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Trait Aggression and Problematic Alcohol Use among College Students: The Moderating Effect of Distress Tolerance

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Abstract

Background—Trait aggression has been linked to alcohol-related problems among college students. However, the individual conditions underlying this association are unknown. Empirical evidence and theory suggest the importance of distress tolerance, defined as an individual's ability to withstand negative affective states, in the relationship between trait aggression and alcohol use. Therefore, the purpose of the current study was to examine whether distress tolerance moderates the relationship between trait aggression and problematic alcohol use.

Methods—Participants were 646 undergraduate students in a large university, who reported any lifetime alcohol use. The dependent variable, problematic alcohol use, was measured using the Alcohol Use Disorders Identification Test (AUDIT) total score. The main independent variable, trait aggression, was assessed on the negative emotionality scale of the Multidimensional Personality Questionnaire (MPQ-NE), and the moderator, distress tolerance, was determined using the Distress Tolerance Scale (DTS).

Results—Hierarchical linear regression analyses indicated a significant interaction between trait aggression and distress tolerance in predicting problematic alcohol use, adjusting for demographic variables, regular substance use, depressive symptoms, and anxiety symptoms. Specifically, a significant positive relationship between trait aggression and problematic alcohol use was present among those with low, but not high, distress tolerance.

Conclusions—Results provide evidence that college students with high levels of trait aggression are more likely to engage in problematic alcohol use if they also evidence an inability to tolerate negative affective states. Study implications are discussed, including the development of prevention and intervention programs that target distress tolerance skills.

Keywords

Alcohol Use; Distress Tolerance; Trait Aggression

Introduction

Current estimates indicate that 15.6% of college students engage in heavy drinking [Substance Abuse and Mental Health Services Administration (SAMHSA), 2011]. Despite increasing intervention efforts (Larimer and Cronce, 2007; White et al., 2010), the rates of

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alcohol use among college students have remained consistent over the past decade (SAMHSA, 2011). College students are especially vulnerable to risky alcohol use as a result of their physical and social environments (e.g., college parties, football weekends) that foster drinking (McCabe et al., 2005), as well as negative emotionality associated with this transition period (Malouff et al., 2007). Alcohol use is a major contributor to college student morbidity and mortality (Hingson et al., 2005), academic problems, interpersonal problems, and legal problems (Beck et al., 2008; Jennison, 2004). Although alcohol use decreases after college (Bachman et al., 2002), a substantial number of individuals continue or escalate alcohol use into adulthood (Jackson et al., 2001; Jennison, 2004). Subsequently, the chronic use of alcohol negatively impacts health status, quality of life, and social relationships (Roe et al., 2010). Therefore, there is an imperative need to understand the conditions underlying alcohol use for the development of appropriate collegiate prevention and intervention strategies.

One particular dimension of interest in the understanding of problematic alcohol use is trait aggression. Trait aggression refers to an individual's disposition to experience negative affect, or an aversive, psychometrically complex personality trait, consisting of enduring disposition toward violence, such as enjoying distressing others, enjoying observing violence, physically violent, vengeful, vindictive, and victimizing others for own gain (Alia-Klein et al., 2008; Tellegen, 1982). Although trait aggression is considered a distal feature of negative affect as opposed to core features (e.g., stress reaction), psychometric assessments have reliably established trait aggression as a negative affective trait based on the findings that items load most highly on negative affect (Tellegen, 1982; Patrick et al., 2002), which have direct psychobiological referents. Indeed, neurological evidence suggests that a predisposition to aggression may increase use of substances (White, Grover, & de Wit, 2006). Further, studies on undergraduate college students have found that dispositionally aggressive individuals who drink heavily are more likely to develop a stronger alcohol-related aggression expectancy (McMurran, 2009; Tremblay and Ewart 2005), which in turn is associated with alcohol-related verbal and physical violence (Barnwell et al., 2006; Tremblay et al., 2008). Thus, trait aggression is suggested to be a key factor in explaining the development of adverse alcohol-related outcomes in this population. Although the link between trait aggression and the negative consequences of excessive alcohol use has been established, an understanding of the individual conditions underlying this relationship is lacking.

According to a widely studied theoretical approach in the substance use literature, the negative reinforcement model, the primary motivational basis for substance use is the reduction or avoidance of negative affective states (Baker et al., 2004). In other words, alcohol use in response to negative affect brings perceived and/or real relief, thereby reinforcing this behavior and increasing the likelihood of using alcohol in the future. One method of assessing the propensity to engage in behaviors motivated by negative reinforcement is by measuring an individual's distress tolerance, defined as the perceived capacity to withstand aversive states (Simons and Gaher, 2005). Distress tolerance is an important component of emotion regulation (Leyro et al., 2010), with previous research establishing a relation between low distress tolerance and substance use initiation, frequency, and relapse (Brown et al., 2009; Daughters et al., 2009; Howell et al., 2010; Simons and Gaher, 2005). Specific to alcohol use, distress tolerance has been associated with alcohol-related problems (Buckner et al., 2007; Simons and Gaher, 2005) and coping motives for alcohol use (Howell et al., 2010). In line with the need to understand the link between trait aggression and alcohol use, evidence indicates that distress tolerance is an important mechanism underlying the relation between negative affect and alcohol use (Buckner et al., 2007; Gorka et al., 2012).

Taken together, the negative reinforcement model of substance use suggests that individuals with trait aggression may be more likely to engage in problematic alcohol use if they also evidence difficulty regulating this negative affective state. Therefore, the aim of the current study was to examine whether distress tolerance moderates the relationship between trait aggression and problematic alcohol use among college students. It was hypothesized that higher levels of trait aggression would be associated with increased problematic alcohol use among college students with low distress tolerance, but not among those with high distress tolerance.

Materials and Method

Participants

The sample included 646 participants (72.8% female), with the mean age of 19.9, (*SD* = 1.47). Participants reported being 65.5% White, 14.9% African American, 11.8% Asian, and 7.9% reporting Other race. In terms of the ethnic background, 9.3% reported being Hispanic. The mean grade point average (GPA) was 3.21 (*SD* = 0.56).

Procedure

Participants were recruited from a large east coast university in the Washington DC metropolitan area. Undergraduate students were asked to complete an anonymous 45-min web-based survey that contained a number of scales measuring psycho-social traits such as distress tolerance and mood states, as well as questions measuring their alcohol and drug use. Depending on their course requirements, students who participated received either (a) a research experience credit as required by their department, or (b) credit towards their course grade. All participants provided electronic informed consent, and all aspects of the study were approved by the University Institutional Review Board. Following informed consent, participants completed the battery of self-report measures using an anonymous web-based survey tool, Qualtrics Labs, Inc. version 2009 (Qualtrics Labs, Inc., 2012).

Responses were obtained from 853 participants. Due to concerns about the validity of responses, students who took less than 10 minutes ($n = 63$) or more than 274 minutes ($n = 5$) to complete the survey were eliminated. The time criteria for elimination were determined by examining the distribution of completion times for the entire sample ($M = 24.87$ min, $SD = 76.5$ min) and noting extreme outliers. Comparisons between those who were retained versus eliminated showed no significant differences in time to completion for any of the demographic factors, except that the Asian participants who were eliminated took significantly less time than those who were retained [$M = 8.49$ ($SD = 1.53$) vs $M = 19.41$ ($SD = 8.61$)], $X^2(1) = 7.12$, $p < .05$. In addition, students who did not report any lifetime alcohol use ($n = 139$) were excluded from the study. The final sample consisted of 646 participants.

Measures

Problematic alcohol use—Problematic alcohol use was measured using the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 1989). The AUDIT is a brief screening tool for hazardous and harmful alcohol use developed by the World Health Organization (WHO). This scale contains 10 questions in which responses are made using a 5-point Likert scale. The AUDIT total score is a composite index of hazardous and harmful alcohol use and alcohol dependence symptoms, and is defined as total problematic alcohol use. Sample items from the AUDIT include, “How often do you have a drink containing alcohol?” and “Have you or someone else been injured because of your drinking?” The AUDIT has been shown to be a sensitive measure of alcohol use problems in diverse populations and has demonstrated good internal consistency (Saunders et al., 1993). Reliability of total scores

within the current study was good (α = .81). The AUDIT total score was assessed on 646 participants who reported any lifetime use of alcohol.

Trait aggression—Trait aggression was measured using the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982). The MPQ is a nonclinical instrument that comprises eleven primary personality dimensions and three higher order factors, including Positive Emotionality (PE), Negative Emotionality (NE), and Constraint (C). The scale has high internal consistency and high 30-day re-test reliability, indicating good psychometric properties (Tellegen et al., 1988). Participants only completed the MPQ-NE, a 40-item scale measuring trait aggression, stress reaction, and alienation. For the purpose of this study, only trait aggression was utilized in the analyses. Trait aggression consists of 12 items, and participants are asked to respond "yes" or "no" to each statement. Examples of items on this subscale are: "Often when I get angry I am ready to hit someone" and "When people insult me, I try to get even." The trait aggression subscale demonstrated acceptable reliability in the study (α = .76).

Distress tolerance—Distress tolerance was measured using the Distress Tolerance Scale (DTS; Simons and Gaher, 2005). In this 14-item measure, items are rated on a 5-point Likert scale to assess one's perceived ability to withstand negative emotional states. Sample items of the scale include, "Feeling distressed or upset is unbearable to me" and "I can't handle feeling distressed or upset." This scale has demonstrated good internal validity in previous studies (Buckner et al., 2007), as well as in the current study (α = .91).

Potential covariates—Demographic information were obtained on participants' sex, age, race (White, African American, Asian, Other), ethnicity (Hispanic vs. Non-Hispanic), and grade point average (GPA). Also, regular use of substances, including marijuana, crack/cocaine, ecstasy, stimulant, sedative, opioid, PCP, and inhalant, in the past six months were assessed using the following response options: never, one time, 1–2 times a month, once a week, 2–3 times a week, once a day, and more than once day. In line with previous research (Buckner et al., 2010; Dunn et al., 2010), regular use was defined dichotomously across each drug class as at least weekly use of marijuana and at least monthly use of hard drugs, such as cocaine, ecstasy, stimulant, sedative, opioid, PCP, and inhalants. In addition, given the association between alcohol use with both depression and anxiety (Kessler et al., 1996), these symptoms were measured using the Brief Symptom Inventory (BSI; Derogatis, 2000). Participants were asked to rate the extent to which they have been distressed or bothered by various problems over the past seven days on a 5-point Likert scale. Both the BSI-depressive symptoms and BSI-anxiety symptoms subscales consist of 6 items that have demonstrated good internal validity in previous studies (Beck et al., 1996), as well as in the current study (α = .86 and α = .83, respectively).

Data analysis plan

The normality of the data was assessed by using the Kolmogorov-Smirnov test as appropriate for a large sample size (Burdenski, 2000), and adjusted as needed. Potential covariates, namely demographic variables, regular substance use, BSI-depressive symptoms and BSI-anxiety symptoms, were first examined for associations with the total AUDIT score. Then, the main and interactive effects of MPQ trait aggression and total DTS score on total AUDIT score were examined using hierarchical linear regression. All analyses were conducted using SPSS version 19 (SPSS Inc., 2009).

Results

Descriptive data and interrelationships among all variables except sex, race, ethnicity, and substance use are presented in Table 1. Scores on the total AUDIT (D = .11(646), p < 0.001), BSI-depressive symptoms (D = .18(646), p < 0.001), BSI-anxiety symptoms (D = .17(646), p < 0.001), and MPQ-trait aggression (D = .19(646), p < 0.001) were positively skewed. Thus, these scores were log transformed to approximate normal distributions (Aiken and West, 1991). The DTS total score was slightly skewed (D = .04(646), p < 0.05), hence square root transformation was used to correct for skewness (Howell, 2007). All transformed variables were centered in order to reduce multicollinearity (Holmbeck, 2002). Self-report frequency of substance use indicated regular use of marijuana (7.3%), cocaine (0.3%), ecstasy (0.5%), stimulant (1.7%), sedative (0.8%), opioid (0.5%), PCP (0.2%), and inhalants (0.5%).

Identification of Covariates

AUDIT total score was significantly correlated with age (r = −.09, p < .05), MPQ-trait aggression (r = .21, p < .01), BSI-depressive symptoms (r = .11, p < .01), and BSI-anxiety symptoms (r = .09, p < .05). A series of one-way ANOVAs examined the relationship between AUDIT total score and sex, race, ethnicity, and regular substance use. A higher AUDIT total score was significantly related to male sex [F(1,644) = 19.57, p < .001], and regular use of marijuana [F(1,644) = 54.64, p < .001], crack/cocaine [F(1,644) = 24.27, p < .001], ecstasy [F(1,644) = 18.54, p < .001], stimulants [F(1,644) = 40.07, p < .001], sedatives [F(1,644) = 16.67, p < .001], opioids [F(1,644) = 13.94, p < .001], PCP [F(1,644) = 9.42, p < .01], and inhalants [F(1,644) = 16.91, p < .001]. Further, AUDIT total score was significantly related to race [F(3,642) = 17.86, p < .001], with Tukey post-hoc comparisons demonstrating that Whites (M = .05, SD = .25) reported significantly greater problematic alcohol use than African Americans (M = −.12, SD = .23) and Asians (M = −.11, SD = .25), p < .001. All significant covariates were included in subsequent analyses.

Trait Aggression, Distress Tolerance and Problematic Alcohol Use

The unique and interactive effects of distress tolerance and trait aggression on problematic alcohol use were analyzed using hierarchical linear regression analysis (Table 2). Covariates, including sex, race (White vs. non-White), age, depressive symptoms, anxiety symptoms, and regular substances used (i.e., marijuana, crack/cocaine, ecstasy, stimulants, sedatives, opioids, PCP, inhalants) were entered in Step 1 (ΔR^2 = .211, ΔF = 13.00, p < .001), trait aggression and distress tolerance were entered in Step 2 (ΔR^2 = .013, ΔF = 5.24, p < .01), and the trait aggression x distress tolerance interaction variable was entered in the third and final step. After entering the interaction term, Step 3 (ΔR^2 = .006, ΔF = 4.53, p < .05) and the final model [F (16, 629) = 11.71, p < .001] were significant, indicating that the interaction between trait aggression and distress tolerance (b = −0.51, t = −2.13, p < .05) provided a significant increase in the variance in problematic alcohol use as explained by the model.

To further examine the effect of distress tolerance on the association between trait aggression and problematic alcohol use, two post-hoc regressions were performed incorporating the main effects of trait aggression, the conditional moderator (distress tolerance), and the interaction of the two variables to generate the slope of high distress tolerance (1 SD above the mean) and the slope of low distress tolerance (1 SD below the mean) (Aiken and West, 1991; Holmbeck, 2002). As illustrated in Figure 1, results indicated that high trait aggression was associated with problematic alcohol use among individuals with low (b = .34, t = 3.76, p < .001), but not high (b = .09, t = 1.11, p > .05) distress tolerance.

Discussion

College students display high rates of alcohol use (SAMHSA, 2011), and those endorsing trait aggression are prone to adverse consequences due to alcohol use (Barnwell et al., 2006; Tremblay et al., 2008). However, individual conditions influencing the link between trait aggression and problematic alcohol use have not been previously studied. Therefore, the purpose of the current study was to investigate the moderating role of distress tolerance in the relation between trait aggression and problematic alcohol use. Consistent with the study hypothesis, the association between trait aggression and problematic alcohol use was significant among individuals with low, but not high, distress tolerance. Although researchers have examined the association between trait aggression and alcohol-related outcomes in college students (McMurran, 2009; Tremblay et al., 2008), to our knowledge, this is the first study to examine the conditions underlying this relationship.

In line with previous work, the current study found trait aggression to be an important risk factor for alcohol-related problems in college students (McMurran, 2009; Tremblay et al., 2008). In particular, previous research indicates that trait aggression is a risk factor for drug reinforcement and addiction in humans (White et al., 2006), and is associated with alcohol-related aggression (Tremblay et al., 2008) and aggression expectancies (McMurran, 2009; Tremblay and Ewart 2005) in college students. Noting the alcohol use problem in college students, the current study assessed problematic alcohol use, such as hazardous and harmful alcohol consumption, in this vulnerable population. The current findings expand the literature by highlighting the aggression disposition as a risk factor for problematic alcohol use.

In addition to the association between trait aggression and problematic alcohol use, the study supports the moderating role of distress tolerance in this relationship. Specifically, college students with high levels of trait aggression are more likely to engage in problematic alcohol use if they also evidence an inability to tolerate negative affective states. Consistent with the negative reinforcement model, the findings suggest that individuals with an aggressive disposition and inability to withstand negative affective states may use alcohol to cope with their negative mood. Moreover, the identification of distress tolerance as a key component underlying the association between trait aggression and problematic alcohol use extends previous work that underscores the importance of one’s ability to tolerate aversive affective states in predicting substance use outcomes (see Magidson et al., 2013).

Further, it is interesting that despite research indicating both depression and anxiety as risk factors for problematic alcohol use (e.g., Kessler et al., 1996), neither were significant after accounting for the interaction between trait aggression and distress tolerance. This highlights the notion that negative affect alone may not be the critical risk factor for substance use, but instead the ability to withstand negative emotional states. In support of this perspective, another study has noted the significant role of distress tolerance in moderating the relationship between depressive symptoms and problematic alcohol use (Gorka et al., 2012). These findings indicate that the relationship between negative affect and alcohol use is complex and influenced by moderating and mediating factors. As such, other relevant individual factors may also be important in the relationship between negative affect and substance use. For example, Kaiser and colleagues (2012) found both distress tolerance and negative urgency, defined as the tendency to act rashly when experiencing distress, as predictors of problematic alcohol use. A key difference between distress tolerance and negative urgency is that negative urgency specifies a negative behavioral response to distress, as opposed to just an inability to tolerate distress. This may be particularly relevant to understanding trait aggression and the tendency to respond with negative behaviors, namely problematic and harmful alcohol use and violence. As such, future work aimed at

disentangling the contribution of these similar, yet unique, variables will aide our understanding of the mechanisms underlying vulnerability to alcohol problems in the context of trait aggression specifically and negative affect more broadly.

Of note, a main effect of distress tolerance on problematic alcohol use was not evidenced in the study, as has been observed in previous studies (Buckner et al., 2007; Simons and Gaher, 2005). One explanation for this is the use of a different assessment instrument. Specifically, previous work has reported a relationship between the DTS and the Rutgers Alcohol Problems Index (RAPI; White and Labouvie, 1989). Whereas the AUDIT measures hazardous and harmful patterns of alcohol use, the RAPI captures negative consequences due to alcohol use, e.g., “Not able to do your homework or study for a test.” This subtle difference may account for these discrepant outcomes, and future studies are encouraged to examine the conceptual and measurement issues underlying the discrepant relationships between DTS and substance use variables. Moreover, the one additional study examining the relation between the DTS and AUDIT among college students did not yield significant results (Zvolensky et al., 2009).

Further, the literature on aggression has distinguished between reactive/hostile and proactive/instrumental aggression on the basis of both function and motivation. Reactive aggression refers to hostile responses to perceived threats and is characterized as emotionally charged, poorly controlled and impulsive (Buss, 1961; Houston et al., 2003). Whereas, proactive aggression refers to deliberate behaviors aimed at obtaining desired goals or motivated by anticipation of rewards and is characterized as unemotional, highly controlled, and premeditated (Buss, 1961; Houston et al., 2003). However, the current study included a measure of trait aggression, MPQ-NE-aggression, that consisted of items pertaining to both reactive aggression (e.g., “Often when I get angry I am ready to hit someone”) and proactive aggression (e.g., “I see nothing wrong with stepping on people’s toes a little if it is to my advantage”). Therefore, the study did not distinguish between different types of aggression. Even though the assessment of trait aggression on the MPQ-NE subscale is widely regarded as a measurement of negative emotionality (Alia-Klein et al., 2008; Tellegen, 1982), the subscale may not be solely classified based on either reactive or proactive aggression. In that regard, it is possible that the interacting effect of reactive aggression and low distress tolerance is different than the interacting effect of proactive aggression and low distress tolerance in terms of predicting problematic alcohol use. Thus, a potential area of future research may probe to examine the moderating effect of distress tolerance in the interrelation between specific type of aggression (reactive vs proactive aggression) and problematic alcohol use.

A number of implications of the study’s findings are of note. The study highlights individual differences in distress tolerance as a risk factor for problematic alcohol use in college students, especially those with trait aggression. Thus, the study emphasizes the importance of identifying college students with high trait aggression and low distress tolerance as individuals susceptible to heavy alcohol use and negative consequences related to it. In addition, the knowledge that distress tolerance acts as a moderator between trait aggression and problematic alcohol use serves a target for intervention development aimed at reducing alcohol use and alcohol-related aggression among college students. The findings were significant despite controlling for depressive symptoms, anxiety symptoms, and regular use of substances, which suggests that treatment effort with a focus on distress tolerance skills or coping strategies to reduce negative affect in the context of trait aggression (e.g., Dialectional Behavioral Therapy, DBT; Dimeff and Linehan, 2008), may be effective in reducing problematic college student alcohol use, regardless of individuals’ concurrent conditions, such as mood and other substance use problems.

Although this study addresses an important gap in the literature, there are some limitations to be noted. Although the focus of this investigation was on college students, a sample in disproportionate risk for problematic alcohol use, it is of note that the findings may not generalize to non-college adults and clinical populations. As such, future research should investigate these associations using different populations. Also, this study employed a web-based approach, which may have influenced participants' responses; however, studies have noted that self-disclosure to risky behaviors (e.g., illegal drug use and risky sexual behavior) is higher when data collection is done via computer (Palmgreen et al., 2002). In addition, the study utilized a self-report measure of distress tolerance, which captures an individual's perceived capacity to withstand negative affect. In contrast, the behavior measures of distress tolerance assess an individual's actual ability to persist in goal-oriented behavior while facing distress (review in Leyro et al., 2010). Future research may employ behavioral measures to examine the moderating effect of distress tolerance in the relationship between trait aggression and alcohol use given the potential conceptual differences between the modalities of distress tolerance measures (Leyro et al., 2010).

Moreover, given the cross-sectional and self-reported nature of the study, it is important to consider the influence of common method variance that may have influenced the interrelationships among variables. This form of method bias can incur due to scale types, response formats, and response biases. In the current study, the non-significant and near zero correlations between the self-report variables, such as DTS total score and AUDIT total score, suggest that method variance is of little concern. Also, the anonymity of the web-based survey may have limited response biases, such as social desirability. Future research may utilize multimethod approach to replicate the findings and incorporate advanced statistical strategies to control for method variance, such as partial correlation technique (Lindell & Whitney, 2001) that requires a marker variable that is theoretically unrelated to the study variable. Lastly, the current design was cross-sectional, which limits inferences of causality. Therefore, a longitudinal design may yield directionality of the effects between distress tolerance, trait aggression, and the development of problematic alcohol use.

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References

Aiken, LS.; West, SG. Multiple regression: Testing and interpreting interactions. Sage; Newbury Park, CA: 1991.

Alia-Klein N, Goldstein RZ, Kriplani A, Logan J, Tomasi D, Williams B, Telang F, Shumay E, Biegon A, Craig IW, Henn F, Wang G, Volkow ND, Fowler JS. Brain monoamine oxidase A activity predicts trait aggression. J Neurosci. 2008; 28(19):5099–5104. [PubMed: 18463263]

Babor, TF.; De La Fuente, JR.; Saunders, J.; Grant, M. Guidelines for use in primary healthcare. World Health Organization; Geneva, Switzerland: 1989. AUDIT: The Alcohol Use Identification Test.

Bachman, JG.; O'Malley, PM.; Schulenberg, JE.; Johnston, LD.; Bryant, AL.; Merline, AC. The Decline of Substance Use in Young Adulthood: Changes in Social Activities, Roles, and Beliefs. Lawrence Erlbaum Associates; Mahwah, NJ: 2002.

Baker TB, Piper ME, McCarthy DE, Majeskie MR, Fiore MC. Addiction motivation reformulated: An affective processing model of negative reinforcement. Psychol Rev. 2004; 111:33–51. [PubMed: 14756584]

Barnwell SS, Borders A, Earleywine M. Alcohol-aggression expectancies and dispositional aggression moderate the relationship between alcohol consumption and alcohol-related violence. Aggressive Behav. 2006; 32:517–527.

Beck KH, Arria AM, Caldeira KM, Vincent KB, O'Grady KE, Wish ED. Social context of drinking and alcohol problems among college students. Am J Health Behav. 2008; 32:420–430. [PubMed: 18092902]

Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. J Pers Assess. 1996; 67:588–597. [PubMed: 8991972]

Brown RA, Lejuez CW, Strong DR, Kahler CW, Zvolensky MJ, Carpenter LL, Niaura R, Price LH. A prospective examination of distress tolerance and early smoking lapse in self-quitters. Nicotine Tob Res. 2009; 11:493–502. [PubMed: 19372572]

Buckner JD, Ecker AH, Cohen AS. Mental health problems and interest in marijuana treatment among marijuana-using college students. Addict Behav. 2010; 35:826–833. [PubMed: 20483200]

Buckner J, Keough M, Schmidt N. Problematic alcohol and cannabis use among young adults: The roles of depression and discomfort and distress tolerance. Addict Behav. 2007; 32:1957–1963. [PubMed: 17258398]

Burdenski T. Evaluating univariate, bivariate, and multivariate normality using graphical and statistical procedures. MLRV. 2000; 26:15–28.

Buss, A. The psychology of aggression. John Wiley & Sons; New York: 1961.

Daughters SB, Reynolds EK, MacPherson L, Kahler CW, Danielson CK, Zvolensky M, Lejuez CW. Distress tolerance and early adolescent externalizing and internalizing symptoms: The moderating role of gender and ethnicity. Behav Res Ther. 2009; 47:198–205. [PubMed: 19135649]

Derogatis, LR. The Brief Symptom Inventory–18 (BSI-18): Administration, Scoring and Procedures Manual. National Computer Systems; Minneapolis, MN: 2000.

Dimeff L, Linehan M. Dialectical Behavior Therapy for Substance Abusers. Addict Sci Clin Pract. 2008; 4:39–47. [PubMed: 18497717]

Dunn M, Degenhardt L, Bruno R. Transition to and from injecting drug use among regular ecstasy users. Addict Behav. 2010; 35:909–912. [PubMed: 20587367]

Gorka SM, Ali B, Daughters SB. The role of distress tolerance in the relationship between depressive symptoms and problematic alcohol use. Psychol Addict Behav. 2012; 26:621–626. [PubMed: 22121919]

Hingson RW, Heeren T, Winter M, Wechsler H. Magnitude of alcohol-related morbidity and mortality among U.S. college age students 18–24: Changes from 1998–2001. Annu Rev Publ Health. 2005; 26:259–279.

Holmbeck GN. Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations. J Pediatr Psychol. 2002; 27:87–96. [PubMed: 11726683]

Houston RJ, Stanford MS, Villemarette-Pittman NR, Conklin SM, Helfritz LE. Neurobiological correlates and clinical implications of aggressive subtypes. J Forensic Neuropsychol. 2003; 3:67–87.

Howell, DC. Statistical methods for psychology. 6. Thomson Wadsworth; Belmont, CA: 2007.

Howell A, Leyro T, Hogan J, Buckner J, Zvolensky M. Anxiety sensitivity, distress tolerance, and discomfort intolerance in relation to coping and conformity motives for alcohol use and alcohol use problems among young adult drinkers. Addict Behav. 2010; 35:1144–1147. [PubMed: 20719435]

Jackson KM, Sher KJ, Gotham HJ, Wood PK. Transitioning into and out of large-effect drinking in young adulthood. J Abnorm Psychol. 2001; 110:378–391. [PubMed: 11502081]

Jennison KM. The Short-Term Effects and Unintended Long-Term Consequences of Binge Drinking in College: A 10-Year Follow-Up Study. Am J Drug Alcohol Abuse. 2004; 30:659–675. [PubMed: 15540499]

Kaiser AJ, Milich R, Lynam DR, Charnigo RJ. Negative urgency, distress tolerance, and substance abuse among college students. Addict Behav. 2012; 37:1075–1083. [PubMed: 22698894]

Kessler RC, Nelson CB, McGonagle KA, Liu J, Swartz M, Blazer DG. Comorbidity of DSM-III-R major depressive disorder in the general population: Results from the US National Comorbidity Survey. Br J Psychiatry. 1996; 171:487–488.

Larimer ME, Cronce JM. Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999–2006. Addict Behav. 2007; 32:2439–2468. [PubMed: 17604915]

Leyro TM, Zvolensky MJ, Bernstein A. Distress tolerance and psychopathological symptoms and disorders: A review of the empirical literature among adults. Psychol Bull. 2010; 136:576–600. [PubMed: 20565169]

Lindell MK, Whitney DJ. Accounting for common method variance in cross-sectional research designs. J Appl Psychol. 2001; 86:114–121. [PubMed: 11302223]

Magidson, JF.; Ali, B.; Listhaus, A.; Daughters, SB. Distress tolerance, Handbook of Addiction Psychopharmacology. MacKillop, J.; De Wit, H., editors. Wiley-Blackwell; Hoboken, NJ: 2013. p. 233-256.

Malouff JM, Thorsteinsson EB, Rooke SE, Schutte NS. Alcohol involvement and the five-factor model of personality: A meta-analysis. J Drug Educ. 2007; 37:277–294. [PubMed: 18047183]

McCabe SE, Schulenberg JE, Johnston LD, O'Malley PM, Bachman JG, Kloska DD. Selection and socialization effects of fraternities and sororities on U.S. college student substance use: A multi-cohort national longitudinal study. Addict. 2005; 100:512–524.

McMurran M. The relationships between alcohol use, trait aggression, and the alcohol-aggression outcome expectancy in male students. J Subst Use. 2009; 14:1–9.

Palmgreen, P.; Donohew, L.; Lorch, EP.; Hoyle, RH.; Stephenson, MT. Television campaigns and sensation seeking targeting of adolescent marijuana use: A controlled time series approach. In: Hornick, RC., editor. Public Health Communication: Evidence for Behavior Change. Erlbaum; Mahwah, NJ: 2002. p. 35-56.

Patrick CJ, Curtin JJ, Tellegen A. Development and validation of a brief form of the Multidimensional Personality Questionnaire. Psychol Assess. 2002; 14:150–163. [PubMed: 12056077]

Qualtrics Labs, Inc [computer program]. Provo, UT: Qualtrics Labs, Inc; 2012.

Roe B, Beynon C, Pickering L, Duffy P. Experiences of drug use and ageing: Health, quality of life, relationship and service implications. J of Adv Nurs. 2010; 66:1968–1979. [PubMed: 20626477]

Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption II. Addiction. 1993; 88:791–804. [PubMed: 8329970]

Simons J, Gaher R. The Distress Tolerance Scale: Development and validation of a self-report measure. Motiv Emotion. 2005; 29:83–102.

SPSS [computer program]. Chicago, IL: SPSS, Inc; 2009.

Substance Abuse and Mental Health Services Administration. [Accessed February 21, 2012] Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings. 2011 Sep. Available at: http://www.oas.samhsa.gov/NSDUH/2k10NSDUH/2k10Results.htm#Fig2-1

Tellegen, A. Unpublished manuscript. University of Minnesota; Minneapolis: 1982. Brief manual for the Multidimensional Personality Questionnaire.

Tellegen A, Lykken DT, Bouchard TS, Wilcox KJ, Segal NL, Rich S. Personality similarity in twins reared apart and together. J Pers Soc Psychol. 1988; 54:1031–1039. [PubMed: 3397862]

Tremblay PF, Ewart LA. The Buss and Perry Aggression Questionnaire and its relations to values, the Big Five, provoking hypothetical situations, alcohol consumption patterns, and alcohol expectancies. Pers Indiv Differ. 2005; 38:337–346.

Tremblay PF, Graham K, Wells S. Severity of physical aggression reported by university students: A test of the interaction between trait aggression and alcohol consumption. Pers Indiv Differ. 2008; 45:3–9.

White A, Kavanagh D, Stallman H, Klein B, Kay-Lambkin F, Proudfoot J, Drennan J, Connor J, Baker A, Hines E, Young R. Online Alcohol Interventions: A Systematic Review. J Med Internet Res. 2010; 12:e62. [PubMed: 21169175]

White TL, Grover VK, de Wit H. Cortisol effects of d-amphetamine relate to traits of fearlessness and aggression but not anxiety in healthy humans. Pharmacol Biochem Behav. 2006; 85(1):123–131. [PubMed: 16934318]

White HR, Labouvie EW. Towards the assessment of adolescent problem drinking. J Stud Alcohol. 1989; 50:30–37. [PubMed: 2927120]

Zvolensky MJ, Marshall EC, Johnson K, Hogan J, Bernstein A, Bonn-Miller MO. Relations between anxiety sensitivity, distress tolerance, and fear reactivity to bodily sensations to coping and

conformity marijuana use motives among young adult marijuana users. Exp Clin Psychopharm. 2009; 17:31–42.

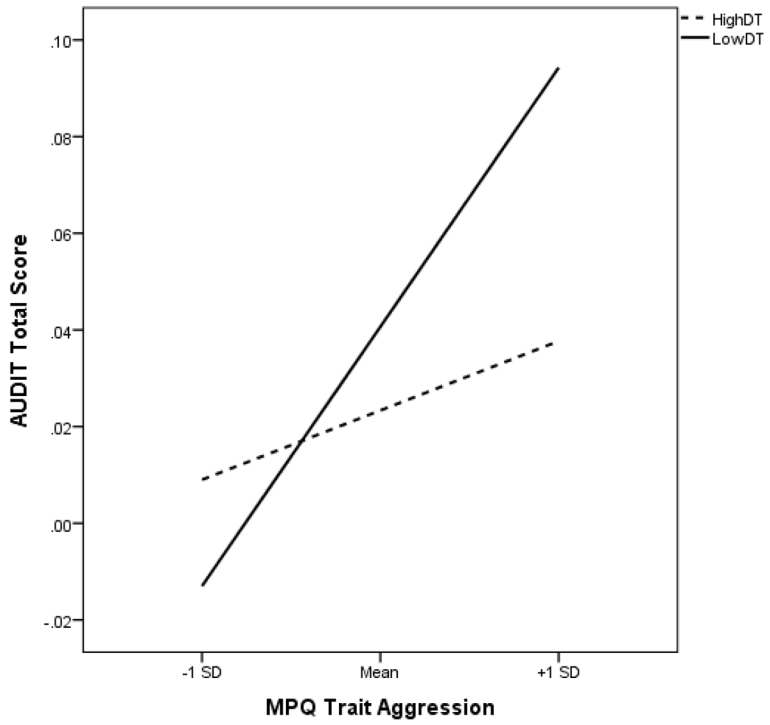

Figure 1.
The relation between trait aggression and problematic alcohol use as a function of distress tolerance.
Note. DT = Distress Tolerance; SD = Standard Deviation. All values are standardized. Low distress tolerance is 1 standard deviation below the mean. High distress tolerance is 1 standard deviation above the mean.

Table 1

Descriptive data and Pearson's correlations between study variables.

Variable	Mean (SD)	1	2	3	4	5	6	7
1. Age	19.9 (SD = 1.47)	1.00						
2. GPA	3.21 (SD = 0.56)	−.13**	1.00					
3. AUDIT Total Score	17.43 (SD = 4.56)	−.09**	.02	1.00				
4. MPQ Trait Aggression	0.22 (SD = 0.20)	−.09*	−.03	.21**	1.00			
5. DTS Total Score	3.43 (SD = 0.78)	−.08	−.02	−.01	−.11**	1.00		
6. BSI Depressive symptoms	10.99 (SD = 4.86)	.09	−.01	.11**	.14**	−.41**	1.00	
7. BSI Anxiety symptoms	10.12 (SD = 4.23)	.06	.08*	.09*	.13**	−.45**	.67**	1.00

Note.

* $p < .05$,

** $p < .01$. Raw scores are reported to facilitate interpretation; however, transformed BSI Depressive Symptoms, BSI Anxiety Symptoms, MPQ Trait Aggression, and DTS Total Score were used to determine statistical significance.

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Table 2

Hierarchical linear regression examining predictors of problematic alcohol use.

Variable	*b*	*SE*	*t*-value	ΔR^2
Step 1:				.211***
Sex (Male)	.10	.02	4.77***	
Race (White)	.12	.02	6.28***	
Age	−.02	.01	−2.36*	
Regular Marijuana Use	.12	.03	3.79***	
Regular Crack/Cocaine Use	.12	.08	1.62	
Regular Ecstasy Use	−.01	.08	−.06	
Regular Stimulant Use	.12	.04	3.31**	
Regular Sedative Use	.04	.07	.49	
Regular Opioid Use	−.06	.10	−.63	
Regular PCP Use	−.04	.16	−.22	
Regular Inhalants Use	.24	.17	1.45	
BSI Depressive Symptoms	.06	.03	2.04*	
BSI Anxiety Symptoms	.01	.03	.30	
Step 2:				.013**
MPQ Trait Aggression	.20	.06	3.22**	
DTS Total Score	−.03	.04	−.71	
Step 3:				.006*
MPQ Trait Aggression x DTS Total Score	−.51	.24	−2.13*	

Note:

* $p < .05$,

** $p < .01$,

*** $p < .001$. BSI Depressive Symptoms, BSI Anxiety Symptoms, MPQ Trait Aggression, and DTS Total Score are transformed variables.