A LATENT PROFILE ANALYSIS OF DRINKING MOTIVES AMONG HEAVY DRINKING COLLEGE STUDENTS

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Abstract

Introduction—Positively (Enhancement and Social) and negatively (Coping) reinforcing drinking motives have been shown to be associated with alcohol use, alcohol-related problems, and depression among college students. Although prior studies of drinking motives have mostly consisted of variable-centered analyses, the current study used a person-centered approach where individuals were grouped into categories based on shared characteristics using Latent Profile Analysis (LPA). We investigated the utility of drinking motive profiles to determine how different profiles were associated with alcohol outcomes and depressive symptoms.

Method—Participants were 648 undergraduate students who had violated a university alcohol policy and who endorsed consuming alcohol in the past month. Social, Coping, and Enhancement subscales from the Drinking Motives Questionnaire were used as indicators.

Results—After examining one-through-eight class LPA solutions, the six-class solution provided the best empirical and clinically meaningful fit to the data. Classes with high coping and high positive reinforcing drinking motives consumed more alcohol than profiles of students with high coping and low positive reinforcing motives. Classes high on both coping and positively reinforcing motives reported the most alcohol related problems. Classes with higher levels of coping motives and either high or low positive reinforcing motives reported the highest depression symptoms.

Conclusions—Drinking motive profiles differ in terms of alcohol outcomes and depressive symptoms. We encourage researchers to explore motives for drinking with individuals, especially assessing the relationship between coping motives and depression in the presence or absence of positively reinforcing motives.

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1. Introduction

Excessive alcohol use among college students is widespread and associated with a variety of negative consequences. Approximately 40% of students report a heavy drinking episode in the preceding two weeks and 20% meet diagnostic criteria for alcohol abuse or dependence (Dawson et al., 2004; White et al., 2006). A dose-response relationship has been established between heavy drinking and problems, including poor academic performance, physical injury, and risky sexual behavior (Wechsler et al., 2000; Wechsler et al., 2002). Students who have violated a university alcohol policy are particularly at-risk for negative alcohol-related outcomes (Caldwell, 2002). Epidemiological studies have established that at-risk alcohol use is associated with major depressive disorder (e.g., Grant et al., 2004), but such associations among college students may be more complex. For example, studies examining the association between alcohol use and depressive symptoms have yielded inconsistent findings (e.g., Geisner et al., 2012; Nagoshi, 1999; Park & Grant, 2005), whereas alcohol-related problems have been more consistently associated with depressive symptoms (e.g., Camatta & Nagoshi, 1995; Martens et al., 2008; Nagoshi, 1999). These findings point to the importance of continued efforts aimed at understanding risk factors for at-risk alcohol use and related consequences among college students.

1.1 Drinking Motives

Motivational models of drinking (Cox & Klinger, 1988; Cooper, 1994) assert individuals engage in alcohol use to attain a valued outcome that is motivated by unique needs. A commonly used theoretical model to conceptualize drinking motives has identified enhancing positive affect and reducing negative affect as primary motivations behind alcohol use (Cox & Klinger, 1988). The Drinking Motives Questionnaire (DMQ-R: Cooper et al., 1992; Cooper, 1994) is the most popular measure used to assess positively (Social and Enhancement subscales) and negatively (Coping and Conformity subscales) reinforcing drinking motives. Positively reinforcing motives include using alcohol to obtain social rewards (Social subscale) and increasing positive affect (Enhancement subscale), while negatively reinforcing drinking motives include using alcohol to alleviate negative emotions (Coping subscale) and drinking to fit in with others (Conformity subscale). Research regarding the relationship between DMQ-R conformity motives and alcohol outcomes has been inconclusive, and there is evidence that higher levels of conformity are not associated with higher alcohol-related risks among college students (e.g., Grant et al., 2007; LaBrie et al., 2011; Müller & Kuntsche, 2011; but see Patrick et al., 2011, for contrary findings). Because conformity motives have not been consistently correlated with alcohol-related outcomes, the present study focused on three subscales of the DMQ-R: Social, Coping, and Enhancement.

Variable-centered approaches examining the relationship between drinking motives and alcohol outcomes have generally shown differential effects between specific motives and

alcohol outcomes (Kuntsche et al., 2005). Some have shown enhancement motives to be associated with drinking in situations considered conducive to heavy alcohol use, social motives with light, nonproblematic alcohol use and in social settings, and coping motives with problematic alcohol use and related problems (Carey & Correia, 1997; Cooper, 1994; Cooper et al., 1992; Kuntsche et al., 2005). However, other prospective studies have found no relationship between coping motives and alcohol use and that coping motives did not predict alcohol-related problems (Bradizza et al., 1999; Read et al., 2003). A more recent prospective study found coping motives predicted alcohol problems but not alcohol use (Merrill et al., 2014). The degree to which study design (i.e., cross-sectional versus prospective) impacts the relationship between motives and alcohol outcomes remains unclear.

Several studies have examined the relationship between different types of drinking motives and depressive symptoms. Coping motives have been found to be positively associated with depressive symptoms, as those who endorsed using alcohol to cope were more likely to report depressed mood (e.g., Kuntsche et al., 2005; Martens et al., 2008; Park & Levenson, 2002; Stewart & Devine, 2000). In contrast, social and enhancement motives do not have a relationship with depression (see Kuntsche et al., 2005).

1.2 Drinking Motives and Person-Centered Analyses

The relationship between motives and alcohol outcomes has usually been examined using variable-level analysis rather than person-centered analysis, such as Latent Profile Analysis (LPA). Person-centered analyses enable researchers to categorize individuals into different groups based on similar characteristics and then examine the degree to which groups differ on external criterion (Muthén & Muthén, 2002). Person-centered analyses of drinking motives could be used to identify classes of individuals who are at-risk for negative alcohol-related outcomes and candidates for targeted intervention efforts.

The handful of studies that have examined drinking motives in the context of person-centered analyses have important limitations to consider. First, studies have explicitly examined only two-class solutions of drinking motives (i.e., "enhancement" or "coping" drinkers), with one study supporting such a categorization (Kuntsche et al., 2010) and another refuting it (Littlefield et al., 2013). It is possible that a larger number of classes would more accurately classify college students in terms of their motivation for drinking. Second, some have attempted to identify latent drinking classes using measures with unknown psychometric properties (e.g., Coffman et al., 2007). Finally, some studies have conducted person-centered analyses that combined drinking motives with other psychosocial indicators to establish latent classes (e.g., Holt et al., 2013; Patrick & Maggs, 2010), while other studies have used drinking motives as criterion variables and alcohol outcomes as indicators to establish classes (e.g., O'Connor & Colder, 2005). Although valuable, these latter studies do not provide information on drinking motives-specific latent classes and their relationship to relevant criterion variables.

Using a sample of mandated college students who violated a university alcohol policy, the purpose of the current study was twofold. First, we used a person-centered approach to determine both the number and types of drinking motives profiles among mandated college

students as measured by the DMQ-R. Rather than establishing a set number of classes to examine (e.g., a 2-class solution), we estimated an unconstrained model to establish the optimal number of classes. Second, we investigated the utility of drinking motive profiles to determine how different classes were associated with alcohol outcomes and depressive symptoms.

2. Method

2.1. Participants

Participants were 648 undergraduate students from a large, northeastern public university who violated a university alcohol policy and were participating in a study examining the efficacy of group based alcohol interventions (see Cimini et al., 2009). All students who violated an alcohol policy were eligible to participate in the study and were given the option of enrolling in the study and participating in a group intervention or participating in an alternative program though the university counseling center. The research protocol underwent ethical review and was approved by the university IRB. Participants in the present study were those who reported consuming alcohol in the past 30 days. The majority of the sample was male (62.1%) and White (83.2%), and the mean age was 18.82 years (*SD* = 0.81).

2.2. Measures

Drinking Motives Questionnaire-Revised (DMQ-R)—The DMQ-R (Cooper, 1994) is a 20 item measure used to assess positively and negatively reinforcing drinking motives. For the current study three subscales were examined: Social (e.g. "Because it improves parties and celebrations"), Coping (e.g. "To forget about your problems"), and Enhancement (e.g. "Because it gives you a pleasant feeling"). Each subscale consists of five items and participants were asked to respond to how frequently they consume alcohol for various motives. Responses are scored on a 5-point scale ranging from *Almost Never/Never* to *Almost Always/Always* and subscale scores are then averaged. The DMQ-R has been shown to be a reliable and valid indicator of drinking motives among college students (Kuntsche et al., 2008). Internal consistency estimates (α) for this sample were: .79 (Coping), .83 (Enhancement), and .84 (Social). Average inter-item correlations were: .47 (Coping), .59 (Enhancement), and .61 (Social).

Daily Drinking Questionnaire (DDQ)—The DDQ (Collins et al., 1985) is used to assess drinking via a calendar-based method and is frequently used in alcohol studies among college students (e.g., Carey et al., 2006; Kivlahan et al., 1990). Standard definitions of an alcoholic drink were provided and participants were asked to indicate the number of drinks they typically consumed on each day of the week over the past 30 days. An average number of drinks per week was then calculated.

Rutgers Alcohol Problems Index (RAPI)—The RAPI (White & Labouvie, 1989) is a 23-item measure used to assess the frequency that individuals experience various alcohol-related problems over the past month. Participants were asked to indicate the number of times they have experienced a problem, ranging from 0 (*never*) to 4 (*more than 10 times*)

(e.g. "Not able to do your homework or study for a test", "Got into fights"). In previous studies the RAPI has been shown to be a valid measure of assessing alcohol-related problems (Devos-Comby & Lange, 2008). The internal consistency estimate (α) for this sample was .90 and average inter-item correlation was .31.

Center for Epidemiologic Studies Depression Scale (CES-D)—The CES-D (Radloff, 1977) is a 20-item measure used to assess depressive symptoms. Participants were asked to indicate the number of times they have experienced each symptom in the past week, ranging from 0 (*< 1 day*) to 3 (*5–7 days*), with higher scores indicating more depressive symptoms. The sensitivity of the CES-D in identifying those with a diagnosis of Major Depression Disorder has been found to range from .83 to .94 (Rost et al., 1993). Internal consistency for this sample was adequate (α =. 75) and average inter-item correlation was .15.

2.3 Procedures

For a detailed description of the procedures see Cimini et al (2009). Students who violated a university alcohol-policy (e.g., having alcohol in a dorm room) were mandated by the university to participate in an alcohol intervention program and were eligible to participate in the study. For the current analyses, only data provided by participants at the baseline session was examined.

2.4 Analytic Procedure

We used LPA to classify students' drinking motives into optimal classes. Analyses were conducted using MPlus version 7.0 (Muthén & Muthén, 2004). The best fitting model was determined based on both statistical results and ability to interpret the classes. The fit of one-class through eight-class solutions were assessed. Selection of class solution was based in part on Bayesian Information Criterion (BIC; Schwartz, 1978), entropy (Ramaswamy et al., 1993), the Vuong-Lo-Mendell-Rubin (VLMR) likelihood difference test, and the Parametric Bootstrap Likelihood Validation Test (MPlus 7.0). As there is no set rule in LPA regarding cut-off on class sizes, we were especially mindful of model parsimony of fit statistics and sample sizes, as we aimed to identify the smallest number of meaningful classes. When considering cell size, we determined classes with less than 2% membership would be difficult to interpret due to sparse cell size and only solutions with sufficient class membership were selected for interpretation.

After determining the optimal class solution we used ANCOVA to examine the relationship between classes and alcohol use, alcohol-related problems, and depressive symptoms, while adjusting for sex and ethnicity. For each model, class was the independent variable and the alcohol or mental health outcome (i.e. alcohol use, alcohol-related problems, depressive symptoms) was the dependent variable. Each outcome was modeled separately. Post-hoc pairwise comparisons using Least Significant Difference (LSD) were used to examine differences among classes with regards to each outcome. To account for missing data, maximum likelihood estimation was used (Arbuckle, 1996; Little, 1995).

3. Results

Correlations and means/standard deviations of all variables are shown in Table 1. All subscales were positively correlated with alcohol outcomes and depression symptoms.

3.1 Identification and Description of Latent Classes

Model fit indices for the eight classes are reported in Table 2. We concluded that a six-class solution provided the best theoretical and empirical fit to the data. Although the VLMR *p* value of the six-class was not statistically significant (meaning the six-class solution was not a better fit to the data than the five-class solution by this criteria), the BIC of the six-class was lower than the five-class and the entropy value (.75) indicates acceptable classification of individuals. Further, every class that emerged from the six-class solution was distinct from the other classes on the criterion variables (i.e., alcohol consumption, problems, depressive symptoms-see analyses below). A bootstrap validation procedure confirmed that the six-class solution offered a better fit than the five-class solution. The seven and eight-class solutions had low membership (< 2%) in some classes[1]. For these reasons it was difficult to interpret the findings of both these solutions.

A detailed description of the six classes is provided in Figure 1. Classes were named on their respective levels of motivation to drink for positive reinforcement (PR) and coping purposes. The "high PR/extreme coping" class (*N* = 18; 2.8%; 72.2% male; 66.7% White), had elevated scores on all subscales. The "high PR/high coping" (*N* = 91; 14.0%; 54.9% male, 79.1% White) and the "high PR/moderate coping" (*N* = 225; 34.7%; 70.7% male, 85.3% White) classes had similar level of positively reinforcing motives but differed on the coping subscale. A smaller class was the "low PR/high coping" (*N* = 18; 2.8%; 61.1% male; 66.7% White) class. The "all moderate" class was the largest (*N* = 227; 35%; 58.1% male, 85.3% White,) and the "all low" class (*N* = 69; 10.6%; 55.1% male, 80.9% White) had the lowest scores on all subscales[2].

3.2 Association Between Latent Classes and Alcohol Use

Post-hoc pairwise comparisons of the association between classes and outcome (alcohol use/related-problems/depressive symptoms) are shown in Figure 2. Drinks consumed per week among the classes was significantly different, $F(5,639) = 14.09$, $p < .001$, $\eta_p^2 = .10$. The highest level of alcohol consumption was among classes that endorsed high positively reinforcing motives. Among the "high PR/high coping" and the "high PR/moderate coping" classes, there were no significant differences in alcohol consumption, suggesting level of coping motives was not related to alcohol use when positively reinforcing motives were similar.

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[1]We ultimately chose the 6-class solution as the best fitting model as it provided the best fit for classes that could be interpreted. For example, the 5-class solution had 1 class with 7 people in it (1% class membership), and the 7-class solution had 1 class with 10 people in it (1.5% class membership).

[2]Despite low class membership, we believe the 2.8% classes are meaningful in regards to their utility as they offer important clinical implications. The "high PR/extreme coping" class captures a class of individuals endorsing the highest levels of alcohol-related problems and second highest depression symptoms. The "low PR/high coping" class is the only class to have elevated scores on coping with respect to scores on positively reinforcing motives, and individuals in this class reported the highest levels of depression symptoms, despite moderate levels of both alcohol use and related-problems.

3.3 Association Between Latent Classes and Alcohol-Related Problems

Results indicated significant differences in alcohol-related problems among the classes, $F(5,639) = 21.15$, $p < .001$, $\eta_p^2 = .14$, as summarized in column 2 of Figure 2. The "high PR/extreme coping" class reported the most alcohol-related problems, while the "all moderate" and "all low" classes reported the lowest level of problems. Additionally, the "high PR/high coping" class reported more problems than the "high PR/moderate coping" and "low PR/high coping" classes.

3.4 Association Between Latent Classes and Depressive Symptoms

Depressive symptoms among the classes were significantly different, $F(5,639) = 23.36$, $p < .001$, $\eta_p^2 = .15$ (see Figure 2, column 3). The "low PR/high coping" and the "high PR/extreme coping" classes reported the highest level of depressive symptoms, while the "all moderate" and "all low" classes reported the lowest levels. Of the "high PR/high coping" and "high PR/moderate coping" classes, the high coping class reported more depressive symptoms.

4. Discussion

The present study examined the utility of drinking motive profiles among mandated students, specifically by assessing the relationship of the profiles to alcohol use, related-problems, and depression. Classes higher on positively reinforcing motives consumed more alcohol. Classes high on both positively reinforcing and coping motives reported the most alcohol-related problems. Elevated level of depression symptoms were found among classes with higher levels of coping motives with varying levels of positive reinforcing motives.

Findings from the present study point to the potential importance of considering specific types of drinking motives in the context of other motives, as opposed to just their individual relationships with alcohol-related outcomes. For example, in the present study profiles with high coping and high positive reinforcing motives consumed more alcohol than profiles with high coping and low positive reinforcing motives. These findings suggest coping motives should be considered in conjunction with other positive reinforcing motives to fully examine the utility of motives and the relationship with alcohol use. Such studies may help to shed light on inconclusive relationships in the literature (Kuntsche et al., 2005).

There were some similarities between the drinking motive classes and those from other person-centered analyses. The pattern of motives from the majority of the classes are consistent with Littlefield and colleagues (2013), who concluded enhancement and coping drinkers do not form two distinct groups. In their study individuals generally high in positively reinforcing motives were also high in coping motives (or vice versa). Although the degree of strength of motives in the current study varied between "high" to "extreme" and "moderate" to "low", the general direction was consistent (i.e., both high or both low). Additionally, the emergence of a class endorsing high levels of all drinking motives ("high PR/extreme coping") is similar to findings of Coffman and colleagues (2007). Although the DMQ was not used by Coffman, a class of high school students labeled the "Multi-reasoners", was found to endorse high levels of both enhancement and coping motives and engaged in the highest levels of risky drinking.

Nonetheless, one important distinction between our findings and those of Littlefield and colleagues (2013) is the identification of a "low PR/high coping" class. For individuals in this class, coping scores were greater than one standard deviation above the mean while enhancement scores were one standard deviation below the mean (social scores were in the average range). Although this class comprised a relatively small number of participants, it represents a unique class in further understanding drinking movies. This class may be specific to mandated or other at-risk students, which is why it has not emerged in other studies. Considering its associations with potentially harmful outcomes and elevated depressive symptoms, it will be important to continue to assess for its existence and relationship with clinical outcomes.

This study illustrated how varying classes derived from three types of drinking motives differ in terms of relevant outcomes. One clear pattern is regardless of a class' level of coping motives, those classes with the highest levels of positively reinforcing motives reported (a) greater alcohol consumption than the other classes and (b) no differences among themselves in terms of alcohol consumption. In contrast, elevated coping motives in the absence of other elevated motives may not be a risk factor for excessive alcohol consumption. The findings also illustrate how both coping and positively reinforcing motives may each contribute to the likelihood of experiencing alcohol-related problems. Two comparisons are particularly illustrative. First, the "high PR/high coping" and "high PR/moderate coping" differed meaningfully only on their level of coping motives, and also reported significant differences in terms of alcohol-related problems. Such findings would suggest that it may be only differences in level of coping motives that makes one class versus another more at-risk for alcohol-related problems. In contrast, the "high PR/moderate coping" and "low PR/high coping" classes reported similar levels of alcohol-related problems, despite differences in coping motives. These findings would suggest that perhaps both positively reinforcing and coping contribute to the likelihood of experiencing alcohol-related problems.

An important clinical implication involves the relationship between classes and depressive symptoms. Our findings indicated the "low PR/high coping" class reported lower levels of alcohol consumption and average levels of alcohol-related problems relative to the other classes, yet the highest level of depressive symptoms. This is consistent with prior findings suggesting students higher in depressive symptoms may not consume a greater quantity of alcohol than others, but when engaging in a drinking occasions they are at greater risk of experiencing negative consequences related to use (Martens et al., 2008). Also, when comparing the "high PR/high coping" class with the "high PR/moderate coping" class, individuals with "high coping" endorsed greater levels of depressive symptoms, despite similar alcohol consumption among both groups. These findings are consistent with models of drinking suggesting college students who drink to relieve negative affect are particularly at-risk for negative outcomes (e.g., Sher et al., 2005), in the present case regardless of their level of positively reinforcing motives.

There are several implications for prevention and treatment based on the current findings as person centered approaches may be useful to understand shared characteristics among individuals in a given drinking motive profile. Targeted interventions based on select

motives unique to the individual may be helpful in tailoring prevention and intervention efforts (Kuntsche et al., 2010; Grant et al., 2009). Carey and colleagues (2007) found interventions that included feedback on drinking motives were more likely to result in a reduction of alcohol-related problems than those that did not. Providing feedback on drinking motives may enhance the efficacy of personalized feedback interventions.

This study had several limitations. Although a strength was the large sample size (N = 648), cross-sectional data limits interpretation of the findings as causal claims cannot be made. It is possible that low class membership may lead to Type II error. Also, data analytic approaches, such as LPA, can be dependent on author interpretation in selection of the optimal class solution. The relatively homogenous age and ethnicity demographics limit generalizability and the sample of heavy drinking, mandated college students may not generalize to low or moderate drinkers. Although the current study examined how drinking motive classes differed on levels of depression, future work could examine the relationship between other psychological symptoms and drinking motive classes. Additionally, self-medication theories (Khantzian, 1997) suggest a negative reinforcement model of alcohol use where individuals drink to cope with negative affect. As the design of the current study cannot establish temporal precedence between depression and drinking motives, one could examine the self-medication theory in a longitudinal design.

Despite these limitations, the present study makes a valuable contribution to the literature on drinking motives. Findings highlight the association between higher coping motives and increased alcohol-related problems and depressive symptoms. Additionally, findings suggest individuals who report elevated levels of positively reinforcing motives consume greater amounts of alcohol. Future work could use the Modified DMQ-R (Grant et al., 2007) to differentiate profiles of students drinking to cope with depressed feelings, anxious feelings, and in addition to social/enhancement motives. We encourage the exploration of transitions among classes over time in regards to drinking motives, and prospective studies examining if latent classes predict drinking over time.

Acknowledgments

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Highlights

Positively (PR) and negatively reinforcing (Coping) drinking motives were used.

Six-classes best fit the data. Classes with higher PR motives drank more.

Classes with high coping/high PR drank more than high coping/low PR classes.

Classes with high coping/high PR had the most alcohol related problems.

Classes with high coping, with either high or low PR, were the most depressed.
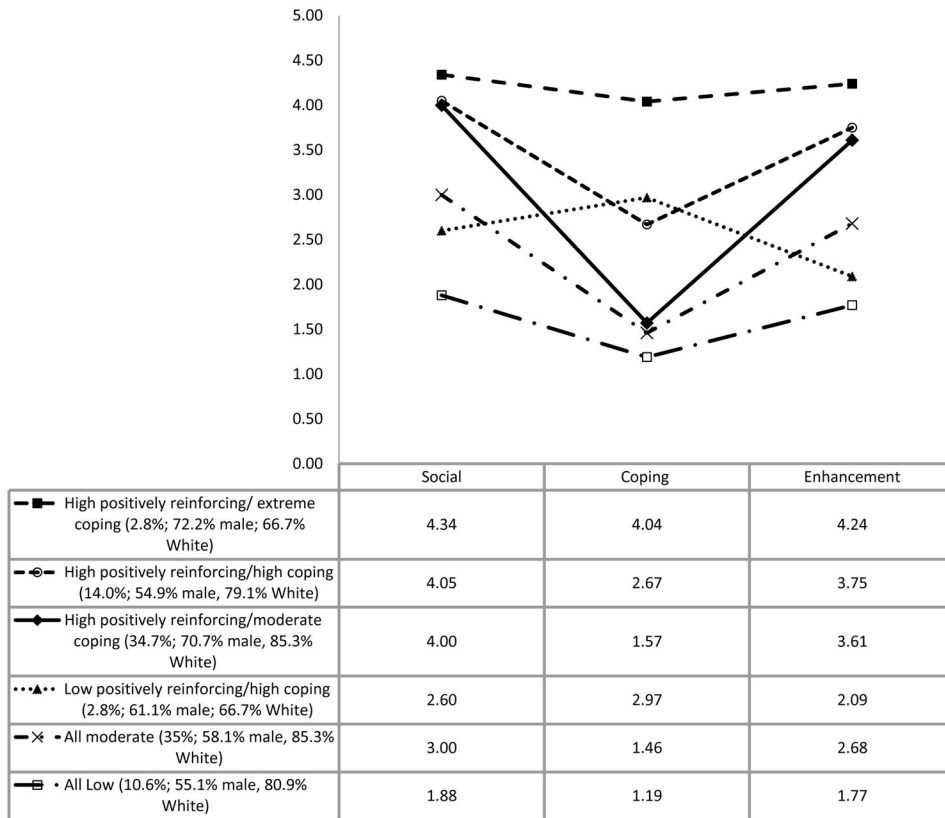
|	Social	Coping	Enhancement
High positively reinforcing/ extreme coping (2.8%; 72.2% male; 66.7% White)	4.34	4.04	4.24
High positively reinforcing/high coping (14.0%; 54.9% male, 79.1% White)	4.05	2.67	3.75
High positively reinforcing/moderate coping (34.7%; 70.7% male, 85.3% White)	4.00	1.57	3.61
Low positively reinforcing/high coping (2.8%; 61.1% male; 66.7% White)	2.60	2.97	2.09
All moderate (35%; 58.1% male, 85.3% White)	3.00	1.46	2.68
All Low (10.6%; 55.1% male, 80.9% White)	1.88	1.19	1.77

Figure 1.

Scores of drinking motive characteristics of the six-class solution. Responses are scored on a 5-point scale ranging from Almost Never/Never (1) to Almost Always/Always (5).
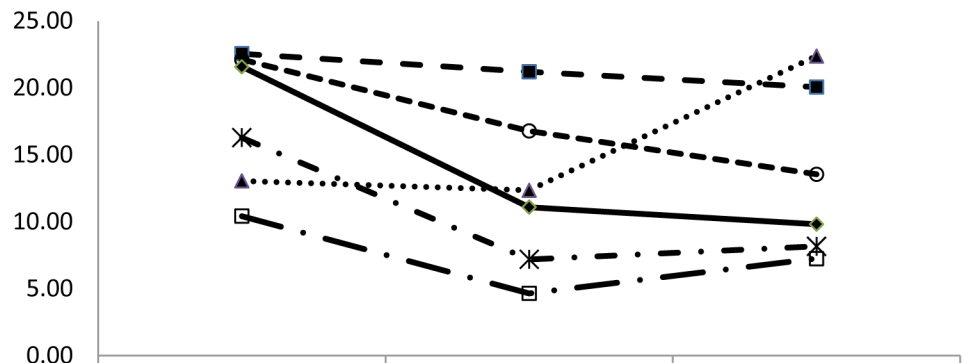
	Drinks per Week	Alcohol-Related Problems	Depressive Symptoms
▬■▬ High positively reinforcing/ extreme coping (2.8%)	22.56 [a]	21.21[a]	20.07 [a]
▬◉▬ High positively reinforcing/ high coping (14.0%)	22.11[a]	16.79 [b]	13.55[b]
▬◆▬ High positively reinforcing/ moderate coping (34.7%)	21.58[a]	11.10 [c]	9.83 [c]
•••▲•• Low positively reinforcing/ high coping (2.8%)	13.06 [bc]	12.35[c]	22.38 [a]
▬✳ • All moderate (35%)	16.29 [b]	7.20 [d]	8.17 [d]
▬⊟ • All Low (10.6%)	10.43 [c]	4.66 [d]	7.25 [d]

Figure 2.
Number of drinks per week, alcohol-related problem, and depressive symptoms associated with each class. *Note.* Post-hoc tests with the same superscript letters indicate no significant difference between classes; different letters indicate significant differences ($p < .05$).

Table 1

Mean, Standard Deviations, and Correlations among all measured variables

	1	2	3	4	5	6	M	SD
1. Social Subscale	-						3.40	0.91
2. Coping Subscale	.34**	-					1.77	0.76
3. Enhancement Subscale	.60**	.32**	-				3.08	0.97
4. Drinks Per Week	.29**	.15**	.39**	-			18.39	11.95
5. Alcohol-Related Problems	.32**	.37**	.32**	.48**	-		10.16	10.72
6. Depressive Symptoms	.12**	.43**	.09*	.03	.35**	-	10.18	8.38

Note.

*
$p < .05$.

**
$p < .01$.

Table 2

Model fit indices for 1- 8- class solutions of Social, Coping, and Enhancement drinking motives.

Model	BIC	Adjusted BIC	VLMR$_p$	Entropy
1-class solution	5051.314	5032.264	-	-
2-class solution	4752.637	4720.887	.00	.71
3-class solution	4633.347	4588.897	.00	.77
4-class solution	4605.974	4548.824	.02	.72
5-class solution	4596.575	4526.725	.69	.76
6-class solution	**4586.200**	**4503.651**	**.38**	.75
7-class solution	4579.541	4484.292	.09	.75
8-class solution	4582.472	4474.523	.58	.77

Note. Bold indicates best fit. BIC = Bayesian information criterion; VLMR = Vuong-Lo-Mendell-Rubin likelihood difference test.