Published in final edited form as:

Subst Use Misuse. 2018 March 21; 53(4): 629–640. doi:10.1080/10826084.2017.1355385.

Internalizing risk factors for college students' alcohol use: A combined person- and variable-centered approach.

Stephanie E. Wemm, Stephanie M. Ernestus, Cathryn Glanton-Holzhauer, Renata Vaysman, Edelgard Wulfert, and Allen C. Israel

University at Albany, State University of New York

Abstract

Background: Most studies that investigate internalizing problems (i.e., depression and anxiety symptoms) and alcohol use disorders use variable-centered approaches, losing important information about differences among individuals.

Objectives: To group college students by different profiles of alcohol-use risk factors using a person-centered cluster analysis in two separate samples.

Methods: Questionnaires were used in both studies to assess positive expectancies regarding alcohol use, coping motives for alcohol use, and symptoms of depression and anxiety. In the first study (2012), we collected information about past month alcohol use, including frequency and binge drinking episode ($n=171$). In the second study (2013), we also included measures of externalizing behaviors and negative alcohol-related consequences ($n=526$).

Results: In Study 1, the cluster analysis identified four groups of students who displayed different patterns of risk: a low-risk group, moderate cognitions/low internalizing cluster, a high internalizing/low coping motives group of drinkers, and a high internalizing/high coping motives cluster of drinkers. This fourth group showed high levels of depression, moderate anxiety, high positive expectancies and coping motives for alcohol use, and reported the highest frequency of alcohol use. Study 2 replicated the findings from the previous study. Three groups of individuals were identified, replicating the low-risk cluster, the moderate cognitions/low internalizing cluster, and the internalizing cluster of drinkers from Study 1. Participants in the latter cluster endorsed the highest number of negative consequences of alcohol use.

Conclusions: Results from both studies highlight the importance of tailoring alcohol abuse prevention efforts to a subgroup young adult who endorse internalizing symptoms.

Keywords

Cluster Analysis; Alcohol; Expectancy; Coping Motives; Internalizing; Depression; Anxiety

Correspondence concerning this article should be addressed to: Stephanie E. Wemm, Department of Psychology, 1400 Washington Ave, Albany, New York 12222. Contact: swemm@albany.edu. Phone: (518) 442-4825. Fax: (518) 442-4867. Authors Stephanie E. Wemm, Edelgard Wulfert, and Allen C. Israel are at the University at Albany, State University of New York. Stephanie M. Ernestus is affiliated with the Nathanson Family Resilience Center at the University of California, Los Angeles. Cathryn Glanton-Holzhauer is at the University of Massachusetts Medical School. Renata Vaysman is affiliated with the New York Police Department.

Drinking during college, particularly at binge levels, is widely considered by many students as a normative experience. As compared to their non-college attending peers, a larger proportion of college students endorse binge drinking or heavy drinking (SAMHSA, 2014) and are more likely to meet criteria for alcohol dependence (Blanco et al., 2008). Heavy alcohol use in young adulthood often co-occurs with both internalizing (i.e., depression- and anxiety-related symptoms; Kramer, Krueger, & Hicks, 2008), and externalizing disorders (i.e., aggression, oppositional, and rule-breaking behaviors; Krueger et al., 2005) (see Chassin, Colder, Hussong, & Sher, 2016). Although substance use has generally been associated with externalizing disorders, internalizing symptoms often co-occur with alcohol use disorders in college students and in older adults (Dawson, Grant, Stinson, & Chou, 2005).

Many theories have attempted to explain the co-occurrence between internalizing symptoms and problematic alcohol use, positing that individuals use alcohol to eliminate unpleasant feelings (Conger, 1956; Baker, Piper, McCarthy, & Fiore, 2004). However, research examining the relationship between internalizing symptoms and alcohol abuse has yielded mixed results (see Chassin et al., 2016). Some research has suggested that internalizing symptoms result in increased engagement with substances (King et al., 2004; Shivolo et al., 2008), that they have limited impact on substance use (Stice et al., 1998, Kaplow et al., 2001), or that they even be protective (Colder et al., 2013, Fleming Mason, Mazza, Abbott, & Catalano, 2008). The unclear relationship may in part result from the focus solely on negative affect rather than how negative affect interacts with other variables that might co-occur to lend risk for alcohol abuse. Consequently, efforts towards refining theories explaining negative affect and alcohol abuse (Baker et al., 2004; Hussong, Hicks, Levy & Curran, 2001) suggest that internalizing symptoms *per se* not be directly related to substance abuse, but rather they might interact with individual cognitive variables to influence a person's tendency toward drinking. Individuals with higher levels of negative affect use less alcohol but, when they drink, they do so because of beliefs that alcohol will alleviate negative affect (Park et al., 2004). It may therefore prove more fruitful to identify a profile of characteristics (person-centered approach) that interact to lead an individual to drink. Hussong and colleagues (2011) hypothesize that, for a subset of individuals, internalizing risk factors is particularly salient for this type of drinking. Externalizing disorders have been shown broadly to increase risk for substance abuse (King, Iacono, & McGue, 2004; Farmer et al., 2016) and-occur with internalizing problems to predict substance use (Colder et al., 2013). However, internalizing problems lend specific risk for problematic alcohol use in a small subset of individuals, particularly when coupled with beliefs that support alcohol use (Hussong et al., 2011).

Positive expectancies are one such variable that might interact with internalizing symptoms to put a person at risk for alcohol abuse. Expectancy theory postulates that individuals classify expectancies regarding the outcome of a behavior (in this case, alcohol consumption) as either positive or negative and that this appraisal will guide an individual's behavioral choices (Jones, Corbin, & Fromme, 2001). At-risk youth continue to develop a growing expectancy that drinking alcohol reduces negative feelings and enhances positive ones (Colder, Chassin, Stice, & Curran, 1997), and research shows that this belief increases the likelihood to initiate alcohol use (Reese, Chassin, & Molina, 1994). One study found that

social anxiety predicted alcohol use only when the participants also expected positive outcomes from their use (Kashdan, Collins, & Elhai, 2006). Positive expectancies about alcohol use combine with a persistent experience of internalizing symptoms to increase the risk for problematic alcohol use.

Coping motives for drinking be another risk factor that interacts with positive expectancies and internalizing symptoms to predict problematic drinking. Alcohol expectancies relate to a person's beliefs about the results of use and conceptually precede the development of coping motives. In contrast, drinking motives require experience and develop only after the initiation of alcohol use (Cooper, Frone, Russell, & Mudar, 1995; Cooper, 1994). That is, an individual can have expectations about drinking without ever having used alcohol, whereas motives are based on prior experience and are more specific to the drinking episode. Therefore, assessing motives contributes additional information about a person's cognitive set regarding alcohol use since a person have an expectation about alcohol use but not be motivated to drink. Coping motives mediate the relationship between social anxiety disorder and alcohol use (Windle & Windle, 2012) and, along with depressive symptoms, the relationship between hopelessness and excessive drinking (Stewart et al., 2011). Therefore, once drinking is initiated, coping motives develop and increase the likelihood of using alcohol to regulate internalizing symptoms, leaving individuals more prone to the negative consequences of drinking.

Advantages of a Person-Centered Approach

Research on the relationship between internalizing symptoms and alcohol use has mainly employed variable-centered analyses (e.g., regression and ANOVA). The variable-centered approach describes associations among variables that occur to a similar degree in all members of a group. It focuses on changes in variables and seeks to link predictors to outcomes of interest (Masten, 2001) by quantifying the strongest relationships between independent variables and generalizing to the whole sample. The information from a smaller group is more likely to be lost in these analyses. Disregarding how variables interrelate to one another within a person may contribute to the contradictory findings regarding the role of internalizing symptoms in alcohol misuse.

A person-centered approach is predicated on the assumption that a population is heterogeneous and that independent variables operate differently on outcomes for certain sub-groups. The advantage of a person-centered analytic approach, such as cluster analysis, is that it identifies naturally occurring constellations of risk factors within individuals -- information that is lost in variable-focused approaches. Therefore, the aim of the two studies reported below was, first, to use a person-centered analysis to identify patterns of risk factors, and then to employ a variable-centered approach to examine the relationships between risk groups and outcome variables. To accomplish this goal, we assessed the differences in alcohol consumption between empirically based cognitive and psychopathological profiles. We used cluster analysis in both studies to identify groups of individuals with specific characteristics who might be at increased risk for alcohol abuse. In Study 1, we established the pattern of risk factors (i.e., clusters) as they relate to alcohol use in college students. In Study 2, we determined the reliability of these risk factors in another

sample of college students, using different measures. In both studies, we also used the identified clusters to predict alcohol use.

Study 1 – Method

Participants

A sample of 211 college students (123 women and 88 men) recruited from psychology classes at a public university participated in the study for research credit. Participants were given the option to check a box at the end of the survey to have their responses excluded if they had not answered honestly or had not put forth adequate concentration/effort in their responses, which resulted in fourteen exclusions. Another 26 participants were excluded for not having used any alcohol in the past month. The final sample comprised 73 men and 98 women ($N=171$). The average amount of standard drinks consumed per drinking sessions was 5.94 ± 3.47 , and participants reported binge drinking $3.08 \text{ times} \pm 1.27$ in the past two weeks. Their average age was 19.73 years (range 18–26). The majority identified as Caucasian (56.4%), followed by Asian (17.1%), African American (13.3%), Hispanic (7.6%), and “other” (5.7%).

Procedure

The University’s institutional review board approved the study. Participants anonymously consented and completed a set of questionnaires via a web-based program in a computer lab.

Measures

Positive expectancies.—The Alcohol Expectancy Questionnaire-3 (AEQ-3; George et al., 1995) is an updated version of Rohsenow and colleagues’ (1983) Alcohol Effects Questionnaire. The updated version assesses alcohol use expectancies on a 6-point Likert scale (1=strongly disagree to 6=strongly agree). We used the overall positive expectancies subscale (e.g., “A few drinks make me less shy;” “Alcohol makes me worry less;” “Drinking adds a certain warmth and friendliness to social occasions for me”) which includes 26 items measuring broad beliefs that drinking will have anxiolytic and antidepressant effects, improve social situations, enhance sexual pleasure, and increase feelings of power and aggression. George and colleagues (1995) suggest using the broader positive expectancy score due to a significant pattern of intercorrelations between the subscales. This subscale has been used in several recent studies with college student samples (Holt et al., 2013; Glanton & Wulfert, 2013; LaBrie, Kenney, Migliuri, & Lac, 2011; O’Hara, Armeli, & Tennen, 2014), with Cronbach’s alpha ranging from .88 to .95. In the present sample, the scale had strong internal consistency (Cronbach’s $\alpha = .95$).

Coping motives for alcohol use.—The Drinking Motives Questionnaire (DMQ; Cooper, 1994) is comprised of four subscales, with items rated on a 5-point Likert scale (from 1=almost never/never to 5=almost always/always). We used only the 5-item Coping Motives subscale, which includes questions such as, “How often do you drink to cheer up when you’re in a bad mood?” and “How often do you drink to forget your problems?”. Its internal consistency in the present sample was .94 (Cronbach’s alpha).

Internalizing symptoms.—The Beck Depression Inventory – Second Edition (BDI-II, Beck & Steer, 1984) and the Beck Anxiety Inventory (BAI; Beck & Steer, 1990) were used to measure participants' internalizing symptoms during the past week. Both BDI-II and BAI are 21-item inventories (each item is scored from 0=none to 3=high severity). Overall scores were used to measure current levels of depression and anxiety. The internal consistencies (Cronbach's alpha) for the present sample were .76 (depression) and .92 (anxiety).

Alcohol use.—The CORE Alcohol and Drug Survey (CORE Institute, 2004) measures substance use and social norms in college students. We focused on the frequency of alcohol consumption over the past month (potential responses ranging from 1=0 days to 7=all 30 days) and number of binge drinking episodes (5 or more drinks per occasion) over the previous two weeks. Although the standard cutoff for binge drinking is four drinks for women and five drinks for men, this cut-off has been called into question by previous researchers. The +4/+5 often fails to predict problematic alcohol use and does not consider other potential factors, such as body mass or cultural variations in drinking habits (see Pearson, Kirouac, & Witkiewitz, 2015). We opted to ask participants about the higher cutoff to reduce the influence of these other factors.

Data Analytic Plan—The alcohol use frequency was positively skewed and was logarithmically transformed.

We used correlation analyses to first examine the relationship between the variables. Then, cluster analyses were conducted in SPSS. All variables were first standardized by dividing the values by their respective ranges to ensure that no one variable contributed unequally based on differences in scales (Milligan & Cooper, 1988). As recommended by Henry et al. (2005), a hierarchical cluster analysis using Ward's method provided a hierarchical tree diagram and an agglomeration table to identify clusters of unique alcohol risk patterns. Thereafter, we conducted a k-means cluster analysis using the identified number of clusters to assign cluster membership for each case. We then used chi-square analyses to assess if certain demographic characteristics (i.e., gender, race, and ethnicity) was distributed differently between the clusters. Finally, we used ANOVAs and Welch's adjusted ANOVAs to examine the pattern of risk factors for the clusters and to assess whether the clusters differed in alcohol use.

Results

The correlation analysis revealed that depression and anxiety symptoms correlated with one another and coping motives for alcohol use (Table 1). All the drinking-related variables were significantly correlated. A hierarchical cluster analysis was conducted, using the depression, anxiety, coping motives, and positive expectancies scales. We used the re-formed agglomeration schedule to differentiate distinct clusters. A larger coefficient between two clusters indicates a larger distance and a more distinct cluster, whereas smaller coefficients indicate greater similarity between clusters. The results revealed that the step from one cluster to two clusters resulted in a change of 8.18; from two to three clusters, 4.16; from three to four, 3.44; from four to five, 1.29; and from five to six clusters, 1.09. We determined that four clusters were optimal for describing the data, and further clustering yielded few

additional benefits. A k-means cluster analysis identified each participant's membership in one of four clusters.

Cluster 1 ($n=87$, 50.8% of the sample) was characterized by low internalizing symptoms (anxiety, depression), the lowest reported coping motives, and low positive expectancies for alcohol use (Figure 1). Cluster 2 ($n=54$, 31.6%) also reported low internalizing symptoms, average levels of coping motives and positive alcohol expectancies. Cluster 3 ($n=19$, 11.1%) showed the highest levels of anxiety, moderate levels of depression, and low levels of positive expectancies and coping motives for alcohol use. Cluster 4 ($n=11$, 6.4%) displayed a moderate degree of anxiety, and the highest levels of depression, positive expectancies, and coping motives for alcohol use.

With one-way ANOVAs, we examined whether individuals in the four clusters differed on each cluster variable to establish whether the clusters were statistically and meaningfully distinct on each one of our variables of interest. As the homogeneity of variance assumption was violated for all variables except positive alcohol expectancies, we used Welch's adjusted F for anxiety, depression, and coping motives. The clusters were overall different on all four constructs: positive expectancies [$F(3,167)=31.51$, $p\leq.001$], depression [Welch's adjusted $F(3,31.34)=13.85$, $p\leq.001$], anxiety [Welch's adjusted $F(3,31.19)=49.02$, $p\leq.001$], and coping motives [Welch's adjusted $F(3,31.54)=146.20$, $p\leq.001$]. Post-hoc tests showed that all four clusters differed from one another in coping motives (see Table 2). Cluster 1 held lower positive alcohol expectancies than the other three clusters, and Cluster 4 had higher positive expectancies than Cluster 3. Clusters 1 and 2 had similarly low internalizing symptoms, and both differed from Clusters 3 and 4. Cluster 3 endorsed more anxiety symptoms than Cluster 4, but equivalent depression symptoms. All other comparisons were non-significant ($p>.05$).

Finally, we examined the clusters for gender and ethnic/racial differences using chi-square analyses. Men and women were represented in equal proportions in Clusters 1 and Cluster 4 ($p>.05$), but men were more likely to belong to Cluster 2 whereas women were more likely to fall into Cluster 3 [Table 2; $\chi^2(3, N=171)=9.32$, $p=.029$]. There were no proportional differences in race/ethnicity across clusters [$\chi^2(12, N=171)=10.13$, $p=.605$].

The Clusters' Predictive Ability of Alcohol Use

We used ANOVAs to assess cluster-based differences in the frequency of alcohol use and binge drinking. As the assumption of homogeneity of variance was upheld for binge drinking but not for alcohol use frequency, we reported the unadjusted F-test and LSD posthoc tests for the former, and Welch's adjusted values for the latter and Games-Howell posthoc tests. The overall main effect revealed that the clusters were different both in frequency of alcohol use [see Table 2; Welch's adjusted $F(3,36.02)=9.44$, $p<.001$, $\eta_p^2=.13$] and binge drinking [$F(3,167)=4.98$, $p=.002$, $\eta_p^2=.08$]. Post-hoc analyses indicated that Cluster 4 drank alcohol more frequently than the other three clusters. Cluster 2 reported more frequent alcohol use and more binge drinking episodes than Cluster 1. The other pairwise comparisons were not significant ($p>.05$).

Discussion

We identified four clusters of college students who displayed different patterns of risk factors and drinking behavior: a “Low Risk” group (Cluster 1), a “Low Internalizing/Moderate Cognition” group (Cluster 2), an “Internalizing/Low Coping” group (Cluster 3), and an “Internalizing/High Coping” group (Cluster 4). The Low-Risk Cluster endorsed low levels of risk factors and drank the least alcohol. The Low Internalizing/Moderate Cognition Cluster was more likely to be comprised of men; they reported moderate levels of positive alcohol expectancies and coping motives, but limited symptoms of depression and anxiety and more binge drinking episodes than individuals in the other clusters. Individuals in the High Internalizing/Low Coping Cluster were more likely to be women, report higher anxiety, endorse mid-range positive expectancies of use but limited coping motives for alcohol use, and were the least distinctive in alcohol habits. The High Internalizing/High Cognition Cluster endorsed high levels of coping motives and positive expectancies regarding alcohol use, and they reported the highest level of depression and moderate levels of anxiety. Students in this group used alcohol more frequently but did not reach the same levels of binge drinking as the Low Internalizing/Moderate Cognition group. The differences between the two internalizing clusters reflects the mixed findings in the literature noted previously. Our results from this first study suggest that internalizing symptoms only result in increased alcohol use when coupled with beliefs that support alcohol use.

Study 2

The second study was conducted with a fourfold purpose: (1) to replicate the findings from Study 1 to assess the stability of the cluster characteristics with a different sample; (2) to gather data from a larger sample to increase power for the alcohol use analyses; (3) to assess differences in the clusters in alcohol-related consequences of use; (4) and to assess if the generated clusters differed in externalizing symptoms.

Method

Participants

The sample consisted of 646 college students (366 women and 280 men) recruited from psychology classes at the same institution. As in Study 1, the analyses included students who reported drinking at least once in the past month, providing a final sample of 526 participants (237 men and 299 women). The participants' mean age was 19.38 years (range 18–48). Most identified as Caucasian (53.9%) followed by Black/African American (14.7%), Asian American (13.6%), Hispanic (5.4%), American Indian or Alaskan Native (1.9%), Pacific Islander (.3%), and “other” (10.2%).

Procedure

The same procedure was used as described in Study 1.

Measures

Study 2 used largely the same measures as in Study 1, including our measures for coping motives (DMQ-R) and anxiety (BAI); the reliabilities for these scales were Cronbach's α of .90 and .88, respectively. The analyses for Study 2 were conducted on data drawn from a larger study. While this allowed us to achieve our stated aims, some of the measures for our constructs of interest (i.e., those to measure alcohol-related positive expectancies and depression) changed.

As in Study 1, we used the CORE-R to assess frequency of alcohol use and binge drinking. Unlike Study 1, we also used this measure for assessing positive alcohol-related expectancies and adverse consequences of alcohol use. The CORE-R assesses alcohol expectancies with 14 yes/no questions (e.g., alcohol enhances social activity; makes it easier to deal with stress). In this sample, the reliability of this scale was .86 (Kuder-Richardson-20).

We also included the 18-item scale from the CORE-R that asks the participant to respond with the frequency of experiencing negative alcohol-related consequences ("Indicate how often you have experienced the following due to your drinking during the last year"). Items included "got into an argument or fight," "performed poorly on a test," and "driven a car while under the influence," and were measured on a Likert scale (from 1=never to 6=10 or more times). Our interest in also examining alcohol-related consequences was based on research demonstrating that internalizing symptoms (e.g., social anxiety) were more strongly related to negative consequences than to alcohol consumption (Lewis et al., 2008). In the present sample, the scale's reliability coefficient was .84 (Cronbach's α).

Depression was measured with the Center for Epidemiological Studies Depression Scale - Revised (CESD-R; Eaton et al., 2004). The CESD-R exhibits sound psychometric properties (Van Dam & Earleywine, 2011). Respondents indicated on a 4-point Likert scale ranging from 0 (Rarely or none of the time; less than one day) to 4 (Most or all of the time, 5–7 days) how often they experienced each of twenty symptoms over the past two weeks (e.g., "I had trouble keeping my mind on what I was doing;" "I had crying spells"). The scale's internal consistency for the present sample was $\alpha=.93$.

Externalizing symptoms were measured using symptoms from the DSM-IV-TR criteria for oppositional defiant disorder and conduct disorder (American Psychiatric Association, 2000). This measure was comprised of 29 symptoms that participants scored on a 1–3 scale (1 =not true, 2=somewhat or sometimes true, or 3=very often or very true). Examples of items included were, "I often lose my temper" and "I often initiate physical fights." The internal consistency of this scale for the current sample was .89 (Cronbach's α).

Data Analytic Plan

The same analytic approach was used as in Study 1. Transformations were used to correct the positive skew of the consequences of alcohol use measure (square root transformation) and externalizing symptoms measure (log-transformed).

Results

Hierarchical cluster analysis

The correlation analyses revealed that all the variables related to one another (Table 3) except depression symptoms and positive expectancies. Depression and anxiety symptoms were most closely associated with coping motives and negative consequences of alcohol use. We conducted a hierarchical cluster analysis using depression, anxiety, coping motives, and positive alcohol expectancies. Using Ward's method, this analysis provided an agglomeration table, which we used to demarcate clusters. The results revealed that the step from one cluster to two clusters resulted in a change of 20.69; from two to three clusters, 14.48; from three to four, 5.34; and from four to five, 4.31. Unlike in Study 1, we identified three clusters of unique risk patterns that best represented the data. A k-means cluster analysis identified membership for each participant in one of three distinct clusters (Table 4).

Individuals in Cluster 1 ($n=222$, 42.2%) reported limited anxiety and depression, and the lowest levels of coping motives and positive alcohol expectancies (replicating the "Low Risk" Cluster from Study 1). Individuals in Cluster 2 ($n=206$, 39.2%) reported low internalizing symptoms and coping motives but had the highest positive alcohol expectancies (like the "Low Internalizing/Moderate Cognitions" Cluster from Study 1, albeit with lower coping motives). Individuals in Cluster 3 ($n=98$, 18.6%) reported high levels of depression and anxiety, moderate levels of positive expectancies and very high coping motives for alcohol use (the "High Internalizing/High Coping Motives" Cluster from Study 1; Figure 2).

ANOVAs were used to identify group differences on the clustering variables. Levene's test showed that homogeneity of variance was violated for all variables; thus, Welch's adjusted F is reported. The three clusters differed on all four cluster variables, i.e., positive expectancies [Welch's adjusted $F(2,240.66)=439.65$, $p \leq .001$], depression [Welch's adjusted $F(2,241.83)=26.60$, $p \leq .001$], anxiety [$F(2,221.56)=20.228$, $p \leq .001$], and coping motives ($F(2,226.76)=267.63$, $p \leq .001$). Post-hoc tests revealed that the Cluster 3 was different from both Clusters 1 and 2 on all four variables ($p < .05$). The Clusters 1 and 2 did not differ in depression and anxiety, but Cluster 2 did have higher coping motives and alcohol expectancies (Table 4).

Chi-square analyses replicated findings from Study 1, showing no differences among clusters in ethnicity/race [$\chi^2(2, N=526)=14.192$, $p=.436$], but differences in gender [$\chi^2(2, N=526)=36.90$, $p < .001$]. Women more likely fell into Clusters 1 and 3 whereas men were more likely classified in Cluster 2.

We used an ANOVA to investigate cluster differences in externalizing symptoms. The Welch's adjusted F is reported to account for differences in homogeneity of variance between the three clusters. The overall analysis revealed a significant between-group difference, Welch's $F(2,242.19)=10.46$, $p < .001$. Games-Howell posthoc test showed that Cluster 1 endorsed fewer externalizing symptoms than Cluster 2 ($p < .05$) and Cluster 3 ($p < .05$), with the latter two not being different from each other ($p > .05$).

Alcohol Use

One-way ANOVAs examined possible differences among clusters in alcohol use and alcohol-related negative consequences. Homogeneity of variance was established for frequency of alcohol use and binge drinking, but not for consequences of alcohol use. For drinking frequency and binge drinking, we therefore used the unadjusted F-test and LSD posthoc tests, whereas for the latter we report Welch's adjusted F-test below.

Omnibus *F* tests showed that the groups differed in past-month alcohol use [$F(2,523)=21.28$, $p<.001$] and binge drinking [$F(2,523)=23.87$, $p<.001$]. LSD posthoc tests showed that all three groups differed from one another in past-month alcohol use (Table 4; $p<.05$). Cluster 1, akin to the Low-Risk Cluster from Study 1, showed the lowest frequency of alcohol use, followed by the Cluster 2. Cluster 3 reported a high-frequency alcohol use, like the High Internalizing/High Coping Cluster in Study 1. In contrast, there was no difference in binge drinking between Clusters 2 and 3 ($p=.92$), although both reported more binge episodes than Cluster 1 ($p<.001$). Thus, individuals in Cluster 2, although drinking less frequently, engaged in some risky drinking behavior such as bingeing like individuals in the Low Internalizing/Moderate Cognition Cluster from Study 1

The three clusters also differed in alcohol-related consequences [Welch's adjusted $F(2,247.05)=29.72$, $p<.001$]. Games-Howell posthoc tests showed that all three clusters differed from one another. Cluster 3 reported the highest negative consequences of alcohol use, Cluster 2 fell in the middle, and Cluster 1 experienced the lowest adverse consequences of drinking.

General Discussion

The results of the current studies support that anxiety and depression can be a risk factor for alcohol misuse in a non-clinical population, particularly among those who drink alcohol for coping purposes. Cluster 1 from Study 2 displayed a pattern akin to the Low-Risk Cluster from Study 1. Clusters 2 and 3 in Study 2 paralleled the Low Internalizing/Moderate Cognition Cluster and the High Internalizing/High Coping Cluster from Study 1. Notably, while the Low Internalizing/Moderate Cognition Cluster and the High Internalizing/High Coping Cluster in Study 2 both endorsed higher externalizing symptoms, the Low Internalizing/Moderate Cognition Cluster endorsed less depression and anxiety symptoms in both studies. In Study 1 the High Internalizing/High Coping Cluster reported the highest alcohol use frequency, and in Study 2 individuals in this cluster not only drank more frequently than the other two clusters but also reported the greatest number of negative alcohol-related consequences. In both studies, this group reported as many binge drinking episodes as the Low Internalizing/Moderate Cognition Cluster. Thus, for a small group of young adults, internalizing risk factors predict alcohol-related problems (Holt et al., 2013) particularly when combined with positive alcohol-related cognitions. Our results showed that these clusters are replicable between two samples of college students.

Both studies also identified two additional clusters: a group of individuals with non-problematic drinking habits who endorsed relatively few risk factors and a group who reported more positive expectancies and coping motives for alcohol use. Both groups

endorsed fewer internalizing symptoms than the High Internalizing Drinking cluster. Low Internalizing/Moderate Cognition Drinkers in both studies showed a mid-range level of drinking frequency and espoused high positive alcohol expectancies. There is ample evidence that strong positive alcohol expectancies are, independently, a powerful predictor of alcohol use (Sher, Grekin, & Williams, 2005) and not specific to an internalizing profile. In a college population such expectancies alone can put students at risk for frequent alcohol use and binge drinking and should therefore be targeted in prevention efforts.

In Study 1 we identified one additional cluster, a High Internalizing/Low Coping Drinkers group. Although these individuals endorsed few positive alcohol expectancies and risk factors for alcohol use, they also fell within the mid-range for alcohol use frequency and binge drinking. This group appeared to be an artifact of the smaller sample size in Study 1 and was subsumed by the Internalizing Cluster in Study 2.

As mentioned, Low Internalizing/Moderate Cognitions Drinkers in both studies did not differ in binge drinking episodes from High Internalizing/High Cognitions Drinkers. This result is likely related to the powerful effects of positive expectancies and reflects the variety of beliefs that college drinkers hold regarding alcohol use. Further, the number of coping motives endorsed by the Low Internalizing/Moderate Cognitions group differed between the two studies. This finding suggests that, for this group, positive expectancies are closely tied to drinking behavior when internalizing symptoms are lower. It also reflects both the propensity of college students to drink heavily during college but then decrease use afterward (Carter et al, 2010) and the social factors that contributes to drinking behavior during this time (Weitzman et al., 2003). Consistent with previous research, the current results suggest that binge drinking is due to several factors (e.g., social drinking, parties) and is not necessarily indicative of alcohol-related problems.

In contrast, negative consequences due to excessive drinking and frequency of alcohol use is less subject to contextual factors and provides a better index of internalizing-specific alcohol-related problems. The correlation analyses also suggest that, while consequences are correlated with the frequency of use and binge drinking, more frequent use does not wholly explain consequences. Further, alcohol-related negative consequences were more strongly related to depression and anxiety symptoms than both frequency of use and binge drinking. Consistent with our results, a meta-analysis investigating the relationship between social anxiety, alcohol consumption, and alcohol-related problems found that individuals who endorse higher social anxiety report *more* adverse alcohol-related consequences but *fewer* drinking episodes (Schry & White, 2013). People with internalizing symptoms may not necessarily drink more frequently or in greater quantities than their peers; however, when they do drink, they engage in more risky behaviors.

An additional finding from Study 2 is that women were more likely to be classified in the High Internalizing/High Coping Cluster whereas men were more likely to be classified as Low Internalizing/Moderate Cognition Drinkers. This finding could be attributed either to the higher rate of internalizing disorders in women or possible gender bias in the measurement of internalizing symptoms. However, there is self-report and experimental research showing that women drink to deal with internalizing symptoms more than men

(Karpyak et al., 2016; Nolen-Hoeksema & Hilt, 2006; Mushquash et al., 2013; Olenick & Chalmers, 1991). Therefore, it is likely that addressing the co-occurrence of internalizing symptoms and alcohol use in women is an important implication of this research for treatment and prevention efforts. Prevention efforts targeted at young women should not only address alcohol use but also the link between internalizing symptoms and risky drinking.

Limitations

A limitation of both studies was that they relied on an undergraduate population. The findings therefore may not generalize to young people in general. Future research should include young individuals from different backgrounds to ascertain the external validity of internalizing risk factors for the development of problematic alcohol use.

Another limitation of both studies was their cross-sectional nature. Ideally, future research should identify individuals high on specific internalizing risk factors and examine later whether they were more likely to develop problematic alcohol use habits compared to controls.

A related limitation is that these cross-sectional studies did not allow us to determine the directionality of relationships among variables. Internalizing factors might lead to heavy drinking; conversely, heavy drinking might increase depressed mood and anxiety. Some research has suggested that the development of internalizing disorders follows the onset of substance abuse (Fergusson et al., 2011), but others have suggested that internalizing difficulties precede substance abuse (O'Neil et al., 2011). Future research should explore the sequence of internalizing problems and substance use disorder.

Conclusions

The present studies provide support for the use of a person-centered statistical approach to identify individuals who are at risk for the development of internalizing-related alcohol problems. We identified a group who, based on these risk factors, reported higher levels of alcohol use in both studies, albeit moderate binge drinking, and greater adverse consequences in Study 2. Both studies together highlight the consistency with which these individuals can be identified via a person-centered approach. Using cluster analyses allowed us to examine the collection of risk factors within two large samples of college students. While the risk that is conferred by each of the factors has been shown by prior research, our research examined these risk factors as they naturally occur within individuals. It highlights that internalizing symptoms may not confer risk for problematic alcohol use but, when combined with positive expectancies and motives for use, are associated with consequences from use. Preventing problematic alcohol use in college students – particularly in women – require attention to internalizing symptoms and beliefs about how to deal with those symptoms. While characterizations of students' drinking habits typically entail binge drinking at social events, students who drink to deal with internalizing issues are less focused on social drinking yet experience detriment from their use.

Identifying reliable markers for internalizing-related problematic alcohol use can inform treatment and prevention efforts for alcohol use disorders. Specifically, treating underlying

mood conditions in conjunction with alcohol problems may for a subset of individuals yield better outcomes than focusing on one of these problems in isolation. Our results also suggest that, for a large group of college drinkers represented by the Low Internalizing/Moderate Cognitions cluster, beliefs regarding the positive effects of alcohol are a driving force behind frequency of use and binge drinking. Prevention efforts and treatments that target these cognitions via cognitive restructuring and psychoeducation may reduce alcohol consumption in college drinkers.

References

- American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders (4th ed., text rev.). Washington, DC: Author.
- Babor TF (1996). The classification of alcoholics: typology theories from the 19th century to the present. *Alcohol Health & Research World*, 20(1), 6–14.
- Baker TB, Piper ME, McCarthy DE, Majeskie MR, & Fiore MC (2004). Addiction motivation reformulated: an affective processing model of negative reinforcement. *Psychological Review*, 111(1), 33. [PubMed: 14756584]
- Beck AT, & Steer RA (1984). Internal consistencies of the original and revised Beck Depression Inventory. *Journal of Clinical Psychology*, 40(6), 1365–1367. [PubMed: 6511949]
- Beck AT, & Steer RA (1990). *Manual for the Beck anxiety inventory*: San Antonio, TX: Psychological Corporation.
- Blanco C, Okuda M, Wright C, Hasin DS, Grant BF, Liu S, & Olfin M (2008). Mental health of college students and their non-college-attending peers: Results from the National Epidemiological Study on Alcohol and Related Conditions. *Archives of General Psychiatry*, 65(12), 1429–1437.
- Brown SA, McGue M, Maggs J, Schulenberg J, Hingson R, Swartzwelder S, ... & Winters KC (2008). A developmental perspective on alcohol and youths 16 to 20 years of age. *Pediatrics*, 121(Supplement 4), S290–S310. [PubMed: 18381495]
- Carter A, Brandon KO, & Goldman MS (2010). The college and noncollege experience: A review of the factors that influence drinking behavior in young adulthood. *Journal of Studies on Alcohol and Drugs*, 71(5), 742–750. [PubMed: 20731981]
- Chassin L, Colder CR, Hussong A, & Sher K (2016). *Substance Use and Substance Use Disorders. Developmental Psychopathology* Cicchetti D (Ed.). New York, NY: Anchor.
- Colder CR, Chassin L, Stice EM, & Curran PJ (1997). Alcohol expectancies as potential mediators of parent alcoholism effects on the development of adolescent heavy drinking. *Journal of Research on Adolescence*, 7(4), 349–374.
- Colder CR, Scalco M, Trucco EM, Read JP, Lengua LJ, Wieczorek WF, & Hawk LW, Jr. (2013). Prospective associations of internalizing and externalizing problems and their co-occurrence with early adolescent substance use. *Journal of Abnormal Child Psychology*, 41(4), 667–677. [PubMed: 23242624]
- Conger JJ (1956). Reinforcement theory and the dynamics of alcoholism. *Quarterly Journal of studies on alcohol*.
- Cooper ML, Russell M, Skinner JB, Frone MR, & Mudar P (1992). Stress and alcohol use: Moderating effects of gender, coping, and alcohol expectancies. *Journal of Abnormal Psychology*, 101(1), 139–152. [PubMed: 1537960]
- Cooper M, Frone M, Russell M, & Mudar P (1995). Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *Journal of Personality and Social Psychology*, 69(5), 990–1005. [PubMed: 7473043]
- Cooper ML (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment*, 6(2), 117–128.
- CORE Institute. (2004) National Reference Group: Cross- Tabulation. Carbondale, IL: Core Institute.

- Dawson DA, Grant BF, Stinson FS, Chou PS (2005). Psychopathology associated with drinking and alcohol use disorders in the college and general adult populations. *Drug and Alcohol Dependence*, 77(2), 139–150. [PubMed: 15664715]
- Eaton WW, Smith C, Ybarra M, Muntaner C, & Tien A (2004). Center for Epidemiologic Studies Depression Scale: Review and revision (CESD and CESD-R) In Maruish ME, Ed. *The use of psychological testing for treatment planning and outcomes assessments, Instruments for adults* (363–377). Mahwah, NJ: Lawrence Erlbaum.
- Farmer RF, Gau JM, Seeley JR, Kosty DB, Sher KJ, & Lewinsohn PM (2016). Internalizing and externalizing disorders as predictors of alcohol use disorder during three developmental periods. *Drug and Alcohol Dependence*, 164(1), 38–46. [PubMed: 27141839]
- Fergusson D, Boden J, & Horwood L (2011). Structural models of the comorbidity of internalizing disorders and substance use disorders in a longitudinal birth cohort. *Social Psychiatry and Psychiatric Epidemiology*, 46(10), 933–942. doi: 10.1007/s00127-010-0268-1 [PubMed: 20617429]
- George WH, Frone MR, Cooper ML, Russell M, Skinner JB, & Windle M (1995). A revised Alcohol Expectancy Questionnaire: Factor structure confirmation and invariance in a general population sample. *Journal of Studies on Alcohol and Drugs*, 56(2), 177.
- Glanton CF, & Wulfert E (2013). The relationship between parental alcohol use and college students' alcohol-related cognitions. *Addictive Behaviors*, 38(11), 2761–2767. [PubMed: 23954562]
- Henry DB, Tolan PH, & Gorman-Smith D (2005). Cluster analysis in family psychology research. *Journal of Family Psychology*, 19(1), 121. [PubMed: 15796658]
- Holt LJ, Armeli S, Tennen H, Austad CS, Raskin SA, Fallahi CR, ... Pearlson GD (2013). A person-centered approach to understanding negative reinforcement drinking among first-year college students. *Addictive Behaviors*, 38(12), 2937–2944. [PubMed: 24064193]
- Hussong AM, Hicks RE, Levy SA, & Curran PJ (2001). Specifying the relations between affect and heavy alcohol use among young adults. *Journal of Abnormal Psychology*, 110(3), 449. [PubMed: 11502088]
- Hussong A, Jones D, Stein G, Baucom D, & Boeding S (2011). An internalizing pathway to alcohol use and disorder. *Psychology of Addictive Behaviors*, 25(3), 390–404. doi: 10.1037/a0024519 [PubMed: 21823762]
- Jones BT, Corbin W, & Fromme K (2001). A review of expectancy theory and alcohol consumption. *Addiction*, 96(1), 57–72. doi: 10.1080/09652140020016969 [PubMed: 11177520]
- Karpyak VM, Biernacka JM, Geske JR, Abulseoud OA, Brunner MD, Chauhan M, et al. (2016). Gender-specific effects of comorbid depression and anxiety on the propensity to drink in negative emotional states. *Addiction*, e-pub ahead of print.
- Kashdan TB, Collins RL, & Elhai JD (2006). Social Anxiety and Positive Outcome Expectancies on Risk-Taking Behaviors. *Cognitive therapy and research*, 30(6), 749–761.
- King SM, Iacono WG, & McGue M (2004). Childhood externalizing and internalizing psychopathology in the prediction of early substance use. *Addiction*, 99(12), 1548–1559. [PubMed: 15585046]
- Kramer MD, Krueger RF, & Hicks BM (2008). The role of internalizing and externalizing liability factors in accounting for gender differences in the prevalence of common psychopathological syndromes. *Psychological Medicine*, 38(01), 51–61. [PubMed: 17892625]
- Krueger RF, Hicks BM, Patrick CJ, Carlson SR, Iacono WG, & McGue M (2002). Etiologic connections among substance dependence, antisocial behavior and personality: Modeling the externalizing spectrum. *Journal of abnormal psychology*, 111(3), 411. [PubMed: 12150417]
- LaBrie JW, Kenney SR, Migliuri S, & Lac A (2010). Sexual experience and risky alcohol consumption among incoming first-year college females. *Journal of child & adolescent substance abuse*, 20(1), 15–33. [PubMed: 25392606]
- Lewis MA, Hove MC, Whiteside U, Lee CM, Kirkeby BS, Oster-Aaland L, Neighbors C, & Larimer ME (2008). Fitting in and feeling fine: Conformity and coping motives as mediators of the relationship between social anxiety and problematic drinking. *Psychology of Addictive Behaviors*, 22(1), 58–67. [PubMed: 18298231]

- Masten AS (2001). Ordinary magic: Resilience processes in development. *American Psychologist*, 56(3), 227–238. [PubMed: 11315249]
- Merrill JE & Read JP (2010). Mediation pathways to unique types of alcohol consequences. *Journal of Addictive Behaviors*, 24(4), 705–711.
- Milligan GW, & Cooper MC (1988). A study of standardization of variables in cluster analysis. *Journal of Classification*, 5(2), 181–204.
- Mushquash AR, Stewart SH, Sherry SB, Sherry DL, Mushquash CJ, Mackinnon AL (2013) Depressive symptoms are a vulnerability factor for heavy episodic drinking: a short-term, four-wave longitudinal study of undergraduate women. *Addictive Behaviors*. 38(5), 2180–2186. [PubMed: 23454875]
- Nolen-Hoeksema S, Hilt L Possible contributors to the gender differences in alcohol use and problems. *Journal of General Psychology*, 133(4), 357–74.
- Olenick NL, Chalmers DK. (1991). Gender-specific drinking styles in alcoholics and nonalcoholics. *Journal of Studies on Alcohol*.52(4):325–30. [PubMed: 1875705]
- O'Hara RE, Armeli S, & Tennen H (2014). College students' daily-level reasons for not drinking. *Drug and alcohol review*, 33(4), 412–419. [PubMed: 24976084]
- O'Neil KA, Conner BT, & Kendall PC (2011). Internalizing disorders and substance use disorders in youth: Comorbidity, risk, temporal order, and implications for intervention. *Clinical Psychology Review*, 31(1), 104–112. doi: 10.1016/j.cpr.2010.08.002 [PubMed: 20817371]
- Park CL, Armeli S, & Tennen H (2004). The daily stress and coping process and alcohol use among college students. *Journal of Studies on Alcohol and Drugs*, 65(1), 126.
- Pearson MR, Kirouac M, & Witkiewitz K (2015). Questioning the validity of the 4+/5+ binge or heavy drinking criterion in college and clinical populations. *Addiction*, 111, 1720–1726. [PubMed: 27605077]
- Pedrelli P, Borsari B, Lipson SK, Heinze JE, & Eisenberg D (2016). Gender differences in the relationships among major depressive disorder, heavy alcohol use, and mental health treatment engagement among college students. *Journal of Studies on Alcohol and Drugs*, 77(4), 620–28. [PubMed: 27340967]
- Reese FL, Chassin L, & Molina BS (1994). Alcohol expectancies in early adolescents: predicting drinking behavior from alcohol expectancies and parental alcoholism. *Journal of Studies on Alcohol*, 55(3), 276–284. [PubMed: 8022174]
- Rohsenow DJ (1983). Drinking habits and expectancies about alcohol's effects for self versus others. *Journal of consulting and clinical psychology*, 51(5), 752. [PubMed: 6630690]
- Schry AR & White SW (2013). Understanding the relationship between social anxiety and alcohol use in college students: A meta-analysis. *Addictive Behaviors*, 38(11), 2690–2706. [PubMed: 23906724]
- Sher K, Grekin E, & Williams N (2005). The development of alcohol use disorders. *Annual Review of Clinical Psychology*, 1, 496–523.
- Stewart SH, Sherry SB, Comeau MN, Mushquash CJ, Collins P, & Van Wilgenburg H (2011). Hopelessness and excessive drinking among aboriginal adolescents: the mediating roles of depressive symptoms and drinking to cope. *Depression Research and Treatment*, 2011. doi: 10.1155/2011/970169
- Substance Abuse and Mental Health Services Administration (2014). Results from the 2014 National Survey on Drug Use and Health: Detailed Tables. Rockville, MD: Author.
- Van Dam NT, & Earleywine M (2011). Validation of the Center for Epidemiologic Studies Depression Scale—Revised (CESD-R): Pragmatic depression assessment in the general population. *Psychiatry Research*, 186(1), 128–132. [PubMed: 20843557]
- Weitzman ER, Nelson TF, & Wechsler H (2003). Taking up binge drinking in college: the influences of person, social group, and environment. *Journal of Adolescent Health*, 32, 26–35. [PubMed: 12507798]
- Windle M, & Windle RC (2012). Testing the specificity between social anxiety disorder and drinking motives. *Addictive Behaviors*, 37(9), 1003–1008. doi: 10.1016/j.addbeh.2012.04.009 [PubMed: 22626889]

Figure 1
 . Mean-corrected range-transformed cluster variables indicating patterns of risk factors within each cluster in Study 1 (Error bars $\pm$ SEM).

Figure 2. Mean-corrected range-transformed cluster variables indicating patterns of risk factors within each cluster for Study 2 (Error bars $\pm$ SEM).

Table 1.

Cluster Analysis Variables Correlations for Study 1.

Cluster Variables	1	2	3	4	5
1. Depression symptoms	-				
2. Anxiety symptoms	.516 ^{**}	-			
3. Coping motives	.287 ^{**}	.169 [*]	-		
4. Positive expectancies	.118	.149	.526 ^{**}	-	
5. Frequency of alcohol use	.090	.063	.308 ^{**}	.309 ^{**}	-
6. Binge drinking	.010	.022	.246 ^{**}	.308 ^{**}	.652 ^{**}

Note.

*
p ≤ .05,**
p ≤ .01

Table 2.
Proportion of Gender and Unstandardized Means and Standard Deviations for each cluster in Study 1

	Cluster 1 Low Risk Cluster (<i>n</i> =87)		Cluster 2 Low Internalizing/ Mod Cognitions (<i>n</i> =54)		Cluster 3 High Internalizing/ Low Coping Mot (<i>n</i> =19)		Cluster 4 High Internalizing/ High Coping Mot (<i>n</i> =11)		Total (<i>n</i> =171)	
	N		N		N		N		N	
Men	34 (39%)		21 (57%) [*]		4 (21%) [*]		4 (36%)		73 (43%)	
Women	53 (61%)		23 (43%)		15 (79%)		7 (64%)		98 (57%)	
Depression symptoms	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	2.31 ^a	3.27	2.10 ^a	2.70	10.05 ^b	6.07	15.36 ^{bb}	12.10	3.94	5.94
Anxiety symptoms	1.65 ^a	2.46	2.71 ^a	3.10	19.58 ^b	6.74	9.32 ^c	4.95	4.47	6.67
Coping motives	1.28 ^a	.32	2.64 ^b	.62	1.82 ^c	.55	4.36 ^d	.62	1.97	.99
Positive expectancies	3.46 ^a	.73	4.44 ^{b,c}	.53	4.13 ^{cc}	.71	4.74 ^b	.51	3.93	.82
Frequency of alcohol use	3.28 ^a	1.03	3.87 ^b	1.13	3.79 ^{a,b}	.98	4.73 ^b	.91	3.61	1.12
Binge drinking	2.74 ^a	1.22	3.56 ^b	1.16	3.21 ^a	1.36	3.45 ^a	1.37	3.08	1.27

Note:

^{*} indicates $p < .05$.

^a Means with different superscripts are significantly different ($p < .05$).

^b Coping Mot = Coping motives for drinking. Mod Cognitions= Moderate Positive Expectancies and Coping Motives.

^c We used LSD posthoc tests for the binge drinking variable.

^d All other variables were compared using Games-Howell due to the heterogeneity of variance and unequal sample size.

Table 3.

Cluster Analysis Variables Correlations for Study 2.

Cluster Variables	1	2	3	4	5	6	7
1. Depression symptoms	-						
2. Anxiety symptoms	.468 **	-					
3. Coping motives	.268 **	.304 **	-				
4. Positive expectancies	.040	.093 *	.282 **	-			
5. Externalizing symptoms	.236 **	.114 **	.197 **	.182 **	-		
6. Frequency of alcohol use	.172 **	.185 **	.232 **	.287 **	.169 **	-	
7. Binge drinking	.089 *	.110 *	.174 **	.269 **	.199 **	.613 **	-
8. Negative consequences	.296 **	.252 **	.282 **	.319 **	.349 **	.490 **	.510 **

Note.

*
p ≤ .05,**
p ≤ .01

Table 4.

The proportion of Gender and Untransformed Means and Standard Deviations for each cluster in Study 2.

	Cluster 1 Low Risk (n=222)		Cluster 2 Low Internalizing/ Mod Cognitions (n=206)		Cluster 3 High Internalizing/ High Coping Mot (n=98)		Total (n=526)	
	N		N		N		N	
Men	76 (34%)		125 (61%) *		32 (33%)		233 (44%)	
Women	146 (66%) *		81 (39%)		66 (67%) *		293 (56%)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Depression symptoms	13.17 ^a	10.34	12.35 ^a	9.68	23.41 ^b	13.79	13.26	10.43
Anxiety symptoms	2.02 ^a	3.70	1.48 ^a	2.57	6.25 ^b	6.36	2.02	0.39
Coping motives	1.30 ^a	0.39	1.48 ^b	0.45	3.13 ^c	0.73	1.30	0.26
Positive expectancies	6.43 ^a	2.50	12.17 ^b	1.45	11.20 ^c	2.21	6.42	2.48
Externalizing symptoms	.92 ^a	1.46	1.44 ^b	2.17	2.13 ^b	2.83	1.35	2.10
Frequency of alcohol use	3.18 ^a	1.01	3.63 ^b	.99	3.94 ^c	1.14	3.50	1.07
Binge drinking	2.52 ^a	1.28	3.10 ^b	1.26	3.18 ^b	1.37	2.87	1.32
Alcohol-related consequences	.66 ^a	.71	1.08 ^b	.92	1.46 ^c	1.20	.98	.95

Note:

* indicates $p < .05$.

^a Means with different superscripts are significantly different ($p < .05$).

^b Coping Mot = Coping motives for drinking. Mod Cognitions= Moderate Positive Expectancies and Coping Motives.

^c We used LSD posthoc tests for the binge drinking variable.

^d All other variables were compared using Games-Howell due to the heterogeneity of variance and unequal sample size.