, 0.41)	0.39	0.16 (0.02, 0.29)	0.16 (0.02, 0.29)	0.03
Number of lifetime traumatic events	-0.02 (-0.27, 0.23)	0.9 -0.02 (-0.28, 0.23)	0.9	0.20 (0.08, 0.32)	0.18 (0.06, 0.30)	0.003
Age of alcohol use initiation	-	-0.07 (-0.27, 0.15)	0.5	-	-0.16 (-0.27, -0.04)	0.006
R ²	0.03	0.04		0.08	0.10	

Note: AUD = alcohol use disorder, PTSD = posttraumatic stress disorder.