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A Longitudinal Study of the Effects of Coping Motives, Negative Affect and Drinking Level on Drinking Problems among College Students

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Abstract

We examined among college students the interactive effects of drinking to cope motivation, anxiety and depression symptoms, and drinking level in predicting drinking-related problems. Using an Internet-based survey, participants (N = 844, 53% women) first reported on their drinking motives and monthly for up to 3 months, they reported on their drinking level, anxiety, depression and DRPs. We found a 3-way interaction between drinking to cope motivation and average levels of drinking and anxiety (but not depression) in predicting drinking-related problems. Specifically, among individuals with stronger drinking to cope motives, higher mean levels of anxiety were associated with a stronger positive association between mean drinking levels and drinking-related problems. We did not find 3-way interactions in the models examining monthly changes in anxiety, depression and drinking in predicting monthly drinking-related problems. However, individuals high in drinking to cope motivation showed a stronger positive association between changes in drinking level and drinking-related problems. The results are discussed in terms of mechanisms related to attention-allocation and self-control resource depletion.

Keywords

Drinking motives; anxiety; depression; drinking-related problems

Consistent evidence indicates that independent of drinking levels, drinking to cope (DTC) motivation is associated with drinking-related problems (Cooper et al., 1988; Cooper et al., 1995; Merrill & Read, 2010; Simons et al., 2005). Although most conceptual models specify DTC motivation as a mediator of the effect of antecedent factors (e.g., expectancies, personality factors, negative affect) on drinking-related problems (DRPs), more recent research indicates that the additive and interactive effects of negative affect and drinking level on DRPs might be stronger among individuals high in DTC motivation compared to individuals low in DTC motivation (Ham, Bonin, & Hope, 2007; Marten et al., 2008; cf. Clerkin & Barnett, 2012). The purpose of the present study was to further examine among college students – a high risk group for maladaptive drinking (O'Malley & Johnston, 2002) – the possibility that DTC motivation exacerbates the effects of negative affect and drinking level on DRPs. Demonstrating that drinking for specific reasons exacerbates the effect of drinking level on related problems will help to further elucidate the underlying mechanisms involved which in turn has important implications for prevention and intervention.

It has been hypothesized that in addition to being an important process variable, DTC motivation can be conceptualized as an important individual difference factor – or moderator – with respect to the processes underlying problematic drinking. The majority of studies testing the moderating effects of DTC motivation have focused on the association between negative affect and drinking levels, with the central premise being that individuals with stronger DTC motives should display stronger negative affect-drinking contingencies, i.e., their drinking levels, more so than others, should ebb and flow along with negative affective states. To date, there is conflicting evidence regarding the notion that high DTC motivation individuals show stronger positive associations between negative affect and drinking level. Specifically, some studies have found support for this interaction (Grant et al., 2009; Mohr et al., 2005) whereas others have not (Armeli et al., 2010; Hussong et al., 2005; Park et al., 2004). These inconsistent findings, however, do not preclude the possibility that the experience of drinking (if not the amount of drinking) during periods of high distress might be qualitatively different for individuals high in DTC motivation. Moreover, the distinct nature of alcohol use associated with coping could have important implications in terms of DRPs; specifically, that such drinking might actually increase the risk of experiencing DRPs. Indeed, Martens et al. (2008) found that among individuals with high DTC motivation, those with higher levels of negative affect showed a stronger positive association between drinking level and DRPs compared to individuals with lower levels of negative affect. Stated in other words, high DTC motivation/high negative affect individuals, compared to others, seemed to experience greater DRPs for each additional unit of alcohol consumed. This synergistic effect of negative affect and drinking was not present among low DTC motivation individuals.

Several lines of research support the notion that drinking level might be more closely linked to DRPs among individuals high in DTC motivation. According to the Attention Allocation Model (AAM: Steele & Josephs, 1990; Steele & Josephs, 1988), alcohol use constricts attention, causing individuals to focus on salient internal and external cues such as ongoing stressors and negative affect. This alcohol-induced narrowing of attention, especially in the absence of distraction, can actually result in an exacerbation of such states (Steele & Josephs, 1990; Steele & Josephs, 1988). Additionally, some evidence indicates that

individuals high in DTC motivation, more so than others, might be especially likely to retain focus on negative affect when drinking, and thus be at greater risk for intensified negative affect. For example, Colder (2001) found that individuals high in DTC motivation, but not other motives, showed larger increases in respiratory sinus arrhythmia – believed to be an index of orienting response and sustained attention – after viewing aversive pictures compared with neutral pictures. This was interpreted as evidence that such individuals might allocate more attention-related resources to process aversive stimuli. Stated in other words, when drinking in the context of distress, high DTC-motivated individuals, more so than others, might have a harder time disengaging their attention from their negative affect.

Increased focus on negative affect during drinking episodes for high DTC motivated individuals could be accompanied by sustained attempts to regulate such emotion. This in turn could tax self-control resources (Muraven & Baumeister, 2000), and thus increase the risk of engaging in maladaptive behavior during drinking episodes. This would be consistent with Merrill and Read's (2010) findings showing that DTC motivation, controlling for drinking level and other motives, was positively associated with the risky behavior domain of Read, Kahler, Strong and Colder's (2006) alcohol consequences measure which assesses impulsive behaviors such as drinking and driving, property damage and unprotected sex. Merrill and Read's (2010) finding that DTC motivation was uniquely associated with reports of poor self-care (e.g., being less physically active, having less energy, not eating properly) and academic/occupational problems (e.g., neglecting obligations to family, work, or school) would also be consistent with the self-control resource depletion hypothesis to the degree that such depletion lingers beyond the drinking episode (perhaps to the next day), resulting in neglect of responsibilities that require focused attention and discipline.

We proposed to further this area of research in several ways. First, to the degree that individuals who characteristically drink to cope are more at risk for DRPs due to negative affect-related self-control depletion, we would expect that DRPs for such individuals should be higher during periods characterized by relative increases in negative affect and drinking. Results showing that average levels of negative affect and drinking are more strongly related to average levels of DRPs among high DTC-motivated individuals cannot inform us about the within-person contingencies among these variables. Indeed, within-person findings can differ in both magnitude and direction from cross-sectional, between-person associations (Kenny, Bolger, & Kashy, 1999; Tennen & Affleck, 1996). Results showing stronger within-person covariation between deviations from individuals' mean levels of negative affect and alcohol use and DRPs among high DTC-motivated individuals would be more consistent with the posited mechanisms. To test this we had college students report on their drinking motives, and over three months, report on their negative affect, alcohol use, and DRPs. Thus our primary hypothesis was that individuals high in DTC motivation, compared to others, would demonstrate a stronger positive association between relative increases in monthly drinking level and DRPs, especially during months characterized by relatively higher levels of negative affect. As a comparison we also estimated a model similar to the one reported by Martens et al. (2008) testing the interactive effects for DTC motives and average levels of drinking and negative affect (across all months) in predicting average levels of DRPs. Examination of these effects at different levels of analysis can provide a more nuanced understanding of the processes at play.

Additionally, we advanced this line of research by examining anxious and depressive symptoms separately. One possibility is that drinking-related exacerbation of these distinct emotional states, which are comprised of unique appraisal profiles (e.g., Smith & Ellsworth, 1985) and arousal levels (Larsen & Diener, 1992), might have differential effects on intoxicated behavior through the processes spelled out above, and ultimately on DRPs. Evidence of whether these processes are stronger for anxious or depressive affect would help us to better understand the processes at play and would help to tailor intervention strategies accordingly. Finally, given the moderate correlation between DTC and enhancement motivation (e.g., Cooper, 1994; Simons et al., 2005) and some evidence that enhancement motivation might play a role in the negative affect-drinking association (Armeli et al., 2010), we re-estimated the models incorporating enhancement motivation as a control variable; significant moderating effects for DTC motivation and not enhancement motivation would add further support for our proposed theoretical framework.

Methods

Participants and procedure

Prospective participants were freshmen recruited via email announcements, informational talks and campus advertisements from two colleges, a small liberal arts college and a state university, to participate in a larger study of college student substance use and well-being which included both drinkers and non-drinkers. Out of the 1524 students who completed the initial assessment (which included the assessment of drinking motives), 568 reported either never drinking (318) or not drinking in the prior three months (250). Given our focus on drinking motives (and need for participants to recall motives from past drinking episodes), we only included individuals who consumed alcohol at least in the previous three months. An additional 112 subjects either had missing data on one or more of the core study variables, resulting in a final sample of 844 students (53% female). The mean age was 18.33 years ($SD=0.73$) and participants reported their race/ethnicity as: 78% Caucasian, 7% African/African American, 5% Hispanic or Latino, 4% Asian American, 5% Multiracial/Other, and 1% did not report. The majority (69%) of the participants attended the state university.

Upon acceptance into the study, participants were briefed in person on the term “drink” which was defined as drinking one 12-oz. can or bottle of beer, one 4-oz. glass of wine, one 12-oz. wine cooler or one 1-oz. shot (this description also appeared on the Internet-based survey), not just a sip. Also, during the initial visit they were instructed on how to access the Internet-based survey and completed the first assessment in which they reported on demographics, drinking motives, negative affect, drinking level and drinking related problems. In the subsequent two months they again accessed the web-site to report on their negative affect, drinking level and drinking related problems. For the follow-up assessments (occurring 1 and 2 months after the initial assessment), participants were instructed to complete the survey during the first week of the month; the median reporting day was day 2 and 95% of the surveys completed were done so by day 6. Participants were locked out of the system on day 7. Additionally, participants could not access previous months’ surveys in the following months. Students were paid for their participation.

Participants reported on a total of 1,979 person-month periods for a mean of 2.34 months ($SD = 0.81$) per person – a 78% monthly completion rate. Females had more completed assessments (i.e., higher completion rates), $r = .17$, $p < .01$, as did students from the small liberal arts college (vs. the state university), $r = .11$, $p < .01$. The number of completed months was not associated with DTC motivation, $r = -.06$, $p = .15$, or ethnicity (1 = Caucasian vs. 0 = other), $r = -.004$, $p = .91$. However, the number of completed months was associated with average weekly drinking levels, $r = -.25$, $p < .01$, average anxiety levels, $r = -.11$, $p = .002$, average depression levels, $r = -.12$, $p = .001$, and average levels of DRPs, $r = -.36$, $p < .01$. Rather than excluding individuals with fewer than three months of complete data, we retained all participants for estimation of our multilevel regressions. This is consistent with recommendations for multilevel analysis of longitudinal data that inclusion of all subjects, regardless of the number of missing repeated observations, maximizes the accuracy of parameter estimates (Singer & Willett, 2003; Newman, 2003).

Measures

Drinking motives—In the first monthly assessment, participants completed a slightly modified version of the coping and enhancement subscales from the Motivations for Alcohol Use scale (Cooper, 1994). Specifically, two original coping items regarding drinking when depressed/nervous and drinking to feel more confident/sure of oneself were each split into two separate items asking about each component (e.g., depressed, nervous, to feel more confident, and to feel sure of oneself). This was done for a separate research question not examined in the present study. Responses were made using a 5-point scale (1 = almost never/never to 5 = almost always/always) regarding how often they drink for various reasons; we created composites by taking the mean of the relevant items. Internal consistency (α) for the coping subscale was .91.

Depression and anxiety symptoms—Each month participants completed the Beck Depression Inventory (BDI: Beck & Beck 1972) and the State-Trait Anxiety Inventory (STAI: Spielberger, 1983). The 13-item short form of the BDI is a widely used measure of depressive symptoms. Participants were asked to describe how they were feeling during the past month using a 4-point scale (ranging from 0 to 3). The STAI is a 20-item measure of general and longstanding anxiety. Participants were asked to respond regarding how they in the past month using a 4-point scale ranging from 1 (strongly disagree) to 4 (strongly agree). The mean internal consistency (α) estimates across the multiple months were high: $\alpha = .94$ for the STAI and $\alpha = .90$ for the BDI.

Alcohol use—Each month participants recalled the quantity and frequency of last month's alcohol use. Specifically, they answered two questions regarding (a) the number of drinking days in the past month and (b) the average number of standard drinks (defined as per NIAAA guidelines as 12-oz. can or bottle of beer, one 4-oz. glass of wine, one 12-oz. wine cooler or 1-oz. of liquor straight or in a mixed drink) they consumed on each drinking day. We multiplied the values together to get a total number of drinks consumed each month. Preliminary inspection of the monthly drinking values indicated a highly positively skewed distribution with approximately 2% of the values 3 or more standard deviations from the mean. To reduce the impact of these outlier values we log transformed the values.

Drinking-related problems—Each month participants reported on DRPs using seven items adapted from the Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ; Kahler et al., 2005). We selected a subset of items that represented the full range of severity (see Kahler et al., p. 1184) such as feeling sick/throwing up and passing out (lower severity), to forgetting large stretches of time and missing class/work (moderate severity) to quality of school/work suffering, and feeling like one needed a drink after getting up (high severity). Responses were made on a 4-point scale (1 = never, 2 = 1–2 times, 3 = 3–5 times, 4 = more than 5 times) and were averaged together to create a composite. Mean α across all months was .86.

Data analysis

Given the unbalanced and nested nature of the data (i.e., up to 3 repeated measures for drinking, affect and problems for each person), we used a multilevel regression approach (Kreft & De Leeuw, 1998; Nezlek, 2001; Schwartz & Stone, 1998) to examine our core hypotheses. For the models predicting average levels of DRPs, we used intercept only models with random intercepts (see Raudenbush & Brvk, 2002). Specifically, we calculated mean levels (across all available months) of negative affect (anxiety and depression were examined in separate models) and drinking levels and entered them along with DTC motives and the relevant 2-way and 3-way product terms into the intercept portion of model. All predictors for this model were grand mean-centered prior to creating product terms to test the interactions. Thus all effects in the presence of higher-order interactions are conditional effects, interpreted at average levels of the other variables involved in the interaction. Sex (coded males = 0, females = 1) and school type (state university = 0, liberal arts college = 1) were included as a control variables.

Next, we examined how DTC motives moderated the effects of *changes* in monthly anxiety, depression and drinking in predicting monthly levels of DRPs. Specifically, we used similar random intercept models predicting monthly DRPs, however, monthly levels of anxiety or depression (in separate models) and drinking level were incorporated into the level 1 (within-person) portion of the model. Monthly anxiety, depression and drinking were person-mean centered (i.e., each person's overall mean was subtracted from each monthly value); this approach yields within-person associations for the effects of the level 1 predictors. DTC motivation was grand-mean centered and school type and sex were included as a control variable.

Results

Descriptive statistics and correlations

Participants reported a mean of 42.3 drinks ($SD = 43.2$) – or 592.09 grams of alcohol ($SD = 604.90$) – consumed per month, or approximately 10 drinks (140 grams of alcohol) per week. Table 1 shows the descriptive statistics for the study variables across the three assessment waves. Table 2 shows the correlations for DTC motivation and the mean levels (across all months) of anxiety, depression, drinking level and DRPs. All correlations were significant at the .01 alpha level except for the associations between average drinking level and both anxiety and depression. Consistent with previous studies we found moderate to

strong positive associations between DTC and enhancement motivation, between anxiety and depression symptoms, between drinking level and DRPs, and between motives and DRPs.

Finally, given our interest in explaining monthly (within-person) variation DRPs as a function of anxiety, depression and drinking, we calculated intraclass correlations (ICC: see Raudenbush & Byrk, 2002) for the repeated measures variables; ICC is an estimate of the proportion of total variance that is due to between-person variation (i.e., differences in mean levels). ICCs were as follows: DRPs = .48, drinking level = .61, anxiety = .75 and depression = .71. Thus, DRPs demonstrated the largest proportion of within-person (monthly) variation (52%) and anxiety symptoms the least (25%).

DTC motives and average levels of affect and drinking predicting average levels of DRPs

The results are shown in Table 3. The lower-order conditional effects (i.e., interpreted as the effect of that predictor at mean levels of the other predictors involved in the interaction) of mean affect, mean drinking and DTC motivation were significant in the positive direction in both models. In the model containing mean anxiety, we found significant 2-way interactions between DTC motivation and mean anxiety and between DTC motivation and mean levels of drinking; both of these effects were subsumed under the significant 3-way DTC motivation $\times$ mean anxiety $\times$ mean drinking level interaction. The form of this higher order effect can be seen in Figure 1. We designated values of plus/minus 1 standard deviation from the mean to correspond to high and low levels of the moderator variables. It should be noted that the mean and standard deviation for DTC motivation in our sample were similar to values found in previous research (e.g., Cooper et al., 2008; Martens et al., 2008; Merrill & Read, 2010; Simons et al., 1998). Similarly, the mean and standard deviation for the STAI found in our sample were virtually identical to the values reported by Spielberger (1983) for his college student comparison sample. Thus our specifications of high and low levels for these variables correspond closely to what has been found in the literature

As shown in Figure 1, the moderating effect of anxiety on the association between drinking level and DRPs changes as a function of DTC motivation. Probing of the mean anxiety $\times$ mean drinking level interaction among high DTC motive individuals revealed a significant effect ($p = .018$), indicating that the drinking level-DRP slope was stronger (more positive) among individuals reporting high levels of anxiety compared to those low in anxiety. In contrast, among low DTC motive individuals, there was no mean anxiety $\times$ mean drinking level interaction ($p = .32$). None of the interactions involving mean depression levels was significant.

DTC motives and monthly changes in affect and drinking predicting monthly DRPs

The results are shown in Table 4. The lower-order conditional effects from both models were similar to the results from the model focusing on average levels. We also found an interactive effect between monthly changes in drinking level and DTC motivation with the association between monthly changes in drinking and DRPs being stronger in the positive direction among individuals with higher levels of DTC motivation (see Figure 2). However, none of the other interactions across both models was significant.

Supplemental models examining enhancement motivation

We re-estimated all of the models controlling for enhancement motivation by entering it and its multiplicative composites with each of the negative affect predictors, drinking level and the 3-way product term (enhancement $\times$ negative affect $\times$ drinking level). Results from the models including mean levels of affect and drinking indicated that none of the significant effects involving DTC motivation was altered. The only significant effect involving enhancement motivation was an enhancement $\times$ mean drinking level interaction ($b = .031$, $SE = .009$, $p = .001$; 95% CI: .013 to .050 in the anxiety model and $b = .030$, $SE = .009$, $p = .002$; 95% CI: .011 to .048 in the depression model). The form of this effect was similar to the DTC motivation $\times$ drinking level interaction with the association between drinking level and DRPs being stronger in the positive direction for individuals higher in enhancement motivation.

Inclusion of enhancement motives in the models examining the effects of monthly changes in affect and drinking on problems did alter the effects of DTC motivation, with the DTC motive $\times$ changes in monthly drinking level interactions falling just below significance ($p = .10$ in the anxiety model and $p = .073$ in the depression model). However, the interactions involving enhancement motives were also non-significant ($p = .31$ in the anxiety model and $p = .35$ in the depression model) and the size of the coefficients for the interactions involving DTC motivation were larger in both models. Thus, the reduction in the significance levels for the interactions involving DTC motivation might simply be due the redundancy between DTC and enhancement motivation ($r = .51$, $p < .01$).

Discussion

We found some support for the notion that alcohol use and negative affect are more strongly associated with drinking-related problems among college students with higher levels of drinking to cope motivation. Specifically, drinking to cope motivation and average levels of alcohol use and anxiety interacted in predicting average levels of drinking-related problems. This three-way interaction was not observed for average levels of depressive symptoms, nor when examining the effects of monthly changes in drinking and affect on concurrent levels of drinking-related problems. However, we did find that individuals higher in drinking to cope motivation showed stronger effects for monthly changes in drinking level on monthly levels of drinking-related problems.

Our work replicated the core finding from Martens et al. (2008) showing that the association between alcohol use and drinking-related problems was a synergistic function of distress levels and drinking to cope motivation – although our results indicate that this effect was specific to anxious affect. Specifically, among individuals high in drinking to cope motivation, those with higher overall levels of anxiety demonstrated a stronger positive association between mean drinking level and drinking-related problems. In contrast, among individuals low in drinking to cope motivation, the association between mean drinking level and drinking-related problems did not vary as a function of mean anxiety levels. This pattern is generally consistent with the posited attention allocation and self-control depletion mechanisms – specifically that individuals with high levels of drinking to cope motivation and anxiety, compared to others, might maintain greater focus on their anxiety when

drinking, resulting in exacerbation of such emotions and corresponding efforts to regulate such emotions. Such emotion regulation could exert a considerable drain on self-control resources, which in turn might increase the risk for engaging reckless and impulsive behavior. Self-control resource depletion might also linger after the drinking episode, possibly resulting in neglect of academic and/or other responsibilities that require self-control.

The specificity of the higher-order interactive effect to anxiety, and not depressive affect, might be due to the high arousal levels associated with anxious affect (Watson et al., 1995). Exacerbation of this arousal component – especially during the ascending limb of the blood alcohol concentration curve, which is related to increased stimulation (Erblich et al., 2003) – might be especially draining in terms self-control resources. Depressive affect, in contrast, is characterized by low arousal levels (Watson et al., 1995), the exacerbation of which might not be as taxing on self-control resources. The specificity to anxiety also might be related to findings showing that, in general, individuals have a difficult time diverting their attention away from anxiety-evoking stimuli (Fox et al., 2001; Georgiou et al., 2005), a process thought to be adaptive in potentially harmful situations. Consistent with Colder's (2001) findings, disengagement from anxiety-evoking stimuli might be especially challenging for individuals high in drinking to cope motivation.

The null findings for the interactive effects in the models examining monthly changes in anxiety somewhat muddle our interpretation about the underlying mechanisms. It would be expected that among high drinking to cope motivation individuals, the deleterious effect of increased drinking on drinking-related problems should be most pronounced during periods of increased anxiety. One possibility that our findings for anxiety have less to do with the relative levels of anxiety during or proximal to drinking episodes, but rather they are linked to processes inherent in high trait-anxious individuals. Indeed, Georgiou et al. (2005) found that individuals higher in trait anxiety, compared to others, exhibited reduced ability to disengage from anxiety-evoking stimuli. Alternatively, the lack of higher-order interactions in examining monthly changes anxiety might be due to the nature of our research design – specifically limiting our longitudinal assessment to consecutive months. This approach might not have been sensitive to meaningful changes in anxiety levels. Indeed, our results showed that only 25% of the variation in anxiety was due to monthly changes. Research designs assessing affect over longer periods of time might have better captured meaningful changes in these variables. Alternatively, designs examining changes in affect at the drinking episode level of analysis might be better suited for capturing the posited micro-processes at play.

At both levels of analysis we found that individuals high drinking to cope motivation showed stronger associations between drinking level and drinking-related problems, irrespective of anxiety or depression. One possibility is that regardless of their concurrent levels of distress (within-person) or overall levels of distress (between-person), individuals high in drinking to cope motivation, upon drinking, shift their attention to distress. Alcohol use for high coping-motivated drinkers might prime negative affective states and/or related cognitions. Indeed, studies using implicit priming techniques have shown that individuals with high drinking to cope motivation show stronger connections between negative mood

states and both alcohol expectancies (Birch et al., 2004) and attention to alcohol-related cues (Grant et al., 2007). Activation of such affective states and related cognitions during drinking, though short-lived, might set into motion the affect-exacerbation process and subsequent drain on self-control resources described above. Future studies using more fine-grained assessments of affect, drinking, self-control recourses and motives are needed to test this interpretation.

Finally, support for the posited mechanisms was obtained by showing that the moderating effects of drinking to cope motivation were generally maintained after controlling for enhancement motives (or larger in size than the coefficients for enhancement motives). It should be noted, however, that we also found that enhancement motives uniquely moderated the effect mean levels of drinking on drinking-related problems. This finding is suggestive of other processes, besides attention allocation and self-control resources depletion, linking positive affect-regulation drinking and exacerbated effects of drinking on drinking-related problems.

We believe that our core findings have important clinical and public health implications. Our results add to the literature (e.g., Martens et al., 2008) showing that drinking-related problems among college students are a multiplicative function drinking level and reasons for drinking (mainly, negative reinforcement motives); thus prevention and intervention efforts should focus on both components. One possibility is that common campus-wide intervention strategies that focus on reducing overall drinking level, such as social norms media campaigns (e.g., Perkins, 2002), might be augmented to also address drinking to cope motivation. Incorporating didactic components of expectancy challenge interventions (Scott-Sheldon et al., 2012) focusing on the expected tension-reduction aspects of alcohol use (a robust antecedent of drinking to cope motivation), or directly addressing the hazards of coping-related drinking, might enhance the efficacy of such efforts. Future research is needed to evaluate the additive and interactive effects of such treatment components.

There are several additional limitations to the current study that merit mention. First, we focused only on anxiety and depressive affect and did not assess other relevant dimensions such as anger/hostility; indeed, many of the affect items used in Marten's et al. (2008) reflected this emotion. Drinking-related exacerbation of anger/hostility – which is associated with increased arousal levels and a distinct profile of appraisals and attributions concerning impeded goals and other-blame (Smith & Ellsworth, 1985) – might result in more intense and distinct types of drinking-related problems such as aggression and interpersonal conflict. Future studies might also examine whether changes in drinking to cope motivation might moderate the effect of drinking level and negative affect on drinking-related problems. There is some evidence that drinking to cope motives have substantial state-like variance (Arbeau, Kuiken, & Wild, 2011; Armeli et al., 2008); proximal increases in coping motivation might prove to be a more powerful moderator of the effects of interest. Another limitation concerns our use recall of previous months' affect, drinking and related problems. Although research indicates that simple recall of quantity/frequency correlates highly with more sophisticated measurement procedures (e.g., TLFB; Carter-Sobell et al., 2003; Webb et al., 1990), it cannot accurately assess more nuanced aspects of drinking such as patterns. Additionally, recall of affect could have been affected by concurrent affect levels; future

studies using daily assessment strategies would provide more accurate assessments of monthly affect. Finally, our sample was limited to first year, primarily Caucasian students from geographically proximal schools, thus the generalizability of our findings to older students and students from other ethnic backgrounds and geographical locations is unclear.

These limitations notwithstanding, the results of the present study add to a large literature indicating the deleterious effects of using alcohol as a method of coping with stress and negative affect. Moreover, our findings begin to shed light onto the processes involved in how such motivation might exacerbate the effects of drinking and negative affect on alcohol-related problems.

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Figure 1.

Interactive effects of drinking to cope, mean drinking and mean anxiety in predicting mean drinking-related problems (high and low levels of anxiety and drinking to cope correspond to values plus/minus 1 SD from the mean; high and low levels of drinking correspond to the 5th and 95th percentiles).

Figure 2.

Interactive effects of drinking to cope and monthly changes in drinking in predicting monthly drinking-related problems (high and low levels of anxiety and drinking to cope correspond to values plus/minus 1 SD from the mean; high and low levels of drinking correspond to the 5th and 95th percentiles).

Table 1

Descriptive statistics

	<i>Month 1</i> N = 844		<i>Month 2</i> N = 607		<i>Month 3</i> N = 528		<i>Total^b</i> N = 1979	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Drinking to cope	1.88	0.90	1.86	0.89	1.85	0.86	1.87	0.89
Anxiety	2.02	0.51	1.98	0.53	1.98	0.51	2.00	0.51
Depression	0.29	0.38	0.25	0.35	0.25	0.36	0.27	0.36
Alcohol use ^a	3.32	1.10	2.93	1.39	2.76	1.43	3.05	1.31
Drinking problems	1.64	0.60	1.26	0.36	1.23	0.32	1.42	0.51

Note. Drinking to cope measured only at baseline; values reflect levels for participants in that wave.

^alog transformed.

^bMean across all available months.

Table 2

Aggregate variable correlations

	1	2	3	4
1. Drinking to cope				
2. Anxiety	.41 [*]			
3. Depression	.39 [*]	.72 [*]		
4. Alcohol use ^a	.22 [*]	.02	.04	
5. Drinking problems	.34 [*]	.26 [*]	.29 [*]	.55 [*]

^{*}
 $p < .01$,

^alog transformed

Table 3

Results for average level regression models

predictor	b	SE	p	95% CI	
				Lower	Upper
School	-.042	.023	.072	-.088	.004
Sex	.012	.022	.591	-.032	.055
Mean anxiety	.107	.025	<.001	.058	.157
Drinking to cope (DTC)	.095	.015	<.001	.066	.124
Mean drinking	.190	.011	<.001	.169	.211
DTC X Mean anxiety	.102	.024	<.001	.055	.150
Mean anxiety X Mean drinking	.019	.020	.350	-.021	.059
DTC X Mean Drinking	.063	.012	<.001	.040	.087
DTC X Mean drinking X Mean anxiety	.050	.019	.008	.013	.088
School	-.031	.024	.186	-.078	.015
Sex	.008	.022	.727	-.036	.052
Mean depression	.203	.039	<.001	.126	.280
Drinking to cope (DTC)	.108	.014	<.001	.080	.135
Mean drinking	.193	.011	<.001	.172	.214
DTC X Mean depression	.022	.030	.453	-.036	.081
Mean depression X Mean drinking	.056	.032	.079	-.007	.118
DTC X Mean Drinking	.070	.011	<.001	.047	.092
DTC X Mean drinking X Mean depression	.023	.025	.359	-.026	.072

Note. b = unstandardized regression coefficients. 95% CI = 95% confidence interval for b.

Table 4

Results for monthly change regression models

predictor	b	SE	p	95% CI	
				Lower	Upper
School	.021	.029	.466	-.036	.079
Sex	-.077	.028	.005	-.131	-.023
Monthly anxiety	.128	.042	.002	.046	.210
Drinking to cope (DTC)	.222	.015	<.001	.192	.252
Monthly drinking	.112	.013	<.001	.086	.138
DTC X Monthly anxiety	-.006	.047	.896	-.099	.087
Monthly anxiety X Monthly drinking	-.003	.065	.959	-.132	.125
DTC X Monthly drinking	.039	.015	.010	.009	.068
DTC X Monthly drinking X Monthly anxiety	.025	.072	.733	-.117	.166
School	.022	.029	.459	-.036	.080
Sex	-.077	.028	.005	-.131	-.023
Monthly depression	.253	.059	<.001	.138	.369
Drinking to cope (DTC)	.222	.015	<.001	.192	.252
Monthly drinking	.109	.013	<.001	.083	.135
DTC X Monthly depression	-.013	.057	.823	-.124	.099
Monthly depression X Monthly drinking	.001	.100	.991	-.195	.197
DTC X Monthly drinking	.041	.015	.006	.012	.070
DTC X Monthly drinking X Monthly depression	-.008	.102	.935	-.208	.191

Note. b = unstandardized regression coefficients. 95% CI = 95% confidence interval for b.