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Sex Differences in Trait Anxiety's Association with Alcohol Problems in Emerging Adults: The Influence of Symptoms of Depression and Borderline Personality

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Abstract

Objective: The co-occurrence of alcohol use disorder (AUD) and internalizing psychopathology, such as anxiety and depression, has been well documented. However, most studies of the association between alcohol problems and anxiety, and do not simultaneously consider depression or borderline personality, which covary strongly with both anxiety symptoms and AUDs. The current study examined sex differences in the association between alcohol problems and anxiety, while accounting for depressive and borderline personality (BPD) symptoms.

Method: A sample 810 (364 females) young adults aged 18-30 recruited from the community, who varied widely in lifetime alcohol problems, were administered diagnostic interviews and measures of a trait anxiety, depression, and BPD symptoms.

Results: Analyses revealed that trait anxiety, depression, and borderline symptoms were all significantly associated with higher lifetime alcohol problems in both males and females. However, the association between trait anxiety and alcohol problems was significantly stronger for males compared with females, even when controlling for depression and BPD symptoms. There were no significant sex differences in the association between alcohol problems and symptoms of either depression or BPD symptoms.

Conclusion: This suggests specific sex differences in the mechanisms by which trait anxiety is associated with alcohol problems.

Keywords

Trait Anxiety; Depression; Borderline Symptoms; Alcohol Problems; Sex Differences

Introduction

Alcohol and substance use disorders are associated with elevated levels of anxiety and negative affect in general (Wills, Sandy, Shinar, & Yaeger, 1999). The elevated levels of

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Disclosure of Interest

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anxiety observed in those with Alcohol Use Disorders (AUDs) may reflect internalizing psychopathology, such as an anxiety disorder or depression, or may also reflect the negative affect symptomatology characteristic of Borderline Personality Disorder (BPD), which is strongly associated with substance use disorders (Kruegelbach, McCormick, Schulz, & Grueneich, 1993; Trull, Sher, Minks-Brown, Durbin, & Burr, 2000). Internalizing psychopathology has long been acknowledged as a potential factor in the development and perpetuation of alcohol and other substance use disorders (Cowley, 1992; Kendler et al., 1995) and the association between anxiety, in particular, and alcohol problems has been well documented in the literature (Kessler et al., 1997; Lazarus, Beardslee, Pedersen, & Stepp, 2016; Kushner, Krueger, Frye, & Peterson, 2008; Kushner et al., 2012). Much of the previous work focused on the relationship between alcohol problems and internalizing psychopathology conceptualized broadly as a single multifactorial dimension. Previous studies have suggested that increased alcohol problems in high internalizing individuals is related to motivation to use alcohol as a means of tension or stress reduction (Conger, 1956; Sher, 1987) and that internalizing symptoms are a risk factor for development of alcohol problems.

Furthermore, it has also been shown that alcohol use in response to negative emotional states is particularly prevalent in individuals with AUDs and comorbid Borderline Personality Disorder (Stepp, Trull, & Sher, 2005). As Borderline Personality Disorder (BPD) reflects both internalizing and externalizing psychopathology (Eaton et al. 2011, Krueger, Caspi, Moffitt, & Silva, 1998), BPD symptoms are a potential risk factor for the development of AUDs and are, therefore, relevant in studies of the relationship between internalizing psychopathology and alcohol problems. Additionally, while BPD is strongly associated with substance use disorders (Kruegelbach et al., 1993; Trull et al., 2000) and a specific feature of BPD is emotional dysregulation reflected in depressive affect (American Psychiatric Association, 2013), there are few if any studies of the association between AUDs and dimensions of internalizing psychopathology along with BPD symptoms.

The relationship between alcohol problems and negative emotional states associated with depression has also been extensively documented in the literature (Grant & Hartford, 1995, Petty 1992, Swendsen & Merikangas, 2000). Specifically, studies have shown that individuals with an Alcohol Use Disorder and comorbid depression may respond less favorably to treatment and are at an increased risk for suicide compared to individuals with only a depression diagnosis (Davis, Uezato, Newell, & Frazier, 2008). While the directionality of this relationship is not clear, there is evidence suggesting that depression may be a consequence of a primary Alcohol Use Disorder rather than a causal factor (Brown et al., 1995; Dackis, Gold, Pottash, & Sweeney, 1986).

Additionally, Kushner, Abrams, & Borchardt (2000) suggest that anxiety disorders may both lead to, and be a consequence of, AUDs. The literature also proposes that anxiety is likely involved in the maintenance of alcohol problems, where alcohol is ingested in larger amounts for its anxiolytic effects (Kushner et al., 2000). It has also been suggested that internalizing symptoms early in life reflect a vulnerability to alcohol problems in adulthood, particularly in those genetically predisposed to AUDs (Caspi et al., 1997; Hussong, Jones, Stein, Baucom, & Boeding, 2011). Moreover, research has suggested that co-morbid anxiety

(specifically generalized anxiety) in females with AUDs leads to worse alcohol treatment outcomes (Farris, Epstein, McCrady, & Hunter-Reel, 2012) and that females high in anxiety sensitivity are more likely to use alcohol as a coping mechanism when compared to males (Stewart, Karp, Pihl, & Peterson, 1997; Stewart & Zeitlin, 1995). Multiple studies have also shown a link between social anxiety and vulnerability to alcohol problems in both males and females (Buckner & Turner, 2009; Schry, Maddox, & White, 2016). While some research has examined the relationship between internalizing disorders and AUDs in males, this relationship has been explored much less extensively compared with females. Dawson, Goldstein, Moss, Li & Grant (2010) present data suggesting that males experiencing only internalizing psychopathology (without externalizing problems) use greater quantities of alcohol and have more problems when compared to females. It has also been demonstrated that males are more likely than females to use alcohol or other substances to relieve symptoms of social anxiety disorder (Xu et al., 2012). Previous studies do not separate anxiety, depression, and BPD symptoms in studies investigating sex differences in the relationship between internalizing disorders and alcohol problems. The current study aims to expand and further clarify previous findings by investigating sex differences in the relationship between alcohol problems, trait anxiety, depression, and borderline symptoms in young adults.

Materials and Methods

Participants

Young adults aged 18–30 ($n = 810$) were recruited through advertisements placed online and around the community in a Midwestern college town (cf., Finn, Gunn, & Gerst, 2015; Finn, Gerst, Lake, & Bogg, 2017). The range of ads/flyers targeted, “*daring, rebellious, defiant individuals*,” “*carefree, adventurous individuals who have led exciting and impulsive lives*,” “*impulsive individuals*,” “*heavy drinkers wanted for psychological research*,” persons with a “*drinking problem*,” persons who “*got into a lot of trouble as a child*,” persons “*interested in psychological research*,” “*quiet, reflective and introspective persons*,” and “*social drinkers*.” This approach has been effective in attracting responses from individuals who vary widely in terms of alcohol use and problems as well as disinhibited traits (Finn et al. 2015, 2017; Gunn, Finn, Endres, Gerst & Spinola, 2013). Additionally, the sample was recruited to have a large proportion of individuals with AUDs. Forty percent ($n = 323$) of the sample had a lifetime DSM-IV diagnosis of alcohol dependence (178 Men and 145 Women). The sample consisted of 46% females ($n = 369$) and 54% males ($n = 441$) with mean age 21.3 years. The ethnicity of the sample was 78% Caucasian, 14% African American, 5% Asian, 2% Hispanic, and 1% Pacific Islander. All respondents were given a telephone screening interview that began with a brief description of the study, followed by a series of questions assessing the study exclusion criteria, current and lifetime alcohol and other drug use, lifetime symptoms of alcohol and other drug abuse and dependence, childhood conduct disorder (CCD), and adult antisocial personality (ASP). Participants were excluded from the study if they (a) were not between 18 and 30 years of age, (b) could not read and speak English, (c) had never consumed alcohol, (d) had less than a sixth grade level of education, (e) reported having suffered from any serious head injuries, or (f) had a history of severe

psychological problems. Participants were paid \$10 dollars an hour for their time in the lab. Table 1 lists the demographic data and mean values on all measures broken up by sex.

Assessment

Participants were assessed for lifetime alcohol dependence and problems (40% with a lifetime Alcohol Dependence diagnosis) using the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA; Bucholz, Cardoret, & Cloninger, 1994) and diagnostic criteria from the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1994). Diagnoses for this study were made prior to the release of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*. The analyses used a measure of lifetime alcohol problems, which were total problem counts for positive responses to all questions in the SSAGA section on Alcohol Use Disorders. Sex was determined using a dichotomous item from the demographic section of the SSAGA which assesses biological sex, rather than gender. Borderline symptoms were assessed using the Structured Clinical Interview for DSM-IV (SCID: First, Gibbon, Spitzer, Williams, & Benjamin, 1997) administered in a questionnaire format. This self-report version of the SCID-II BPD section dichotomizes the items into yes or no questions asking whether a participant endorses these types of traits/behaviors in the past several years. These SCID-II screening questionnaires have shown to be highly and reliably correlated with symptoms counts obtained from diagnostic interview (Ekselius, Lindström, von Knorring, Bodlund, & Kullgren, 1994; Jacobsberg, Perry, & Frances, 1995). Trait anxiety was assessed with the Trait Anxiety Scale of the State Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Symptoms of depression were measured with the Beck Depression Inventory (BDI: Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). All of these measures were part of an extensive assessment battery for a large study of disinhibition and alcohol problems (e.g., Finn et al., 2017; Finn et al., 2015; Gunn et al., 2013).

Data Analysis

Bivariate correlations were compared to assess for sex differences in the relationship between Alcohol Problems and our internalizing variables: Trait Anxiety, Depression, and BPD symptoms. Multiple regressions were used to analyze the data in a sequential manner. First, a multiple regression was used to assess the effects of Trait Anxiety, Sex and their interaction on lifetime Alcohol Problems. Then, in a second multiple regression, the main effects of Depression and BPD symptoms were included in the previous model to assess whether symptoms of Depression and BPD accounted for the association between Trait anxiety and Lifetime Alcohol Problems. Finally, separate follow up multiple regression analyses were conducted to explore whether there were sex differences in the effects of either Depression or BPD symptoms and there interactions on lifetime alcohol problems. All analyses were conducted in IBM SPSS 24 (IBM Corp 2016).

Results

The association between Anxiety, Sex, and Alcohol Problems

Tests of differences between bivariate correlations revealed a significantly stronger association between Trait Anxiety and Lifetime Alcohol Problems in males ($r = .249$, $p = .$

0001) compared with females ($r = .204$, $p = .0001$), $z = 2.04$, $p = .02$. Table 2 Lists the bivariate correlations for all study variables. Table 3 lists significance tests for differences in correlations between sexes. A multiple regression analysis assessing the effects of Sex and Trait Anxiety and their interaction on Lifetime Alcohol Problems revealed a significant main effect of Trait Anxiety, $R^2 = .119$, $F(1, 805) = 78.3$, $\beta = .408$, $p < 0.001$, and a significant Sex by Trait Anxiety interaction, $F(1, 805) = 7.5$, $\beta = -.399$, $p = .006$.

Anxiety, Sex, and Alcohol Problems controlling for depression and BPD symptoms

Additional multiple regression analyses were conducted to determine whether Depression or BPD symptoms accounted for the association between Trait Anxiety and Alcohol Problems and the sex differences in the association between Trait Anxiety and Alcohol Problems. An analysis assessing main effects of Sex, Trait Anxiety, Depression, BPD symptoms, and the Sex by Trait Anxiety interaction on Alcohol Problems revealed that the Sex by Trait Anxiety interaction remained significant when Depression and BPD symptoms were included in the model, $R^2 = .223$, $F(1, 798) = 6.28$, $\beta = -.345$, $p = .012$. Further multiple regression analyses, assessing main effects of Trait Anxiety, Depression, and BPD symptoms on Alcohol Problems, split by Sex, revealed that Trait Anxiety remained a significant predictor of Alcohol Problems in males, $R^2 = .227$, $F(1, 433) = 5.26$, $\beta = .127$, $p = .022$, but not in females, $R^2 = .202$, $F(1, 364) = 0.027$, $\beta = -.031$, $p = .602$. Figure 1 displays the regression lines for males and females.

Sex, Depression, BPD symptoms and Alcohol Problems

Follow up multiple regression analyses revealed no sex differences in the association between Lifetime Alcohol Problems and either Depression or BPD. The first model, assessing the main effects of Sex, Depression, and their interaction on Alcohol Problems, revealed a significant main effect of Depression, $R^2 = .149$, $F(1, 809) = 89.09$, $\beta = .424$, $p < .0001$, while the interaction between Sex and Depression was not significant, $F(1, 809) = 2.852$, $\beta = -.107$, $p = 0.092$. The second model, assessing the main effects of Sex, BPD symptoms, and their interaction, on Alcohol Problems, revealed a significant main effect of BPD symptoms, $R^2 = .169$, $F(1, 799) = 90.55$, $\beta = .426$, $p < .0001$, but the interaction between Sex and BPD symptoms was not significant, $F(1, 799) = 0.757$, $\beta = -.048$, $p = 0.385$.

Discussion

The overarching goal of this study was to expand on previous findings on the association between internalizing psychopathology, specifically trait anxiety, and alcohol problems. We aimed to accomplish this by investigating sex differences in the relationship between trait anxiety and lifetime alcohol problems while controlling for symptoms of depression and BPD symptoms, which are known to be related to both anxiety and alcohol problems. Consistent with previous studies (Kessler et al., 1997; Lazarus et al. 2016; Kushner et al. 2008, 2012), the analyses revealed that trait anxiety was positively associated with alcohol problems in both males and females. However, the association was significantly stronger for males when compared to females. These sex differences were also apparent when controlling for symptoms of depression and BPD. Consistent with previous studies both

symptoms of depression and BPD were also associated with alcohol problems (Kruegelbach et al. 1993; Trull et al. 2000; Kendler et al. 1995). Furthermore, when the covariance between symptoms of depression and BPD and trait anxiety was considered, trait anxiety remained strongly associated with alcohol problems in males, but not in females. This indicates that, in our sample, the association between trait anxiety and alcohol problems in females might be explained by depression and BPD symptoms. This suggests that the elevated levels of anxiety seen in females with an AUD is a part of a broader depressive – borderline syndrome, rather than specifically reflecting a unique association between trait anxiety and lifetime alcohol problems. On the other hand, for males, trait anxiety was uniquely associated with alcohol problems even while controlling for depression and borderline symptoms.

While many studies have reported an association between anxiety, internalizing psychopathology, and increased risk for alcohol use disorders (Cowley 1992; Kendler et al., 1995; Kessler et al., 1997) the current study adds to the existing literature by suggesting a different process or mechanism for the association between trait anxiety and alcohol problems in females compared with males. Anxiety may represent a unique vulnerability to alcohol problems in males, while in females elevated trait anxiety may reflect a broader syndrome characterized by elevated symptoms of depression and BPD. Our results cannot be used to infer any etiological role for trait anxiety in males with an AUD, since it is a clear possibility that elevated levels of trait anxiety may be a consequence of drinking problems in males. In addition, long-term problematic alcohol use in females may contribute to a syndrome characterized by elevated levels of trait anxiety, depression, and BPD symptoms. More research is needed to determine the causal role for anxiety, and symptoms of depression and BPD in both males and females. In addition, the observed patterns of association may also be unique to alcohol problems in emerging adults as opposed to older individuals with an AUD.

Studies examining sex differences in internalizing psychopathology in individuals with AUDs may have important implications for treatment. For instance, studies have shown that males tend to be more evasive to seeking treatment and respond less favorably to treatment when compared to females (Jarvis, 1992; John, Alwyn, Hodgson, & Phillips, 2008; Otete, Orton, West, & Fleming, 2015). It is possible that, if males are drinking to relieve symptoms of anxiety, elevated levels of trait anxiety may play a unique role in influencing male's decreased likelihood to seek and respond favorably to treatment. Additionally, these results are relevant as the study focuses on emerging adults during a critical period in their development in which problems with alcohol and substance use are likely to manifest (Clements 1999). Emerging adulthood has also been shown as a critical brain maturation period in which heavy alcohol use can have detrimental effects on brain development and decision making capacity (Silveri 2012). Further investigation into the mechanisms underlying sex differences, as well as gender differences, in the relationship between AUDs and anxiety and internalizing problems in general could aid in the development of treatments that can be tailored to an individual's particular etiology.

This study has some limitations that need to be considered when interpreting these results. First, the sample is mostly white, young, or emerging, adults, many of whom are college

students. Results cannot be generalized to older individuals with longer sustained AUDs. Although our recruitment strategy yielded a substantial number of participants with an Alcohol Dependence diagnosis, their alcohol dependence is best considered as reflecting an early stage disorder given their relatively young age. Thus, it may be that trait anxiety has a unique role in the development or maintenance of alcohol problems in early stage AUDs when individuals are in the emerging adult developmental stage. Second, the recruitment strategy used in this study is biased insofar as it also selected individuals who are interested in participating in research and who are motivated enough to come into a research laboratory, often on repeated occasions, for testing. It is important to note, however, that the recruitment strategies used in this study have been successful in attracting responses from individuals who vary widely in terms of alcohol use and problems, including many who had a lifetime Alcohol Dependence diagnosis, as well as disinhibited traits (Finn et al. 2015, 2017; Gunn et al., 2013). Third, the only measure of anxiety used was a trait anxiety measure (Spielberger, 1983). While this measure is strongly associated with diagnosable anxiety disorders, it does not provide a comprehensive assessment of the kinds of anxiety problems and symptoms that would be experienced in anxiety disorders, such as Generalized Anxiety Disorder. Fourth, it cannot be determined from our data whether the anxiety predated or postdated the experience of alcohol problems in the sample. Additionally, we did not collect information regarding participant's current use of psychiatric medications such as antidepressants and anxiolytics. Finally, it is important to note that the elevated symptoms of depression and BPD do not necessarily reflect depressive disorders or Borderline Personality Disorder. Specific diagnoses of Depressive Disorder, Borderline Personality Disorder, or an Anxiety Disorder were not ascertained in this sample.

In summary, these results suggest that there are specific Sex differences in the association between trait anxiety and alcohol problems in emerging adults. The results also suggest that most of the association between trait anxiety and alcohol problems in young females reflects a broader syndrome involving symptoms of depression and BPD. Overall, our results suggest that there are different sex specific mechanisms by which trait anxiety is associated with alcohol problems in young, emerging adults.

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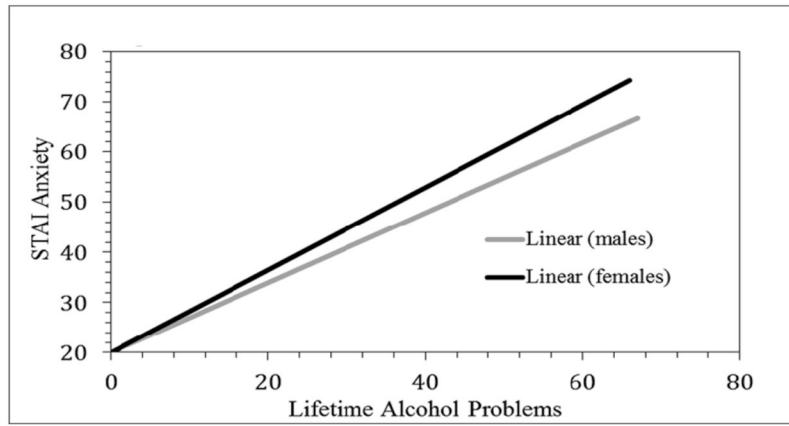


Figure 1. Regression lines for males and females for Lifetime Alcohol Problems and Trait Anxiety.

Table 1.

Sample Characteristics

	Males			Females		
	M(SD)	Min	Max	M(SD)	Min	Max
N	441			369		
Age	21.51 (2.6)	18	30	20.98 (2.4)	18	30
Years Education	13.98 (1.7)	8	20	14.1 (1.8)	8	24
LT Alcohol Problems	18.49 (14.1)	0	67	15.75 (13.0)	0	66
STAI Anxiety	38.38 (9.3)	22	71	39.74 (9.6)	21	71
BPD Symptoms	3.45 (3.3)	0	14	3.34 (3.4)	0	15
BDI Depression	5.96 (5.1)	0	20	7.13 (5.2)	0	20

LT Alcohol Problems: Lifetime alcohol problems measured as the total number of positive responses to questions in the Alcohol Use Disorders section of the SSAGA (Bucholtz et al., 1994)

STAI Anxiety: Trait anxiety scale from the State Trait Anxiety Inventory (Spielberger et al., 1983)

BPD: Borderline Personality Disorder (SCID: First et al., 1977)

BDI Depression: Beck Depression Inventory total score (Beck et al., 1961)

Table 2.

Bivariate Correlations of Study Variables

	1	2	3	4	5
1. Sex	-				
2. LT Alcohol Problems	-.098**	-			
3. Trait Anxiety	.071*	.311**	-		
4. BPD Symptoms	-.017	.401**	.473**	-	
5. BDI Symptoms	.111**	.356**	.590**	.453**	-

*
= p < .05;

**
= p < .0001

Lifetime alcohol problems were measured as the total number of positive responses to questions in the Alcohol Use Disorders section of the SSAGA (Bucholtz et al., 1994)

STAI Anxiety: Trait anxiety scale from the State Trait Anxiety Inventory (Spielberger et al., 1983)

BPD: Borderline Personality Disorder (SCID: First et al., 1977)

BDI Depression: Beck Depression Inventory total score (Beck et al., 1961)

Table 3.

Significance Tests for Differences in Correlations Between Sexes

	Males	Females	z-score
	Alcohol Problems	Alcohol Problems	
STAI Anxiety	0.379 **	0.249 **	2.04 *
BPD Symptoms	0.398 **	0.340 **	0.097
BDI Depression	0.397 **	0.407 **	-0.15

* = $p < .05$;** = $p < .0001$

Lifetime alcohol problems were measured as the total number of positive responses to questions in the Alcohol Use Disorders section of the SSAGA (Bucholtz et al., 1994)

STAI Anxiety: Trait anxiety scale from the State Trait Anxiety Inventory (Spielberger et al., 1983)

BPD: Borderline Personality Disorder (SCID: First et al., 1977)

BDI Depression: Beck Depression Inventory total score (Beck et al., 1961)