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Coping Motives, Negative Moods, and Time-to-Drink: Exploring Alternative Analytic Models of Coping Motives as a Moderator of Daily Mood-Drinking Covariation

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Abstract

Affect regulation models of alcohol use posit individuals use alcohol to modify mood states. Importantly, these models hypothesize that individual difference in coping motives for drinking moderate the relation between drinking and negative moods. Despite consistently significant correlations among negative moods, coping motives, and alcohol involvement in numerous between-level studies, within-person analyses have yielded results inconsistent with theoretical models. Analytic techniques modeling time-to-drink have provided results more consistent with theory, though there remains a paucity of research using these methods. The purpose of the current study was to explore whether coping motives moderate the relation between negative moods and the immediacy of drinking using methodology outlined by Hussong (2007) and Armeli, Todd, Conner, and Tennen (2008). Overall, our study showed little evidence for hypothesized mood-motive-alcohol use relations, thus demonstrating that time-to-drink approaches may not provide more consistent support for these hypotheses.

Keywords

drinking motives; time-to-drink; survival analysis; affect regulation

1.1 Introduction

Affect regulation models suggest alcohol is used to modify negative mood states, especially among individuals that endorse negative reinforcement (i.e., drinking-to-cope [DTC]) motives for use (see Littlefield & Sher, 2010, for a recent discussion). As a corollary, these models hypothesize that individual differences in drinking motives should predict alcohol use and alcohol-related outcomes. Indeed, existing literature shows a consistent positive relation between DTC motives and both alcohol consumption and consequences (see Kuntsche, Stewart, & Cooper, 2008; Kuntsche, Knibbe, Gmel, & Engels, 2005). As noted by Kuntsche et al., (2005, 2008), among several countries in North America and Europe,

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individuals who endorse higher levels of DTC motives typically drink more and experience more alcohol-related problems than individuals with lower levels of these motives. The relation between measures of drinking motives, specifically Cooper's (1994) well-validated Drinking Motive Questionnaire (DMQ), and alcohol involvement is considered so robust by some that it has been labeled as an "ideal instrument" to assess drinking motives for large studies that target motives to reduce problematic drinking (Kuntsche et al., 2008).

As others have noted (e.g., Mohr et al., 2005), hypotheses regarding DTC motives, negative mood states, and alcohol use are inherently process-oriented (i.e., how individual differences in DTC motives might moderate the process through which daily mood affects alcohol within an individual). More specifically, individuals higher in DTC motives should theoretically show stronger relations between daily negative mood states and daily alcohol use compared to individuals lower in these motives. Despite these process-oriented hypotheses, the vast majority of studies have examined between-person associations among motives, mood, and alcohol involvement. The existing evidence from studies using process-oriented methodology to examine evidence for hypothesized motive-mood-alcohol relations have been, at best, mixed (Armeli, Conner, Cullum, & Tennen, 2010; Hussong, Galloway, & Feagans, 2005; Mohr et al., 2005; Park, Armeli, & Tennen, 2004; Todd, Armeli, Tennen, Carney, & Affleck, 2003; Todd et al., 2005). Typically utilizing fine-grained data such as ecological momentary assessment (EMA) or daily diary assessments, these studies apply hierarchical linear modeling (HLM) that assumes fixed-intervals between affect and drinking to test whether between-level differences in DTC motives moderate within-person (usually within-day) relations between negative mood and alcohol use. These mixed results have led some to question the construct validity of DTC motives. For example, based on her findings using fixed-interval hierarchical linear modeling (HLM), Hussong et al. (2005) stated: "The results of the current study lead us to question whether college students' self-reported coping motives reflect the actual relation between their mood and drinking experiences" (p. 351).

Partly in response to these mixed findings from analyses using HLM, some researchers have advocated alternative modeling strategies that may better capture mood-drinking moderation by DTC motives. Given that the optimal interval for assessing mood-motive-alcohol use relations may vary across individuals, the immediacy of response to negative mood might be a better indicator of vulnerability to self-medication (Hussong, 2007). As such, time-to-drink models (TDMs) have been offered as an alternative modeling strategy to fixed-effect HLM models for testing mood-motive-alcohol use relations (see Armeli, Todd, Conner, & Tennen, 2008; Hussong, 2007). These models use survival analyses to estimate the extent to which DTC scores moderate the relation between negative moods and onset (immediacy) of drinking. Studies using these analytic approaches show findings that are more consistent with hypothesized motive-mood-alcohol use relations than studies using traditional HLM approaches. Using the same data as her 2005 study (that questioned the validity of the drinking motive questionnaire), Hussong (2007) found a pattern of interactions suggesting that sex, motives, and alcohol-related problems interacted to predict drinking following peak sadness. Women high in coping motives and alcohol-related problems were more likely to drink sooner after peak days of sadness compared to women who were high in coping but showed low levels of problems, were high in problems but were low in coping, or were low in both coping and alcohol-related problems (see Figure 1 of Hussong). Men high in motives but low in alcohol-related problems, followed by men low in both coping motives or alcohol-related problems, were more likely to drink sooner after peak days of sadness compared to men high in both coping motives and problems or low in coping motives but high in problems (see Figure 2 of Hussong). Hussong noted "These findings suggest that the pattern of risk factors differ for men and women, with that for women being more consistent with the proposed hypotheses" (p. 1061). She speculated that self-medication processes may

differ between men and women but cautioned about generalizing her findings prior to replication.

Armeli et al. (2008) demonstrated that individuals with higher DTC motives, compared to individuals with lower DTC motives, initiated drinking earlier during weeks characterized by higher anxiety. Notably, in both samples, traditional fixed-interval HLM approaches failed to yield results consistent with hypothesized motive-mood-alcohol use relations, suggesting that methodology may determine whether daily diary data support hypothesized relations. Armeli et al. (2008) stated: "...we believe that our time-to-drink approach represents a promising analytic technique for investigating individual differences in the role of alcohol use within the stress and coping process" (p. 321).

Despite this suggestion, TDMs are under-utilized in studies using daily diary data to test motive-mood-alcohol use relations. We are only aware of two studies (Armeli et al., 2008; Hussong, 2007) that have used these approaches to model drinking patterns within weeks using diary data. Importantly, it is unclear whether other researchers have under-utilized these approach because (a) they are potentially more difficult to utilize given that they are less common than their fixed-internal HLM counterparts or (b) their results are no more consistent with hypothesized motive-mood-alcohol use relations (and thus may be relegated to the proverbial "file-drawer"; (Rosenthal, 1979).

Therefore, the goal of the present study is to replicate the existing findings in the literature using a promising, though under-utilized, methodology. The study tests motive-mood-alcohol use relations using two TDMs approaches (i.e., extending from Hussong, 2007 and Armeli et al., 2008) in a daily diary study of college students. Further support for the utility of these analytic approaches and the validity of the DTC measure would be demonstrated if TDMs findings are consistent with hypothesized relations. If, on the other hand, we find a lack of support, this may cast doubt on both 1) the verisimilitude of the hypothesized relations among motive-mood-alcohol and 2) whether the DTC measure accurately capture relations between negative mood states and drinking experiences at either within- or between-levels.

1.2 Material and methods

1.2.1 Participants and Procedure

Data were taken from an 8-week web-based survey to examine alcohol use, smoking, mood, and stress in a college student sample (Jackson, Colby, & Sher, 2010). Students ($n = 115$) were recruited as part of an Introductory Psychology course (57% female; 96% Caucasian; 90% 18 or 19 years old). Participants were enrolled if they met eligibility criteria for both drinking (past-month alcohol use and lifetime consumption of 6 or more drinks) and smoking (past month smoking and lifetime smoking of 100 cigarettes). Participants were assigned to one of three cohorts beginning a week apart (Cohort 1 $n=18$; Cohort 2 $n=33$; Cohort 3 $n=64$).

Participants initially received a brief orientation session about the study, which included the standard definition of a drink, (i.e., 1 beer [12 ounces]; 1 wine cooler [4 ounces]; 1 shot of liquor [1 ¼ ounces]; 1 mixed drink) and were administered a paper-and-pencil baseline survey assessing substance use, mood, personality, motivations for substance use, family history of substance use, and other psychosocial constructs. Then, for 8 weeks (56 days), participants received a daily morning email notice prompting them to complete a 10-minute web-based 26-item survey. The survey assessed prior-day alcohol and tobacco use, current positive and negative mood, and perceived and objective stress. Paper-and-pencil surveys were available in the event that the website was inaccessible. Participants received either

\$10 or two course credits for the baseline survey and for each week of complete data, with cash bonuses for on-time survey completion.

1.2.2. Measures

Daily alcohol use—Respondents reported number of drinks consumed on the prior day, ranging from zero to 25 or more. Any drinking and heavy episodic drinking (HED; five or more drinks) were coded from this variable. Subjective intoxication was assessed by asking the extent to which the respondent felt “drunk” (speech slurred, unsteady on feet), ranging on a 7-point scale from (1) not at all to (7) extremely.

Daily mood—Current positive and negative affect were assessed (as part of the daily morning email notice prompting them to complete the web-based survey) using an abbreviated 10-item version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, Tellegen, 1988). Response options ranged from (1) very slightly or not at all to (5) extremely. To reduce participant burden, we identified similar item pairs (e.g., alert/attentive, proud/strong, etc.) on the full 20-item PANAS and chose the item with the highest factor loading based on Watson et al. (1988). The final set of positive affect (PA) items that was administered included enthusiastic, alert, strong, interested, and active; negative affect (NA) items included scared, upset, jittery, ashamed, and irritable. The first five items were averaged to create an index of PA, and the latter five items were averaged to create an index of NA. Maximum likelihood exploratory factor analyses on the mean PANAS items revealed two factors, with positive items loading on one factor and negative items loading on the other. We found that computed reliabilities (as indexed by coefficient alpha) for the positive (coefficient $\alpha=.94$) and negative (coefficient $\alpha=.92$) subscales affect were high.

In addition, although the PANAS model NA as a single construct, it still subsumes a variety of aversive affective states (e.g., shame, fear, nervousness) under the rubric of NA (Watson et al., 1988). Given the assumption that emotions are not ultimately reducible to a small set of common dimensions, we examined three additional constructs: an anxiety subscale comprised of the items scared, irritable, and jittery; the single item shame; and the single item upset. These measures roughly map onto the negative affect measure used in Hussong (2007) (i.e., the sadness subscale from the expanded, 59-item PANAS, although see the *Limitations* section below), and the negative affect measures used by Armeli et al. (2008) (i.e., a full, 6-item NA scale as well as subscales for anxiety [jittery, nervous], sadness [sad, dejected], and anger [hostile, angry]).

Drinking motives—Drinking motives were assessed at baseline using the Drinking Motive Questionnaire-Revised (DMQ-R; Cooper, 1994), with response options ranging from (1) strongly disagree to (4) strongly agree. The DMQ assesses four motive factors with five items per factor (i.e., social, conformity, coping, and enhancement). The DMQ was used in the Hussong (2007) and Armeli et al. (2008) studies. In an attempt to replicate analyses as closely as possible, we combined social and enhancement motives into a single composite for TDMs consistent with Armeli et al. (see *Analytic Procedure*). All scales exhibited acceptable reliability (coefficient $\alpha s > .75$).

Baseline alcohol use—The baseline survey assessed past 30-day frequency of alcohol use and frequency of heavy drinking, each ranging from (1) no drinking to (8) every day, as well as number of drinks on an average drinking day. The three variables were standardized and a mean composite (coefficient $\alpha = .66$) was computed to be parallel to the measure used in Armeli et al. (2008).

Baseline Alcohol Problems—Past-year alcohol-related problems were assessed with the 37-item Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut & Sher, 1992). Items include problems relevant to college student populations (e.g., missing class, getting involved in regrettable sexual situations) as well as more general problems (hangovers, blackouts, driving while intoxicated). Response options were (1) Not in the past year, (2) Once in past year, (3) Twice in the past year, (4) 3 times in the past year (5) 4+ times in the past year. Coefficient α for the scale was .87.

1.3 Analytic Procedure

In the current analyses, data were taken from the first seven weeks of daily assessment reports due to large amounts of missing data during the eighth week. Individuals whose overall NA measures indicated response sets throughout the diary portion of the study ($n = 8$) were omitted from all analyses¹.

We conducted TDMs using two approaches, one consistent with Hussong (2007) and one consistent with Armeli et al. (2008). Although they address similar research questions, the analyses were set up differently. Hussong (2007) used mood as an anchor and examined time-to-drink following peak mood. Identical to Hussong (2007), the maximum score of the respective peak negative moods (e.g., negative affect) over all reports was identified in order to index the overall level of peak mood. The day in which peak mood was first observed was identified and was coded as the beginning of the survival period for each individual. In contrast, Armeli et al. (2008) used the beginning of each week as an anchor and examined the extent to which DTC moderated relations between mood and time-to-drink. Cox survival models consistent with Hussong (2007) were estimated in Mplus version 6 (Muthén & Muthén, 2010). Multilevel discrete survival models (MDTH) consistent with Armeli et al. (2008) were estimated using HLM software (v. 6.08; Raudenbush, Bryk, Cheong, & Congdon, 2004). These models, and results from these models, are discussed in greater detail below.

1.4 Results

Table 1 provides basic descriptive information and correlations among the primary study variables (aggregate daily variables were based on all diary days from the weeks of interest).

1.4.1 Cox Proportional Hazard Model Parameterization

Consistent with Hussong (2007), analyses were conducted using Cox's Proportional Hazard Model. These models estimate the likelihood of drinking onset among those who have not yet onset for each day subsequent to baseline (the hazard of drinking). In addition to onset of any alcohol use, we also examined onset of HED (as in Hussong, 2007) as well as onset of intoxication. For these models, Hussong identified the first day on which a respondent's peak level of sadness occurred during the diary period. In the present study, we identified the first day of peak negative mood for four variables: total NA, the anxiety subscale, and the shame and upset items. Thus, in this study, each set of survival analyses had a unique "first day" per respondent, one for each of the four negative mood measures.

A set of 12 survival analyses for each drinking outcome (onset of drinking, HED, intoxication) and for each negative mood measure (total NA, anxiety, shame, upset) were then estimated. The outcome variable for each of the models was the number of days between the first day of the analytic interval and the first subsequent day on which each

¹In addition to these eight participants, those who showed no variability on mood subscales were eliminated from analyses specific to that mood measure (anxiety $n = 1$, shame $n = 21$, upset $n = 2$).

drinking outcome occurred. For individuals who did not endorse a given drinking outcome for the analytic interval, data were considered (right) censored. Sex and DTC were included in the model as well as several potential confounds associated with the study design: number of peak negative moods, level of peak negative mood, and duration to weekend. Hussong (2007) also modeled baseline alcohol problems as an additional risk factor, and we included our measure of baseline alcohol problems (see the Measures section for more details) for the sake of consistency, although models that excluded this variable yielded similar findings as those discussed in this section of the manuscript.

Of primary interest, only three of the 12 main effects of coping motives on time-to-drink outcomes were significant; however, these findings suggested that individuals high in coping motives were slightly *less likely* to onset HED and intoxication from peak NA and anxiety (see Table 2). Hussong (2007) also had findings inconsistent with expectations (i.e., individuals with lower alcohol-related consequences were *more likely* to drink after experiencing peak sadness). Thus, she turned her attention to a series of interaction analyses.

Likewise, we next examined whether coping motives interacted with sex and alcohol problems to predict alcohol involvement survival as well as three-way interactions among these variables. Only two of the 12 three-way interactions were significant: time-to-drink from peak NA ($b=0.03$, $p<.01$) and time-to-drink from peak anxiety ($b=0.02$, $p=.02$). The interaction patterns were similar across these two models. Interaction plots (not shown) suggested that, women who reported higher coping motives and higher alcohol problems (+1 SD) had shorter survival curves (shorter time to drinking onset), followed by those who reported lower coping motives (−1 SD) and higher problems, those who reported higher coping motives and lower problems, and finally, those who reported lower coping motives and lower problems. For men, the pattern was the same though differences between these groups were less pronounced. Overall, with regard to coping motives, these patterns of interactions suggest that individuals higher in coping motives have shorter survival curves compared to their lower-coping counterparts; the duration until drinking episodes was especially short for those endorsing higher alcohol-related problems as well as coping motives.

The remaining ten survival models with non-significant three way interactions were trimmed to include only two-way interactions between coping motives and sex and between coping motives and alcohol-related problems. Of these 20 two-way interactions, none were significant.

In sum, there were few significant main effects of coping motives on alcohol involvement survival in the 12 original models and parameters that were significant suggested that individuals higher in coping motives were slightly less likely to onset HED, intoxication from peak NA and anxiety. Significant three-way interactions suggested a pattern of findings consistent with hypothesized mood-motive-alcohol involvement relations (i.e., individuals higher in coping motives should theoretically show stronger relations between negative mood and alcohol use compared to individuals lower in these motives). The detrimental influence of coping motives on reduced time to alcohol involvement was exacerbated among individuals who also endorsed elevated alcohol problems, especially among female participants. Critically, given that a liberal alpha level ($p<.05$) was used despite the multiple tests conducted in these models and that support for patterns of hypothesized mood-motive-alcohol involvement relations were found in a minority of models, there was little evidence that coping motives moderate the mood-alcohol consumption relation.

1.4.2 Multilevel Discrete-time Hazard Model Parameterization

As Armeli et al. (2008) examined weekly cycles of drinking, a person-period data file was created for each week, with the number of records for each participant in a given week (from Sunday to Saturday) equal to the number of days prior to each week's first drinking day². Thus, participants who did not drink in a given week contributed seven records that week (up to 49 records total for consistent non-drinkers). The outcome variable in the MDTH model was a dichotomous indicator of whether the first day of alcohol involvement (i.e., onset of drinking, HED, intoxication) in a given week had occurred (coded as one) or not (coded as zero) on that day. As Armeli et al. did, we included positive mood (i.e., PA) as a covariate in these analyses.

Current models were parameterized similar to those contained in Armeli et al. (2008). Briefly, we estimated effects for average mood up until the day of alcohol involvement for each week (i.e., "daily moving average"; Level-1). Person-level factors (Level-2) were entered into the model, included gender and coping motives, as well as the following factors that were modeled by Armeli and colleagues: social/enhancement motives (which are generally more highly endorsed than DTC motives in college students), aggregate mood levels of each respective mood across all reporting days, and typical level of alcohol consumption. Aggregate mood was included in order to focus on purely within-person associations between mood and drinking (compositional effect; Raudenbush & Bryk, 2002), and individual-level drinking was included given evidence of between-person associations between mood and drinking levels.

Given the pattern of findings was nearly identical across all three indices of alcohol involvement, we highlight the findings for onset of drinking. The pattern of the estimated baseline hazard function for onset of weekly drinking was consistent with Armeli et al. (2008) (see Figure 1). Heavier drinkers compared to lighter drinkers had a greater likelihood of drinking across all days. No other Level 2 predictors, including any drinking motives, were significant. The only significant within-person effects for Level-1 mood variables included weekly average daily upset mood, which was negatively related to onset of drinking on a given week ($b = -.29, p = .01$), and weekly average daily PA, which was positively related to onset of drinking ($b = .37, p = .01$).

Eight cross-level interactions between mood (i.e., PA, anxiety, upset, and shame) and drinking motives (i.e., social/enhancement [SED] and coping) were then tested. Non-significant interactions were then trimmed. Of the eight potential interactions, only one was significant: SED motives with upset mood ($b = -.10, p = .02$). To demonstrate the interaction pattern, we plotted the survival curves at low (-1 SD) and high ($+1$ SD) levels of the SED motives and the daily moving average of upset mood (using grand-level standard deviations for upset mood), and thus, examining effects at a constant value of upset mood across days (Singer and Willett, 2003). This plot (not shown) suggested that individuals high in SED motives and low in upset mood were more likely to begin drinking sooner in the week compared to individuals who were high in SED motives and upset mood, who were low in SED motives and upset mood, or who were high in upset mood and low in SED motives (these individuals showed nearly identical survival curves). This interaction pattern was replicated for both heavy drinking and subjective intoxication onset as well. All interactions involving coping motives were non-significant; the effect sizes, as reflected by odds ratios (OR), ranged from .95–1.06 (average OR = 1.00). Thus, as with the findings from the

²Individuals with missing data within a given week were deleted from analyses for that specific week, but their data were otherwise included in overall analysis.

Hussong (2007) model specifications, there was little support that coping motives moderate the mood-alcohol consumption relation.

1.5 Discussion

Although time-to-drink models (TDMs) have been recently suggested as a promising methodology in which to investigate motive-mood-alcohol use relations, a paucity of studies have been published using these analytic strategies. The present study applied TDMs to data from a daily diary study on drinking, looking at different timeframes (across the diary period versus within a weekly cycle) and using several indices of daily mood and alcohol involvement. Overall, there was little (and sometimes opposing) support for the hypothesis that individuals who report higher levels of DTC motives are more likely to onset drinking after experiencing negative mood, and any effects that were observed were moderated by other risk factors for drinking (sex, alcohol problems). Notably, in supplementary analyses employing more traditional fixed-interval HLM approaches, there was no support that coping motives moderated the mood-alcohol relation³. Thus, at least in this sample, it is unclear the extent to which self-reported DTC motives reflect the actual relation between mood and alcohol involvement.

There are several potential reasons as to why DTC motives have not been consistently found to moderate relations between mood and alcohol use. There is some evidence suggesting that more specific measures of DTC (e.g., DTC for anxiety, DTC for depression) result in findings more consistent with hypothesized motive-mood-alcohol use relations (Grant, Stewart, & Mohr, 2009); thus, the DTC measure from the commonly employed drinking motive questionnaire may be too broad to map onto daily variations in mood and alcohol consumption. As opposed to daily diary data that assesses *between-day* relations in mood-motive-alcohol use patterns, a recent study using EMA to assess moods and drinking at various points within a day suggests that, when modeling *within-day* lags between moods and drinking onset, DTC motives appear to moderate mood-alcohol use associations (Todd, Armeli, & Tennen, 2009). Therefore, findings involving DTC motives may be more consistent with hypothesized motive-mood-alcohol relations when moods are assessed at multiple time points and shorter lags between mood and alcohol involvement are modeled.

Regardless, there appears to be at least two firm conclusions that can be drawn from the existing motive-mood-alcohol use literature. First, as others have noted (e.g., Mohr et al., 2005; Todd et al., 2009), hypothesized motive-mood-alcohol relations only be adequately tested using within-person approaches, although the vast majority of the motive literature has involved between-level analyses (see Kuntsche et al., 2005). Nevertheless, results from these within-level studies, including the current findings, have not clearly mapped onto the hypothesized motive-mood-alcohol relations. Second, despite the current findings, specific analytic approaches utilized for within-person data may alter the conclusions drawn regarding the support for hypothesized relations, even using the same datasets (e.g., compare Hussong et al., 2005 with Hussong, 2007; Todd et al., 2005 with Todd et al., 2009).

Given these conclusions, it is imperative that researchers report attempts to replicate extant findings across a variety of samples using similar analytic approaches. Without this effort, in our opinion, it will be difficult to make firm conclusions regarding the robustness and replicability of the associations among DTC motives, negative mood states, and alcohol use, examined through process-oriented methodology. For example, the current results suggest that, although time-to-drink models have been presented as a promising analytic framework for evaluating hypothesized motive-mood-alcohol relations (Armeli et al., 2008; Hussong et

³Analyses available upon request from the first author.

al., 2007), the use of such models did not provide conclusive support of hypothesized relations in our sample. If these null findings were not available in the extant literature, there would be an incomplete picture of the robustness of this analytic approach to produce results consistent with hypothesized relations

1.5.1 Limitations

Eligibility for this sample was contingent on smoking status, as requirements for the original study were designed to ensure variability in both smoking and drinking (Jackson et al., 2010). Therefore, generalizations about the findings presented here should be taken cautiously. Nevertheless, evidence suggests similar factor structure of drinking motives for both smokers and non-smokers and that smoking status does not moderate motive-alcohol relations in between-level analyses (see Kristjansson et al., 2011) and there was significant variability in DTC motives in the current sample (DTC mean = 12.61 standard deviation = 4.14, range 5–20). Our daily alcohol outcomes were limited to drinking level and perceived intoxication; future studies may consider testing models involving alcohol-related problems. Our sample size was smaller than the sample used in Armeli et al. (2008) but comparable to the sample size in Hussong (2007). Given that our data assess drinking and mood at the daily level and the main purpose was to attempt to replicate whether levels of coping motives serve to moderate time-to-drink following negative moods (as demonstrated in Armeli et al. [2008] and Hussong [2007]), we did not focus on mediational models involving mood, motives, and drinking (see Kuntsche et al., 2006, for a review).

Some studies (Armeli et al., 2008) have used afternoon assessments of mood to predict subsequent drinking; in this study mood was assessed prior to drinking but included morning reports of mood. Although it may be preferable to measure mood that is more proximal to drinking occasions (which typically occur in the afternoon or evening), there is evidence that morning mood predicts later day drinking (Todd, Armeli, & Tennen, 2009). We also note that the Hussong (2007), which measured moods at three times during the day, used peak sadness within a given day (including morning reports) for her survival analyses and did not demonstrate that time of mood assessment influenced her results.

Another limitation is that we did not have direct measures of sadness (used in Hussong, 2007) and depressed mood (which has been linked with coping motivated drinking; e.g., Grant et al., 2009). However, we note that Armeli et al.'s (2008) findings supporting time-to-drink models were limited to their measure of anxiety, which included an assessment of "jittery" and "nervous" mood. Thus, we believe our measure of anxiety (comprised of scared, irritable, and jittery) maps closely to Armeli et al.'s measure. Further, it appears that items from our negative affect scale would correlate highly with other measures of negative mood that explicitly assess sadness/depression. For example, Mohr et al. (2005) assessed negative mood with items from Larsen and Diener's (1992) mood circumplex model, which were identical/very similar to what are used in the current study (i.e., Watson, Clark, and Tellegen's [1988] PANAS). Mohr et al. (2005) created composites of these items; coefficient alpha for these composites were high (.85 or greater; see Mohr et al., 2005, p. 394), suggesting the PANAS items show considerable overlap with measures of sadness. We also note that in the larger motives literature (e.g., Cooper et al., 1995; Kuntsche et al., 2005, 2006), theoretical models of drinking motives are not specific to certain types of negative moods (e.g., depression, sadness) but rather typically have referred to variables that broadly reflect the tendency to experience negative mood states (e.g., neuroticism; see Kuntsche et al., 2006). Thus, although there is some recent evidence and rationale that negative-affect-regulation motives for drinking may be specific to certain negative mood states (see Grant et al., 2009), there remains a gulf between these emerging ideas garnered from the event-based motives literature and the broader motives literature. Regardless, our conclusions are limited in that we did not assess sadness and depressed mood specifically.

1.6 Conclusions

In numerous studies using between-level analyses, DTC motives have been shown to be a reliable predictor of alcohol outcomes (see Kuntsche et al., 2005). However, hypotheses underlying motive-mood-alcohol use relations are process oriented and results from appropriate designs to test process-oriented phenomenon have not clearly demonstrated that measures of DTC influence relations between reported moods and alcohol use. The key to understanding the link between drinking motives, mood, and alcohol consumption is consistently implementing appropriate, pointed methodologies to uncover instances that support or do not support the widely accepted validity of the DTC scale as a general measure of mood-influenced motives to drink.

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Figure 1.
Estimated hazard functions for weekly drinking initiation.

Table 1

Descriptive statistics and correlations

	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Sex	.40 (.49)	-												
2. DTC	12.61 (4.14)	.00	-											
3. Social Drinking	18.27 (1.77)	-.02	.33*	-										
4. Enhance Drinking	16.66 (2.82)	-.04	.30*	.53*	-									
5. Baseline Drinking Level	.03 (.77)	.31*	.16	.20	.30*	-								
6. Baseline Problems	13.13 (5.90)	.30*	.30*	.26*	.31*	.48*	-							
7. Daily Drinking	11.52 (6.24)	-.06	.05	.21*	.26*	.33*	.26*	-						
8. Daily Drunk	9.03 (5.91)	-.05	.04	.27*	.23*	.33*	.32*	.92*	-					
9. Daily HED	9.19 (6.11)	.05	.01	.25*	.25*	.38*	.32*	.94*	.95*	-				
10. Positive Mood	2.65 (.65)	.09	-.02	.00	.15	.07	-.04	.17	.22*	.21*	-			
11. Negative Mood	1.48 (.44)	.03	-.08	.01	.04	.04	.19	.00	.05	-.02	.05	-		
12. Shame	1.28 (.43)	.14	.11	.04	.08	.09	.19	.01	.04	-.01	.05	.91*	-	
13. Upset	1.50 (.45)	-.02	.03	-.08	-.04	-.03	.11	-.05	-.04	-.11	-.10	.89*	.80*	-
14. Anxiety	1.54 (.47)	.04	.07	.02	.04	.04	.20*	.01	.08	.01	.09	.98*	.82*	.80*

Notes.

SD = standard deviation. DTC = drinking-to-cope motives. HED = heavy episodic drinking.

* indicates $p < .05$. Sex is code 0 = female, 1 = male. Spearman correlations are used for correlations involving sex. Aggregates of daily drinking outcomes (i.e., daily drinking, daily drunk, daily heavy drinking) are computed as sums.

Table 2

Main effect (hazard ratio) of drinking to cope on time-to-alcohol involvement for total negative affectivity, anxiety, shame, and upset moods

Alcohol Outcome	Mood			
	Negative affectivity	Anxiety	Shame	Upset
	DTC hazard ratio			
Time-to-Drink	0.97	0.97	1.03	0.97
Time-to-Heavy Episodic Drinking	0.89 *	0.90 *	1.03	0.98
Time-to-Intoxication	0.95 *	0.96	0.97	0.97

Note.

* $p < .05$.

DTC = drinking to cope.