DIMENSIONS OF AFFECT, DRINKING MOTIVES AND DAILY MOODS: AN ELECTRONIC DIARY STUDY OF BINGE DRINKING IN COLLEGE STUDENTS

A thesis submitted
to Kent State University in partial fulfillment of the requirements for the degree of Master of Arts

by
Frank M. Kenner

May, 2009
Thesis written by
Frank M. Kenner
B.S., John Carroll University, 2005
M.A., Kent State University, 2009

Approved by

_____Dan J. Neal, Ph.D._______________________, Advisor

_____Mary Ann Parris Stephens, Ph.D.__________, Chair, Department of Psychology

_____Timothy Moreland, Ph.D._________________, Dean, College of Arts and Sciences
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I would like to thank my advisor and mentor, Dr. Dan Neal, whose seemingly endless patience and willingness to share of his vast statistical knowledge helped me to negotiate the dual learning curves of multilevel modeling techniques and the new (to me) software package used to conduct them. I am indebted to him as well for his helpful reviews of the manuscript and insightful suggestions for its many revisions which culminated in a final document that won accolades from members of the evaluation committee who reviewed it. I am also grateful to the many teachers, too numerous to list, who have helped shape my knowledge and thinking, especially Dr. Jerry Moreno, for showing me how statistics can have you “on the edge of your seat.” Of course, this thesis would never have been started were it not for the guidance and encouragement of Dr. Janet Larsen, chair of the department of psychology at John Carroll University, who inspired me to pursue the academic program from which this project has emerged.

I am forever indebted to my wife, Felicia and her three daughters, Alyssa, Gabriella (Gaby) and Alexandra (Alex) for their understanding, patience and support as I continue to immerse myself in my endless studies day after day, year after year. Finally, I am grateful to my parents for helping to instill in me the courage to follow my dreams and the belief that I can achieve them.
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Introduction

Excessive alcohol use and the resulting consequences among college students is a pervasive problem according to recent findings. Results obtained from a compilation of data from five large-scale national surveys revealed that over two-thirds of college students had consumed at least one drink in the 30 days prior to the survey (O’Malley & Johnston, 2002). Further, over 40% of students report heavy, episodic (“binge”) drinking (5 or more drinks in a row for men and 4 or more drinks in a row for women at least once in the past two weeks; Wechsler, Molnar, Davenport, & Baer, 1999), with almost 20% reporting having binged on a frequent basis (three or more episodes in the previous 2 weeks; Wechsler et al., 1999). Binge drinking is especially problematic in that it is associated with an increased risk of alcohol-related consequences (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). In fact, frequent binge drinkers report experiencing, on average, five or more different drinking-related consequences as a result of this pattern of frequent and heavy alcohol consumption (Wechsler & Nelson, 2001). Considerable research has begun to shed light on the etiology of student binge drinking; however, more is necessary if effective interventions are to be developed and implemented in an effort to curb it.

The Role of Motivation

Motivational factors associated with drinking have been investigated among
college students and other populations. In particular, alcohol may be used strategically either to escape from or cope with a negative mood or to enhance a positive mood. Early research into the nature of problem drinking by Conger (1956) focused on the reinforcement mechanism of drive reduction, specifically, the reduction of anxiety. Later factor analytic research (Farber, Khavari, & Douglass, 1980) revealed that typical reasons given for drinking reflected one of two separable operations: positive and negative reinforcement.

Cox and Klinger (1988) proposed a theoretical model of drinking that incorporated drinking motives with certain psychosocial antecedents, including affect. In their view, “the final common pathway to alcohol use is motivational” and that “people are motivated to bring about affective changes though the use of alcohol” to the extent that they lack the necessary resources to do so otherwise (p. 178). Cox and Klinger (1988, 1990) categorized these motives along two underlying dimensions of the anticipated outcomes: valence (positive or negative reinforcement) and source (internally or externally generated). Thus, an individual can be motivated to enhance mood (internally generated, positively reinforced), secure social rewards (externally generated, positively reinforced), reduce negative emotions (internally generated, negatively reinforced), or avoid rejection from others (externally generated, negatively reinforced).

Cooper (1994) developed and validated a four-factor model of drinking motives based on Cox and Klinger’s (1988) conceptualization. Originally, a three-factor model was proposed (Cooper, Russell, Skinner, & Windle, 1992), which was developed along the identified framework of drinking motives at the time – social facilitation and coping
with negative emotions – with the addition of the enhancement of positive affect as a third motive. Cooper’s four-factor model also included the conformity motive, added in order to bring it in line with Cox and Klinger’s conceptualization. Factor analytic results from a large, ethnically diverse sample supported a four-factor model representing four distinct motives for alcohol consumption: social, coping, enhancement, and conformity. These motives are consistent with the valence (positive/negative) and source (internal/external) dimensions outlined by Cox and Klinger. Replication of this model in both an adolescent and adult sample (Cooper, Frone, Russell, & Mudar, 1995) has further supported Cox and Klinger’s conceptualization. Specifically, not only are both positive and negative emotions associated with alcohol consumption through the more general enhancement and coping strategies respectively, the motivational pathways through which they operate are distinct, albeit with some shared variance between them (Cooper, 1994).

Cooper (1994) also suggests that analyzing drinking motives along either of Cox and Klinger’s two dimensions of valence and source is a valid empirical approach. For example, along the valence dimension, Cooper noted that the negatively reinforced motives – coping and conformity – are each positively associated with alcohol-related consequences, and suggested that this could be indicative of a more maladaptive drinking style than that reflected in the positively reinforced motives. Furthermore, individuals who drink to cope are more likely to exhibit problems irrespective of the amount of alcohol consumed; whereas, those drinking for social reasons do not exhibit abuse related problems independent of consumption level (Cooper, Russell, & George, 1988).
Subsequent research has confirmed a direct link between drinking to cope and alcohol-related consequences irrespective of level of use, whereas the association between enhancement motives and consequences is fully mediated through alcohol consumption (Cooper et al., 1995; Read, Wood, Kahler, Maddock, & Palfai, 2003; Simons, Gaher, Correia, et al., 2005). As noted earlier, those individuals who drink to cope might be exhibiting a more maladaptive drinking pattern; whereas those whose drinking is enhancement-related might have greater control over their choices of when and how much to drink (Cooper, 1994). Along the source dimension, Cooper noted that each of the internally-generated motives is positively associated with quantity and frequency of consumption.

*The Relationship between Drinking Motives and Affect*

Analyses of the intercorrelations among affective antecedents, drinking motives, alcohol consumption, and alcohol-related consequences have revealed a complex pattern of associations. Recent studies have examined the relationships among affect and the coping and enhancement strategies concurrently, and the results have consistently shown associations between both positive and negative affect and alcohol use (Armeli, Tennen, Affleck, & Kranzler, 2000; Hussong, Hicks, Levy, & Curran, 2001; Mohr, et al., 2005; Park, Armeli, & Tennen, 2004; Simons, Gaher, Oliver, et al., 2005) as well as positive and negative daily experiences and alcohol use (Carney, Armeli, Tennen, Affleck, & O’Neil, 2000; Mohr et al., 2001). Because it is an internal experience, it makes conceptual sense to assess affect as it relates to the internally-generated motives of
coping and enhancement, as these are more likely to be influenced by changes in affective state than are externally-generated motives. In general, positive affect has been linked to enhancement motivated drinking, whereas negative affect has been associated with drinking to cope (Cooper et al., 1995; Read et al., 2003).

_Affect Intensity and Lability_

In order to understand the affective experience over time it must be viewed as existing along two underlying dimensions (Diener, Larsen, Levine, & Emmons, 1985). The first dimension is _frequency_, or the number of times a positive or negative emotion is experienced over a given time, and the second is _intensity_, or how strongly the experience is felt. Diener and Emmons (1985) showed that the correlation between positive and negative affect varied depending on the time frame of the assessment. Over short periods of time, positive and negative affect are negatively correlated, suggesting that a person is unlikely to experience both positive and negative affect simultaneously. Over longer time frames, however, the two types of affect are relatively independent, with the smallest within-subject correlation (-.10) being obtained after a three-week period.

Affect intensity reflects the magnitude or strength of the response to emotionally evocative stimuli. Research has shown that individuals vary in the overall intensity of their affective responses to life events, whether these constitute standard life event descriptions or actual events as recorded by the individuals, and regardless of whether the affective response elicited was positive or negative (Larsen, Diener, & Emmons, 1986). Larsen and Diener (1987) subsequently demonstrated that affect intensity is a broad
individual difference characteristic that generalizes across specific emotions (average $r = .41$) and is highly correlated across the broad positive/negative domain (average $r = .70$ to .77). Thus, a person who experiences strong negative emotions also experiences strong positive emotions.

Surprisingly, a search of the extant literature revealed no studies that investigated affect intensity in the context of alcohol-related outcomes. One study found that affect intensity is negatively correlated with perceived emotional self-control (Flett, Blankstein, Bator, & Pliner, 1989). This finding has implications for alcohol research, in that, the heightened emotional vulnerability of individuals with high affect intensity could conceivably impact their ability to control consumption of alcohol when experiencing emotional extremes.

There also is evidence to suggest that assessing the dimensions of affect intensity and frequency concurrently is warranted. Using daily measurements of mood Diener et al. (1985) found that the dimensions of intensity and frequency of experienced affect are relatively independent. Affective lability, the frequency at which a person’s emotions fluctuate, could therefore, be an individual difference variable in its own right that can contribute to alcohol use and binge drinking. In fact, previous research has shown a positive association between affective lability and alcohol-related problems (Simons, 2003; Simons & Carey, 2006) exists even after controlling for gender and lifetime alcohol use (Simons, Carey, & Gaher, 2004) and age (Simons, Oliver, Gaher, Ebel, & Brummels, 2005). Thus, these two underlying dimensions of affect, intensity and lability, constitute individual difference characteristics which might potentially impact
alcohol use, and could explain some of the variance in the association between drinking motives and consumption.

*The Evaluation of Affect*

Because of the transient nature of affect, a precise assessment of the relationships among affect, drinking motives and alcohol consumption requires a fairly nuanced evaluation of the dynamics of a person’s emotional experience. Data collection methodologies vary with respect to the length of time over which the data are aggregated. One time, retrospective assessments, which typically assess factors based on the prior one month’s recall, can be used to determine, at best, trait characteristics of individuals and the general intercorrelations among those characteristics and their associated outcomes. They cannot adequately specify their temporal relations as prospective, event-level data can (Neal, Fromme, et al., 2006). In other words, retrospectively collected data can perhaps show an association between, say depression and increased alcohol consumption, but it cannot show whether an individual actually *drinks more when depressed.* Measurement methodologies that include event-level data, including ecological momentary assessment and experience sampling, assess a person’s affective state at the time it is experienced. Furthermore, event-level data collection can assess affect more proximally to the events to which it is being associated, thus providing a more precise picture of their associations in real time than global assessments that require retrospective recall. Prospective, event-level data collection takes advantage of the negative correlation between positive and negative affect found at the time of the experience
(Diener & Emmons, 1985). It does so by basing assessments in the natural environment and in real time, which minimizes recall bias (Trull, 2007). When used in the context of drinking, event-level data collection allows for a more ecologically valid appraisal of the contribution of affect to alcohol-related outcomes. Event level data collection also provides a more accurate assessment of the consistency of affective responses. By tracking affective responses over time, Diener and Larsen (1984) showed that overall mean levels of responses were quite stable, whereas individual responses were not, as they depended on the person, situation and type of response. From an idiographic perspective, they found individual differences in the overall consistency of responses, suggesting that some individuals are more consistent in their affective responses than others. These individual differences in consistency can be accurately captured only when assessed over time (Larsen, 1987).

Event-level research has revealed a complex association between affect and alcohol-related outcomes. For example, using experience sampling methods with college students, Simons and colleagues (Simons, Gaither, Oliver, et al., 2005) showed that both positive and negative daytime affect were positively associated with drinking that night, but only negative daytime affect was related to alcohol-related consequences that night. This relationship becomes even more complex when examined at the level of specific emotions. Three studies, all of which used daily measurement methodologies, revealed contingencies on the association between particular emotions and drinking. Swendsen et al. (2000) reported that nervousness was the only negative emotion associated with alcohol consumption in a community sample. On the other hand, Hussong, Galloway,
and Feagans (2005) showed that, among college students, sadness was negatively associated with drinking, and fear and shyness were positively associated with drinking only among those endorsing high drinking to cope motives. There was no correlation between negative affect and drinking among those endorsing low coping motives. Finally, Hussong et al. (2001) showed that guilt and fear were not associated with drinking, but hostility and sadness were.

Although a number of factors could potentially explain the inconsistencies among these emotion-specific findings, individual differences in the previously articulated dimensions of affect, intensity and lability, could be one possibility. To date, no study has examined affect intensity and affective lability concurrently in the context of alcohol use. It is possible that these two dimensions of mood variability differentially influence alcohol consumption. Specifically, strong mood fluctuations (high affect intensity) might increase the association between daily affect and the tendency to binge drink as compared to less intense mood fluctuations. Conversely, more frequent mood fluctuations (high affective lability) might result in a greater likelihood of binge drinking as compared to less frequent mood fluctuations, without necessarily influencing the association between daily affect levels and consumption.

Establishing that affect intensity and affective lability indeed have differential effects on binge drinking could have implications from the standpoint of intervention efforts to reduce heavy alcohol consumption. Individuals with high levels of affect intensity, whose drinking is associated with extremes of mood, could potentially benefit from an intervention strategy centered on the modulation of affect and/or the recognition
of intense mood swings and the avoidance of alcohol when they are present.

Comparatively, individuals with high levels of affective lability might benefit from a traditional approach aimed at decreasing alcohol consumption, but which also incorporates an educational component that provides awareness of the role that mood variability plays in increasing drinking levels in these people.

**Overview of Current Study**

The investigation into the relationships among drinking motives and their affective antecedents has resulted in inconsistent findings beyond the level of their overall intercorrelations. Although other factors certainly are relevant to a further evaluation of this relationship, the role of affect has yet to be fully determined. Evaluation of affect along its underlying dimensions of intensity and lability is a reasonable approach that will more accurately delineate their interrelationships with drinking motives. Furthermore, real-time measures of affect provide an opportunity to examine more precisely how they interact with motivation to influence the tendency to binge drink. Because binge drinking has been linked to alcohol-related problems (Wechsler et al., 1994), the ability to more accurately determine those most at risk for this problematic pattern of consumption is particularly important when considering intervention efforts aimed at reducing its likelihood.

The aim of the present study was to test the relationships among the affective antecedents to alcohol use, the motives individuals have for drinking, and the likelihood that they will binge drink. Two procedural strategies were combined in the present study
to achieve that objective. First, both affect intensity and affective lability were assessed concurrently in order to tease out the individual effects of each dimension of emotional experience on drinking behaviors. Second, in addition to one-time self-report assessments of these affect dimensions, experience sampling of mood via an electronic diary was used to obtain event-level data. By assessing affect in this way, a much richer measure of individual differences in mood variability was possible than that obtained from a single retrospective measure. Moreover, the assessment of mood more proximally to the actual time of alcohol use provided a more ecologically valid assessment of its relationship with alcohol consumption. A conceptual model of the proposed relationships among daily affect, affect intensity, affective lability, drinking motives, and binge drinking is provided in Fig. 1.

The following hypotheses are proposed: (1) both positive and negative state affect will be positively associated with binge drinking likelihood. (2) Individuals with higher levels of trait positive emotionality and stronger enhancement-motivated drinking will show a stronger positive association between state positive affect and binge drinking than those with lower levels of positive emotionality and weaker enhancement-motivated drinking. (3) Individuals with higher levels of trait negative emotionality and stronger coping-motivated drinking will show a stronger positive association between state negative affect and binge drinking than those with lower levels of negative emotionality and weaker coping-motivated drinking. (4) Individuals with higher levels of trait affective lability will be more likely to binge drink overall than those with lower levels of affective lability.
Fig. 1. Conceptual model of the proposed relationships among daily affect, affect intensity, affective lability, drinking motives, and the likelihood of binge drinking.
Method

The present study was conducted in two phases. First, participants made individual appointments to come to the lab for an initial assessment. After providing informed consent, participants completed both paper and pencil and computer administered questionnaires. Information provided on the paper and pencil questionnaires was examined to determine eligibility for the second phase of the study which involved completing a 28-day electronic diary (ED) using a palmtop computer. After providing additional informed consent for the second phase of the study, eligible participants were then instructed in the use of the palmtop computers by graduate and undergraduate research assistants. Data for the present study were collected as part of a larger project. Only the information relevant to the present study is presented here.

Participants

A total of 117 undergraduate students were recruited from a large state university in the Midwest. The sample consisted of 67% women \((n = 78)\), 87% Caucasian \((n = 102)\), 16% freshman \((n = 18)\), 31% sophomores \((n = 36)\), 31% juniors \((n = 36)\) and 22% seniors \((n = 26)\). The mean age of the sample was 20.12 years \((SD = 1.53)\). Participants were recruited through advertisements in the university newspaper and bulletin board postings soliciting volunteers for a study examining the day-to-day experiences of college drinkers, with a potential to earn up to $120 for participating. Data collection took place
over the Spring, Summer and Fall 2007 academic semesters.

*Power Analysis*

Power estimates for the proposed analyses (see Analytic Strategy below) based on analytic formulas and assumptions regarding effect sizes (e.g., Cohen, 1988) were not available; therefore power analyses were carried out via simulation. In the absence of reasonable effect sizes, a series of simplifying assumptions was made. The count outcomes (number of drinks consumed) was assumed to be equal to 1.0 and standardized effect sizes (Incidence Rates; IR) were assumed to be equal to 1.05, 1.20 and 1.50, representing small to moderate effect sizes. Note that an IR = 1.20 represents a change from 1 to 2.07 drinks for the entire range of measured daily affect. Power simulations were conducted for sample sizes ranging from 100 to 500. The results indicated sufficient power (i.e., > .90) for moderate effect sizes (IR = 1.20 and above) at N = 100. Thus, a sample size of 117 should provide sufficient power for testing both between- and within-person hypotheses, including interaction terms, for a range of plausible data characteristics, for at least moderate effect sizes. Moreover, this sample size exceeds those of previous studies which used an experience sampling methodology and a similar analytic strategy (e.g., Armeli et al., 2000; Carney et al., 2000; Mohr, et al., 2001; Simons, Gaher, Oliver, et al., 2005).

*Questionnaires.*

*Contact Information.* Participants filled out a contact information form to allow
investigators to provide periodic reminders via telephone or email.

**Demographics.** Age, gender, class level, grade point average (GPA), ethnicity, residence, and fraternity/sorority membership were obtained.

**Daily Drinking Questionnaire.** The DDQ (Collins, Parks, & Marlatt, 1985) assessed the typical frequency and quantity of alcohol consumption. Participants reported the average number of drinks consumed and the number of hours spent drinking each day on a typical week during the previous month. In addition, single-item assessments were obtained for the previous month’s frequency of alcohol consumption, frequency of drinking to intoxication, frequency of binge drinking (i.e., five or more drinks for men, four or more drinks for women), and maximum number of drinks consumed in a single session. Single-item assessments of age of first drink, age of first regular drinking, and any abstinence periods also were obtained.

**Rutgers Alcohol Problem Index.** The RAPI (White & Labouvie, 1989) is a 23-item measure that assesses a wide range of alcohol-related consequences of varying severity. The RAPI assesses the frequency of occurrence of each problem in the past month on a 5-point scale, with anchors of 0 = 0 times, 4 = 11+ times. In college student samples the RAPI has demonstrated excellent test-retest reliabilities of .89 to .92 over periods ranging from one month to one year (Miller et al., 2002), has shown good convergent validity, and is a useful tool for differentiating between individuals with clinically significant drinking histories from those with non-clinical drinking patterns (Neal, Corbin, & Fromme, 2006).

**Drinking Motives Questionnaire.** The DMQ (Cooper, 1994) is a 20-item measure
that assesses motivations for drinking. The DMQ assesses four factors consistent with Cooper’s 4-factor model of drinking motives: *enhancement, coping, social and conformity*. These four factors, though moderately intercorrelated ($r_s = .16$ to .68) have shown good internal consistency ($\alpha = .84$ to .88). In the present study only the enhancement and coping scores were used. Cronbach’s $\alpha$ for the present study were .90 for enhancement and .84 for coping.

*Short Affect Intensity Scale.* The SAIS (Geuens & De Pelsmacher, 2002) consists of 20 items taken from the original 40-item Affect Intensity Measure (AIM) questionnaire (Larsen & Diener, 1987). Items in the SAIS describe affective reactions to typical life events and assess how often the individual reacts in this manner on a 6-point scale, with anchors of 1 = Never, 6 = Always. Factor analytic studies have shown that both the AIM (Bryant, Yarnold, & Grimm, 1996; Weinfurt, Bryant, & Yarnold, 1994) and the SAIS (Geuens & De Pelsmacher) assess three factors associated with affect: positive emotionality, negative emotionality and serenity. In addition, a growing body of evidence from research using the total AIM score as a unitary measure of individual differences in affective experience has shown it to be temporally stable, situationally consistent and conceptually related to many other constructs (Weinfurt et al., 1994). The SAIS has also been shown to be a reliable and valid measure, with a coefficient $\alpha$ of .88 for the total score that is comparable to the coefficient $\alpha$ of .90 to .94 reported for the AIM. Furthermore, scores obtained with the SAIS have been shown to be very highly correlated ($r = .94$) with those obtained with the AIM (Geuens & De Pelsmacher). In the current study, because the three factors were not highly correlated ($r_s = -.02$ to -.32), the
positive emotionality and negative emotionality scores \( (r = .18) \) were tested separately for enhancement and coping motivated drinking respectively. Cronbach’s \( \alpha \) for the current study were .89 for positive and .64 for negative emotionality.

*Affective Lability Scales – Short Form.* The ALS-SF (Oliver & Simons, 2004) consists of 18 items taken from the original 54-item Affective Lability Scales questionnaire (ALS; Harvey, Greenberg, & Serper, 1989). The ALS-SF assesses the degree to which each item describes the individual on a 4-point scale, with anchors of 1 = Very undescriptive, 4 = Very descriptive. Both the ALS and the ALS-SF assess three factors related to affective lability: anxiety/depression, depression/elation and anger. The originators of the ALS-SF (Oliver & Simons) report an improved factor structure over that of the original ALS, construct validity and test-retest reliability \( (r = .73 \) for total score) comparable to the ALS, high internal consistency \( (r = .90 \) for total score), and total scores that are highly correlated with those obtained with the ALS \( (r = .94) \). In the current study, because the three factors were moderately intercorrelated \( (rs = .48 \) to .63\), the total score was used as a unitary measure of affective lability. Cronbach’s \( \alpha \) for the present study for the total score was .90.

*Experience Sampling Measures*

Event-level data were obtained using palmOne™ Tungsten™ E2 palmtop computers, programmed with PMAT software (Weiss, Beal, Lucy, & MacDermid, 2004).

*Daily (State) Affect.* Daily affect was assessed using selected adjectives from the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) and
the Global Mood Scale (GMS; Denollet, 1993). Each item assessed the extent to which the individual was experiencing this emotion on a 5-point scale, with response options of 0 = Not at all, 1 = A Little Bit, 2 = Moderately, 3 = Quite a bit, 4 = Very Much. Positive affect was assessed with items determined, enthusiastic, cheerful, relaxed, and sociable. Negative affect was assessed with items scared, distressed, upset, nervous, ashamed, and guilty. Affect was assessed up to 5 times daily. Scores were averaged across all daily assessments to yield an average positive and negative affect score for each day.

*Daily Alcohol Consumption.* Participants reported the number of standard drinks they consumed at the completion of each episode where they consumed at least one alcoholic beverage. Up to 30 drinks could be recorded for each drinking episode, and a maximum of three drinking episodes could be reported each day. In addition, every morning participants reported the total number of drinks consumed the previous day.

*Procedure*

After providing informed consent, participants completed paper and pencil versions of the contact information form, the demographics form, the DDQ, and the RAPI. Information provided on these measures was examined to determine eligibility for the electronic diary (ED) phase of the study. Inclusion criteria for the second phase consisted of a history of at least one episode of binge drinking (five drinks in a row for men, four drinks in a row for women) in the previous month. Participants were excluded for ethical reasons if they endorsed items on the RAPI indicative of potential alcohol dependence. These participants were referred to one of several local mental health
organizations. As eligibility was being determined, the participants completed computer administered versions of the Drinking Motives Questionnaire, the SAIS, and the ALS-SF.

Eligible participants, after providing additional informed consent for the second phase of the study, were provided instruction in the use of the palmtop computers by a graduate or undergraduate research assistant. The orientation to the ED protocol was manualized and included several verbatim practice scenarios in order to maximize participant familiarity with and comprehension of all assessment items used in the protocol.

Four types of daily assessments were obtained: daily morning reports, pre-drinking reports, post-drinking reports, and random prompts signaled by the palmtop computer. Participants initiated morning reports upon waking for each day of the 28-day session. Participants recorded their current affect via the state affect variables as well as their previous day’s alcohol consumption. Participants initiated pre-drinking reports at the onset of each drinking episode where at least one alcoholic beverage was likely to be consumed. Up to 3 drinking episodes could be reported each day. Participants initiated a post-drinking report at the end of each drinking episode. In the post-drinking report participants recorded the total number of drinks consumed during that episode. The palmtop computer also signaled the participants to complete an assessment at random intervals each day. An average of four of these random prompts occurred between the hours of 12:00 noon and 8:00 PM. Participants reported their current affect via the state affect items at each prompt.

Following the 28-day monitoring period, participants returned the palmtop
computers. The data were downloaded and examined in order to determine the final compensation amount, which was based on the number of reports completed, and additional incentives included to maximize compliance. Participants received $11 for completing the initial questionnaire battery and ED orientation session. Participants who took part in the ED phase of the study received $3 for each completed day of the 28 day protocol. Incentives included an additional $5 for completing 90% of the random prompts, $10 for completing 90% of the morning reports, and $10 for completing 90% of the post-drinking reports. Meeting all minimum criteria resulted in a total compensation of $120.
Results

*Initial Data Screening*

An examination of the distributional characteristics of all predictor variables revealed no substantial deviations from normality, with the exception of the daily negative affect variable, which was positively skewed. Further exploration revealed, however, that there was no evidence of problematic observations or excessive outliers in this or any of the other predictors. The original proposed outcome variable, Drinks per Drinking Day, was highly positively skewed with excessive zeroes, as is typical for count data of behaviors of this nature. Although techniques exist for analyzing non-normally distributed data (e.g., zero inflated Poisson, negative binomial), the Drinks per Drinking Day data were a poor fit even to these types of skewed distributions. Transformation would not correct this level of skew and would have complicated interpretation of results. Because binge drinking has been associated with alcohol-related problems in this population, the Drinks per Drinking Day variable was recoded as a dichotomized binge/no binge outcome, based on the 5/4 binge drinking criterion (Wechsler et al., 1999) as applied to the participants’ reported consumption levels for each day. Thus, the present study investigated the likelihood of binge drinking, a more direct indicator of potentially problematic consumption, rather than the prediction of a more general overall daily consumption level, which may or may not have included heavy episodic (binge) drinking.
Analytic Strategy

Multilevel logistic regression analysis (e.g., Hox, 2002) was used to test relationships among daily positive and negative affect, affect intensity, affective lability, drinking motives, and binge drinking in college undergraduates. Descriptive statistics for each of these variables by gender are displayed in Table 1. The dichotomous outcome (daily binge drinking) was established by determining whether or not a participant had reported consuming a number of drinks consistent with the 5/4 binge drinking criteria or higher (Wechsler et al., 1999) on a given day. Models were treated as nested, with days (level 1) nested within individuals (level 2). Level 1 predictors consisted of state positive and negative affect. These values were person-centered in order to reflect deviations above and below each participant’s typical affect recorded over the assessment period. Level 2 predictors consisted of the positive and negative emotionality scores from the SAIS, the ALS total score and the DMQ enhancement and coping motives scores.
Table 1.

Means, standard deviations and bivariate correlations among the study variables, by gender

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<th>Variable</th>
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<td>Age</td>
<td>19.85 (1.33)</td>
<td>20.67 (1.77)</td>
<td>19.85</td>
<td>20.67</td>
<td>-16***</td>
<td>.10**</td>
<td>.30***</td>
<td>.41***</td>
<td>.16***</td>
<td></td>
</tr>
<tr>
<td>1. Drinks per DD</td>
<td>4.85 (1.95)</td>
<td>7.68 (3.96)</td>
<td>4.85</td>
<td>7.68</td>
<td>-.23***</td>
<td>.44***</td>
<td>.13***</td>
<td>-1.15**</td>
<td>-1.13***</td>
<td></td>
</tr>
<tr>
<td>2. Daily Positive Affect</td>
<td>1.94 (0.67)</td>
<td>2.26 (0.74)</td>
<td>1.94</td>
<td>2.26</td>
<td>.06</td>
<td>.08*</td>
<td>.18***</td>
<td>.02</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td>3. Daily Negative Affect</td>
<td>0.49 (0.63)</td>
<td>0.46 (0.45)</td>
<td>0.49</td>
<td>0.46</td>
<td>.13</td>
<td>-.21**</td>
<td>.18</td>
<td>.12</td>
<td>—</td>
<td>.29***</td>
</tr>
<tr>
<td>4. SAIS-PE</td>
<td>4.26 (0.87)</td>
<td>4.29 (0.78)</td>
<td>4.26</td>
<td>4.29</td>
<td>.28*</td>
<td>.15</td>
<td>—</td>
<td>.36***</td>
<td>.07*</td>
<td>.08*</td>
</tr>
<tr>
<td>5. SAIS-NE</td>
<td>3.66 (0.84)</td>
<td>3.26 (0.76)</td>
<td>3.66</td>
<td>3.26</td>
<td>-.21</td>
<td>-.22*</td>
<td>.18</td>
<td>.12</td>
<td>—</td>
<td>.54***</td>
</tr>
<tr>
<td>6. ALS-Total</td>
<td>2.06 (0.54)</td>
<td>2.01 (0.53)</td>
<td>2.06</td>
<td>2.01</td>
<td>-.47***</td>
<td>.46***</td>
<td>-.09</td>
<td>.49***</td>
<td>—</td>
<td>.21***</td>
</tr>
<tr>
<td>7. DMQ-Enh</td>
<td>3.34 (0.84)</td>
<td>3.38 (0.91)</td>
<td>3.34</td>
<td>3.38</td>
<td>.24*</td>
<td>-.22</td>
<td>.21</td>
<td>.13</td>
<td>.08</td>
<td>—</td>
</tr>
<tr>
<td>8. DMQ-Cop</td>
<td>2.33 (1.01)</td>
<td>2.01 (0.86)</td>
<td>2.33</td>
<td>2.01</td>
<td>-.16</td>
<td>-.22*</td>
<td>.21</td>
<td>-.18</td>
<td>.30**</td>
<td>.38***</td>
</tr>
</tbody>
</table>

Note: SD = Standard deviation; Drinks per DD = Drinks per Drinking Day; SAIS-PE = Short Affect Intensity Scale-Positive Emotionality Score; SAIS-NE = Short Affect Intensity Scale-Negative Emotionality Score; ALS-Total = Affective Lability Scale (Short Form)-Total Score; DMQ-Enh = Drinking Motives Questionnaire-Enhancement Motives Score; DMQ-Cop = Drinking Motives Questionnaire-Coping Motives Score

* p < .05   ** p < .01   *** p < .001
Analyses were conducted separately for men and women as gender differences in drinking outcomes have been found in previous research (see Nolen-Hoeksema & Hilt, 2006; Wilsnack et al., 2000 for reviews). Splitting the sample by gender reduced statistical power; however, this strategy was chosen over that of including gender as a predictor in order to preserve degrees of freedom and limit the number and complexity of interactions to be assessed.

A model building process was used to assess the relationships among the study variables. All models included 6 day-of-week indicators in order to control for differences in alcohol consumption and affect across the week. Models were built as follows: (1) Initial models tested the level 1 (within-person) main effects alone. This allowed for the determination of whether or not within-person differences in state affect predicted the likelihood of binge drinking on a daily basis. (2) The level 2 (between-person) main effects were added, which determined whether or not trait dimensions of affect (intensity or lability) or drinking motives predicted the likelihood of binge drinking across the protocol period. (3) The 2-way interactions were added. This allowed for the determination of whether or not the affect dimensions or drinking motives interacted to predict binge drinking, or moderated the effect of daily affect on the likelihood of binge drinking (cross-level interaction). (4) The 3-way interactions were tested in order to determine whether or not drinking motives and affect dimensions together moderated the effect of daily affect on the likelihood of binge drinking. Results are presented by gender.
Daily Affect and Binge Drinking

*Level 1 Main Effects.* The initial models assessed the associations among daily positive and negative affect and binge drinking. It was expected that higher levels of positive and negative daily affect would each predict a higher odds of binge drinking in both women and men.

For women (see Table 2), the omnibus test was statistically significant, $\chi^2(8, N = 78) = 110.92, p < .0001$. The main effect for daily positive affect was statistically significant, odds ratio (OR) = 1.65, $z = 3.95, p < .001$. These results indicate that a one unit increase in a woman’s level of daily positive affect (5-point scale) is associated with a 65% increase in her odds of binge drinking that day. The main effect for daily negative affect was not statistically significant, however, OR = 0.94, $z = -0.33, p = .741$. 
Table 2.

Odds ratios, standard errors and significance levels of the predictors interpreted in the models of affect intensity for women

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Women</th>
<th>OR (SE)</th>
<th>z</th>
<th>Sig.</th>
<th>95% C. I. for the OR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Level 1 Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily Pos. Affect</td>
<td></td>
<td>1.65 (0.21)</td>
<td>3.95</td>
<td>.000</td>
<td>1.29 2.12</td>
</tr>
<tr>
<td>Daily Neg. Affect</td>
<td></td>
<td>0.94 (0.17)</td>
<td>-0.33</td>
<td>.741</td>
<td>0.66 1.34</td>
</tr>
<tr>
<td><strong>Level 2 Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAIS-PE</td>
<td></td>
<td>0.95 (0.11)</td>
<td>-0.43</td>
<td>.670</td>
<td>0.75 1.20</td>
</tr>
<tr>
<td>SAIS-NE</td>
<td></td>
<td>0.86 (0.11)</td>
<td>-1.19</td>
<td>.236</td>
<td>0.68 1.10</td>
</tr>
<tr>
<td>DMQ-Enh</td>
<td></td>
<td>1.09 (0.15)</td>
<td>0.62</td>
<td>.537</td>
<td>0.84 1.41</td>
</tr>
<tr>
<td>DMQ-Cop</td>
<td></td>
<td>1.03 (0.11)</td>
<td>0.25</td>
<td>.801</td>
<td>0.83 1.28</td>
</tr>
<tr>
<td><strong>Level 2 Interactions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMQ-Enh x SAIS-PE</td>
<td></td>
<td>1.08 (0.14)</td>
<td>0.57</td>
<td>.571</td>
<td>0.84 1.38</td>
</tr>
<tr>
<td>DMQ-Cop x SAIS-NE</td>
<td></td>
<td>0.89 (0.11)</td>
<td>-1.00</td>
<td>.319</td>
<td>0.70 1.22</td>
</tr>
<tr>
<td><strong>Cross-Level Interactions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAIS-PE x Daily Pos.</td>
<td></td>
<td>1.07 (0.05)</td>
<td>1.50</td>
<td>.134</td>
<td>0.98 1.17</td>
</tr>
<tr>
<td>SAIS-NE x Daily Neg.</td>
<td></td>
<td>1.07 (0.08)</td>
<td>0.88</td>
<td>.377</td>
<td>0.93 1.23</td>
</tr>
<tr>
<td>DMQ-Enh x Daily Pos.</td>
<td></td>
<td>0.92 (0.13)</td>
<td>-0.58</td>
<td>.562</td>
<td>0.70 1.22</td>
</tr>
<tr>
<td>DMQ-Cop x Daily Neg.</td>
<td></td>
<td>1.22 (0.22)</td>
<td>1.11</td>
<td>.266</td>
<td>0.86 1.74</td>
</tr>
</tbody>
</table>

*Note:* Day of week indicators are not included in this table; OR = Odds Ratio; SE = Standard Error; Sig. = Significance at α = .05; C. I. = Confidence Interval; SAIS-PE = Short Affect Intensity Scale-Positive Emotionality; SAIS-NE = Short Affect Intensity Scale-Negative Emotionality; DMQ-Enh = Drinking Motives Questionnaire-Enhancement Motives; DMQ-Cop = Drinking Motives Questionnaire-Coping Motives.
For men (see Table 3), the omnibus test was statistically significant, $\chi^2(8, N = 39) = 81.39, p < .0001$. The results differed from those obtained for women, however. For men, the main effect for daily negative affect was statistically significant, OR = 0.51, $z = -2.24, p = .025$. These results indicate that a one unit increase in a man’s level of daily negative affect (5-point scale) is associated with a 51% decrease in his odds of binge drinking that day. The main effect for daily positive affect was not statistically significant, however, OR = 1.26, $z = 1.17, p = .241$. 
Table 3.

Odds ratios, standard errors and significance levels of the predictors interpreted in the models of affect intensity for men

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Men</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OR (SE)</td>
<td>z</td>
<td>Sig.</td>
<td>95% C. I. for the OR</td>
</tr>
<tr>
<td>Level 1 Main Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily Pos. Affect</td>
<td>1.26 (0.24)</td>
<td>1.17</td>
<td>.241</td>
<td>0.86</td>
<td>1.83</td>
</tr>
<tr>
<td>Daily Neg. Affect</td>
<td>0.51 (0.15)</td>
<td>-2.24</td>
<td>.025</td>
<td>0.29</td>
<td>0.92</td>
</tr>
<tr>
<td>Level 2 Main Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAIS-PE</td>
<td>0.89 (0.17)</td>
<td>-0.58</td>
<td>.563</td>
<td>0.61</td>
<td>1.31</td>
</tr>
<tr>
<td>SAIS-NE</td>
<td>1.38 (0.31)</td>
<td>1.42</td>
<td>.155</td>
<td>0.89</td>
<td>2.15</td>
</tr>
<tr>
<td>DMQ-Enh</td>
<td>1.52 (0.31)</td>
<td>2.05</td>
<td>.040</td>
<td>1.02</td>
<td>2.26</td>
</tr>
<tr>
<td>DMQ-Cop</td>
<td>1.03 (0.22)</td>
<td>0.12</td>
<td>.902</td>
<td>0.67</td>
<td>1.57</td>
</tr>
<tr>
<td>Level 2 Interactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMQ-Enh x SAIS-PE</td>
<td>1.29 (0.33)</td>
<td>1.02</td>
<td>.308</td>
<td>0.79</td>
<td>2.12</td>
</tr>
<tr>
<td>DMQ-Cop x SAIS-NE</td>
<td>1.34 (0.32)</td>
<td>1.25</td>
<td>.211</td>
<td>0.85</td>
<td>2.13</td>
</tr>
<tr>
<td>Cross-Level Interactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAIS-PE x Daily Pos.</td>
<td>1.17 (0.08)</td>
<td>2.16</td>
<td>.030</td>
<td>1.01</td>
<td>1.35</td>
</tr>
<tr>
<td>SAIS-NE x Daily Neg.</td>
<td>1.20 (0.15)</td>
<td>1.44</td>
<td>.149</td>
<td>0.94</td>
<td>1.53</td>
</tr>
<tr>
<td>DMQ-Enh x Daily Pos.</td>
<td>1.68 (0.38)</td>
<td>-0.58</td>
<td>.562</td>
<td>0.70</td>
<td>1.22</td>
</tr>
<tr>
<td>DMQ-Cop x Daily Neg.</td>
<td>1.22 (0.22)</td>
<td>2.33</td>
<td>.020</td>
<td>1.09</td>
<td>2.61</td>
</tr>
</tbody>
</table>

Note: Day of week indicators are not included in this table; OR = Odds Ratio; SE = Standard Error; Sig. = Significance at α = .05; C. I. = Confidence Interval; SAIS-PE = Short Affect Intensity Scale-Positive Emotionality; SAIS-NE = Short Affect Intensity Scale-Negative Emotionality; DMQ-Enh = Drinking Motives Questionnaire-Enhancement Motives; DMQ-Cop = Drinking Motives Questionnaire-Coping Motives
**Affect Intensity and Binge Drinking for Women**

**Level 2 Main Effects.** The level 2 predictors were then added to the model to assess the associations among affect intensity, drinking motives and binge drinking (see Table 2). These predictors included the positive and negative emotionality scores from the SAIS, and the enhancement and coping motives scores from the DMQ. It was predicted that higher levels of reported positive and negative emotionality, as well as higher levels of reported coping and enhancement motives would each predict a higher odds of binge drinking.

The omnibus test was statistically significant, $\chi^2(12, N = 78) = 112.54, p < .0001$. The addition of the level 2 main effects did not result in a statistically significant $\chi^2$ change, however, $\chi^2(4, N = 78) = 2.09, p = .719$. None of the level 2 predictors statistically significantly predicted binge drinking in women, (all $ps > .20$).

**2-Way Interactions.** The 2-way interactions among the level 1 and level 2 predictors were then added to the models to assess their interrelationships (see Table 2). The following 2-way interactions were included: positive emotionality X daily positive affect, negative emotionality X daily negative affect, enhancement motives X positive emotionality, coping motives X negative emotionality, enhancement motives X daily positive affect, and coping motives X daily negative affect. It was predicted that higher reported levels of each variable in each interaction would predict a higher odds of binge drinking.

The omnibus test was statistically significant, $\chi^2(18, N = 78) = 115.90, p < .0001$. The addition of the 2-way interactions did not result in a statistically significant $\chi^2$
change, however, $\chi^2(6, N = 78) = 5.39, p = .495$. None of the 2-way interactions was statistically significant, (all $ps > .13$).

3-Way Interactions. The final model included the 3-way interaction terms among the level 1 and level 2 predictors (see Table 2). The following 3-way interactions were included: enhancement motives X positive emotionality X daily positive affect, and coping motives X negative emotionality X daily negative affect. Most importantly, these final sets of models tested the hypotheses that higher reported levels of affect intensity would be associated with a stronger relationship between daily affect and binge drinking than lower levels of affect intensity, with daily positive affect influencing enhancement motivated drinking, and daily negative affect influencing drinking to cope. It was predicted that higher reported levels of each of the predictors in each interaction would predict a higher odds of binge drinking.

The omnibus test was statistically significant, $\chi^2(2, N = 78) = 116.57, p < .0001$. The addition of the 3-way interactions did not result in a statistically significant $\chi^2$ change, however, $\chi^2(2, N = 78) = 1.18, p = .554$. Neither of the 3-way interactions was statistically significant, ($ps > .29$). Contrary to the study hypotheses, affect intensity did not interact with daily affect and drinking motives to predict binge drinking in women.

Affect Intensity and Binge Drinking for Men

Level 2 Main Effects. The omnibus test was statistically significant, $\chi^2(12, N = 39) = 89.12, p < .0001$. Moreover, the addition of the level 2 main effects to the model resulted in a statistically significant $\chi^2$ change, $\chi^2(4, N = 39) = 12.00, p = .017$. Table 3
displays the results of this analysis. The main effect for enhancement motivated drinking was statistically significant, OR = 1.52, z = 2.05, p = .04. These results indicate that individuals reporting a drinking to enhance score one point higher than the mean for the sample (5-point scale) had a 52% higher odds of binge drinking than the average participant. None of the other level 2 predictors statistically significantly predicted binge drinking in men (all ps > .15).

2-Way Interactions. The 2-way interactions among the level 1 and level 2 predictors were then added to the models to assess their interrelationships (see Table 3). The following 2-way interactions were included: positive emotionality X daily positive affect, negative emotionality X daily negative affect, enhancement motives X positive emotionality, coping motives X negative emotionality, enhancement motives X daily positive affect, and coping motives X daily negative affect. It was predicted that higher reported levels of each variable in each interaction would predict a higher odds of binge drinking.

The omnibus test was statistically significant, $\chi^2(18, N = 39) = 101.26, p < .0001$. The addition of the 2-way interactions also resulted in a statistically significant $\chi^2$ change, $\chi^2(6, N = 39) = 16.35, p = .012$. The interaction between positive emotionality and daily positive affect was statistically significant, OR = 1.17, z = 2.16, p = .03. See Fig. 2 for a graph of this interaction. These results indicate that men endorsing higher trait levels of positive emotionality show a stronger positive relationship between daily positive affect and binge drinking than do those who endorse lower levels of positive emotionality. The
results also showed that the interaction between enhancement motives and daily positive affect was statistically significant, OR = 1.68, z = 2.33, p = .02. See Fig. 3 for a graph of this interaction. These results indicate that the odds of binge drinking increase as daily positive affect increases only in men who endorse a stronger tendency to drink to enhance relative to their peers. None of the other 2-way interactions was statistically significant (all ps > .14).

Fig. 2. Interaction between positive emotionality and daily positive affect for men
Fig. 3. Interaction between enhancement motives and daily positive affect for men
**3-Way Interactions.** The final model included the 3-way interaction terms among the level 1 and level 2 predictors (see Table 3). The following 3-way interactions were included: enhancement motives X positive emotionality X daily positive affect, and coping motives X negative emotionality X daily negative affect. Most importantly, these final sets of models tested the hypotheses that higher reported levels of affect intensity would be associated with a stronger relationship between daily affect and binge drinking than lower levels of affect intensity, with daily positive affect influencing enhancement motivated drinking, and daily negative affect influencing drinking to cope. It was predicted that higher reported levels of each of the predictors in each interaction would predict a greater likelihood of binge drinking.

The omnibus test was statistically significant, \( \chi^2(20, N = 39) = 99.37, p < .0001 \). The addition of the 3-way interactions did not result in a statistically significant \( \chi^2 \) change, however, \( \chi^2(2, N = 39) = 0.22, p = .896 \). Just as for the women, neither of the 3-way interactions was statistically significant \( (ps > .73) \). Again, contrary to the study’s hypotheses, affect intensity did not interact with drinking motives and daily affect to predict binge drinking in men.

**Affective Lability and Binge drinking for Women**

The level 2 predictor affective lability total score was added to the level 1 predictors in the models that assessed the association of this dimension of affect to binge drinking. It was hypothesized that individuals with higher levels of affective lability will show a higher odds of binge drinking than those with lower levels of affective lability.
Although the omnibus test was statistically significant, $\chi^2(9, N = 78) = 111.17, p < .0001$, the main effect for affective lability was not statistically significant, $p = .58$ (see Table 4). Contrary to the study’s hypothesis, affective lability was not associated with the overall odds of binge drinking in women.
Table 4.

Odds ratios, standard errors and significance levels of the predictors interpreted in the models of affective lability for women

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Women</th>
<th>OR (SE)</th>
<th>z</th>
<th>Sig.</th>
<th>95% C. I. for the OR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1 Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily Pos. Affect</td>
<td></td>
<td>1.65 (0.21)</td>
<td>3.95</td>
<td>.000</td>
<td>1.29 2.12</td>
</tr>
<tr>
<td>Daily Neg. Affect</td>
<td></td>
<td>0.94 (0.17)</td>
<td>-0.33</td>
<td>.738</td>
<td>0.66 1.34</td>
</tr>
<tr>
<td><strong>Level 2 Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALS-Total</td>
<td></td>
<td>0.90 (0.17)</td>
<td>-0.55</td>
<td>.580</td>
<td>0.63 1.30</td>
</tr>
<tr>
<td>DMQ-Enh</td>
<td></td>
<td>1.06 (0.14)</td>
<td>0.41</td>
<td>.678</td>
<td>0.82 1.36</td>
</tr>
<tr>
<td>DMQ-Cop</td>
<td></td>
<td>1.05 (0.12)</td>
<td>0.40</td>
<td>.689</td>
<td>0.83 1.32</td>
</tr>
<tr>
<td><strong>Level 2 Interactions</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMQ-Enh x ALS-Total</td>
<td></td>
<td>1.31 (0.32)</td>
<td>1.09</td>
<td>.276</td>
<td>0.81 2.12</td>
</tr>
<tr>
<td>DMQ-Cop x ALS-Total</td>
<td></td>
<td>1.10 (0.22)</td>
<td>0.47</td>
<td>.636</td>
<td>0.74 1.64</td>
</tr>
<tr>
<td><strong>Cross-Level Interactions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALS-Total x Daily Pos.</td>
<td></td>
<td>0.97 (0.24)</td>
<td>-0.11</td>
<td>.910</td>
<td>0.59 1.58</td>
</tr>
<tr>
<td>ALS-Total x Daily Neg.</td>
<td></td>
<td>1.47 (0.61)</td>
<td>0.93</td>
<td>.352</td>
<td>0.65 3.31</td>
</tr>
</tbody>
</table>

*Note:* Day of week indicators are not included in this table; OR = Odds Ratio; SE = Standard Error; Sig. = Significance at $\alpha = .05$; C. I. = Confidence Interval; ALS-Total = Affective Lability Scale (Short Form)-Total; DMQ-Enh = Drinking Motives Questionnaire-Enhancement Motives; DMQ-Cop = Drinking Motives Questionnaire-Coping Motives
Affective Lability and Binge Drinking for Men

Just as for women, although the omnibus test was statistically significant, $\chi^2(9, N = 39) = 83.46, p < .0001$, the main effect for affective lability was not statistically significant, $p = .07$ (see Table 5). Again, contrary to the study’s hypothesis, affective lability was not associated with the overall odds of binge drinking in men.

Although the main effect for affective lability was not statistically significant, it was subsequently hypothesized that affective lability interacts with other variables included in the model. To test this possibility, a series of exploratory analyses was conducted. A model building process similar to that used in the affect intensity analyses was employed, except that both the level 1 and level 2 main effects were included in the initial model, followed by the addition of the 2-way interactions, and finally, the 3-way interactions. Again, separate analyses were conducted for each gender. The initial exploratory models included the positive and negative daily affect scores, the DMQ enhancement and coping motives scores and the affective lability total score. Because these were exploratory analyses, no a priori hypotheses were assumed with respect to the outcomes.

Results for Women

The omnibus tests of all models, the level 1 and level 2 main effects, the 2-way and the 3-way interactions, were statistically significant; however, none of the main effects or interactions in any of the models was statistically significant (all ps > .07). Table 4 displays the results of these analyses. In women, affective lability did not
interact with drinking motives and/or daily affect to predict binge drinking.

Results for Men

The omnibus test of the model assessing the level 1 and level 2 main effects was statistically significant, $\chi^2(11, N = 39) = 88.87, p < .0001$. The addition of the level 2 predictors also resulted in a statistically significant $\chi^2$ change, $\chi^2(3, N = 39) = 11.40, p = .01$. Table 5 displays the results of these analyses. Again, the main effect for daily negative affect was statistically significant, OR = .53, $z = -2.17, p = .03$, indicating a lower odds of binge drinking with higher levels of daily negative affect in men. The main effect for enhancement motivated drinking also was significant, OR = 1.53, $z = 2.05, p = .04$. As noted earlier, men reporting a stronger tendency to drink to enhance had a higher odds of binge drinking than men with lower drinking to enhance scores. The remaining main effects were not statistically significant (all $ps > .18$).
Table 5.

Odds ratios, standard errors and significance levels of the predictors interpreted in the models of affective lability for men

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Men</th>
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<tbody>
<tr>
<td></td>
<td>Predictor</td>
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<tr>
<td>Level 1 Main Effects</td>
<td>Daily Pos. Affect</td>
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<td></td>
<td>Daily Neg. Affect</td>
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<tr>
<td>Level 2 Main Effects</td>
<td>ALS-Tot</td>
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<td></td>
<td>DMQ-Enh</td>
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<td></td>
<td>DMQ-Cop</td>
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<tr>
<td>Level 2 Interactions</td>
<td>DMQ-Enh x ALS-Tot</td>
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<td></td>
<td>DMQ-Cop x ALS-Tot</td>
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<tr>
<td>Cross-Level Interactions</td>
<td>ALS-Tot x Daily Pos.</td>
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<tr>
<td></td>
<td>ALS-Tot x Daily Neg.</td>
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Note: Day of week indicators are not included in this table; OR = Odds Ratio; SE = Standard Error; Sig. = Significance at α = .05; C. I. = Confidence Interval; ALS-Tot = Affective Lability Scale (Short Form)-Total; DMQ-Enh = Drinking Motives Questionnaire-Enhancement Motives; DMQ-Cop = Drinking Motives Questionnaire-Coping Motives
The omnibus test of the model assessing the 2-way interactions was statistically significant, $\chi^2(17, N = 39) = 97.38, p < .0001$. Although the addition of the 2-way interactions did not result in a statistically significant $\chi^2$ change, $\chi^2(6, N = 39) = 11.40, p = .06$, this was likely due to the fact that four of the six interaction terms were non-significant, thereby attenuating their overall significance when assessed in combination.

The interaction between coping motives and affective lability was statistically significant, OR = 3.11, $z = 2.18, p = .03$. See Fig. 4 for a graph of this interaction. Men who strongly endorse both coping motives and affective lability had a higher odds of binge drinking than men who did not strongly endorse these factors. The interaction between enhancement motives and daily positive affect also was statistically significant, OR = 1.72, $z = 2.18, p = .03$. As noted earlier, a higher level of daily positive affect was associated with an increase in the odds of binge drinking only for men reporting stronger drinking to enhance motives relative to their peers. The remaining 2-way interactions were not statistically significant (all ps > .27).
Fig. 4. Interaction between coping motives and affective lability for men
Although the omnibus test of the model for the 3-way interactions was statistically significant, $\chi^2(19, N = 39) = 97.40, p < .0001$, the addition of the 3-way interactions did not result in a statistically significant $\chi^2$ change, $\chi^2(2, N = 39) = 0.11, p = .948$. Neither of the 3-way interactions was statistically significant ($ps > .75$). For men, affective lability did not interact with drinking motives and daily affect to predict binge drinking.
Discussion

The goal of the current study was to more accurately define the associations among affect, drinking motives and the likelihood of heavy episodic, or binge drinking in college students. In addition to one-time measures of the dimensions of trait affect – intensity and lability – as well as drinking motives, real-time measures of state daily affect and alcohol use via electronic diary over a 28-day recording period were obtained.

Previous research has found that both positive and negative affect are related to alcohol consumption in young adults. In general, positive affect has been linked to enhancement motivated drinking, whereas negative affect is associated with drinking to cope (Cooper et al., 1995; Read et al., 2003). The present study adds to these findings by revealing how trait measures of the dimensions of affect interact with a person’s moods experienced on a daily basis to predict binge drinking. As in previous research, positive and negative affect were both hypothesized to be positively related to binge drinking likelihood. Moreover, affect intensity was hypothesized to interact with drinking motives to moderate the relationship between state daily affect and binge drinking likelihood. Specifically, high trait positive emotionality and high enhancement-motivated drinking were hypothesized to increase the strength of the relationship between state positive affect and binge drinking. Likewise, high trait negative emotionality and high coping-motivated drinking were hypothesized to increase the strength of the relationship between state negative affect and binge drinking. Trait affective lability, on the other hand, was
hypothesized to be directly positively associated with binge drinking likelihood.

The results were not entirely consistent with these hypotheses. Furthermore, the role of affect in the likelihood of binge drinking in this population appears to differ for men and women, with a much more complex association among these factors for men. In short, state affect played a direct role in predicting binge drinking in women, while trait affect acted as a moderating influence for the men.

In partial support of hypothesis 1, binge drinking in women was directly related to their state positive affect, with a higher odds of binge drinking on days with higher levels of reported positive affect. Contrary to hypothesis 1, however, state daily negative affect was not related to the odds of binge drinking. Hypotheses 2-4 also were not supported, as trait affective lability did not predict binge drinking, and trait affect intensity and drinking motives did not moderate the relationship between state affect and binge drinking, either individually or conjointly.

For men, the relationships among these state and trait measures of affect, drinking motives and binge drinking were more complex. Contrary to hypothesis 1, state positive affect was not associated with the odds of binge drinking. In partial support of hypothesis 2, however, the relationship between state positive affect and binge drinking was stronger for men who endorsed either strong enhancement-motivated drinking or strong trait positive emotionality relative to their peers. Also contrary to hypothesis 1, state negative affect was negatively associated with binge drinking, rather than positively associated as hypothesized. Further, neither trait negative emotionality nor coping-motivated drinking interacted with state negative affect to predict binge drinking. This is
in contrast to the findings of previous research which showed that coping motives moderated the relationship between daily affect and alcohol use (Hussong et al., 2005). Furthermore, contrary to hypothesis 3, affect intensity and drinking motives did not conjointly interact with daily affect to predict binge drinking.

The relationship between trait affective lability and binge drinking in men appears to be more circumscribed than predicted. Rather than predicting a higher odds of binge drinking overall as hypothesized, higher levels of reported affective lability appear to be associated with a higher odds binge drinking only in men who also endorse strong coping motives for drinking. This is an interesting finding given that, in the current study, daily negative affect was negatively associated with binge drinking in men. It is possible that a labile affect may be a vulnerability factor that increases the likelihood that a man will choose to use alcohol as a coping mechanism. Simons and colleagues (Simons, Gaher, Correia, et al., 2005) showed that coping motives mediated the relationship between affective lability and alcohol-related problems, but not frequency of alcohol use. Given that drinking to cope and binge drinking have both been linked to alcohol-related problems (Cooper et al., 1988; Wechsler et al., 1994), the interaction between coping-motivated drinking and affective lability revealed here may be reflecting the same association seen in Simons, Gaher, Correia, et al., only indirectly via binge drinking, rather than directly.

A previously reported gender difference involving drinking motives was elaborated upon by the findings of the current study. Specifically, men have been shown to be more likely to drink to cope than women (Cooper, Russell, Skinner, Frone, &
Mudar 1992; Hussong et al., 2001; Swendsen et al., 2000). The results of the present study extend and further refine this difference by indicating that this increased tendency to drink to cope with a negative mood will result in binge drinking for men only if their moods are also particularly labile.

The results of the present study also partially support those of previous research linking higher levels of positive affect with increased alcohol use (Armeli et al., 2000; Hussong et al., 2001; Mohr, et al., 2005; Park et al., 2004; Simons, Gaher, Oliver, et al., 2005). The gender differences in this association that were revealed in the present study are novel, however. Consistent with these findings, a woman’s binge drinking was related to her state positive affect, with a greater odds of binge drinking on days in which she had experienced higher levels of positive affect. State negative affect was not associated with binge drinking, however. In contrast, state positive affect was not related to the odds of binge drinking for the men, unless they also endorsed either a high level of positive emotionality or a strong tendency to drink to enhance a positive mood.

Surprisingly, daily negative affect was negatively associated with binge drinking in men. This finding appears counterintuitive, and garners little support from previous research. One study (Hussong et al., 2005) showed that increases in sadness were associated with less alcohol consumption, but only for those who also endorsed strong coping motives for drinking. Interestingly, in a prior study (Hussong et al., 2001) sadness showed a positive association with drinking. Although sadness was not among the daily affect items assessed in the present study, the item upset may have been interpreted by the men as referring to sadness, and thus these results could be reflecting the same
negative association reported by Hussong et al. (2005), although this is unlikely. This finding also could be spurious and the result of a floor effect, as the mean value for daily negative affect for men in the current study was only 0.46 on a 5-point scale.

Wilsnack et al. (2000) proposed that gender differences in alcohol use could reflect cultural norms which specify not only a higher normative limit on alcohol consumption for men, but also greater freedom in the choice of when to drink and for what reasons. They posit that such cultural norms may magnify gender differences in alcohol use to varying degrees. Such gender-specific cultural norms could explain some of the gender differences seen in the present study. Specifically, the lack of coping-motivated drinking for the women in this sample could be the result of more restrictive cultural norms for women regarding the use of alcohol as a coping mechanism. A less restrictive cultural norm regarding celebratory drinking among women would likewise explain why a link between daily positive affect and binge drinking was observed. Positive alcohol expectancies have also been shown to increase the risk for alcohol-related outcomes and they appear to be a stronger vulnerability factor for men than for women (Cooper, Russell, Skinner, Frone, et al., 1992). Differential expectancies regarding the effects of alcohol might therefore explain the lack of coping-motivated drinking among the women but not the men in this sample. In an experimental setting involving stress induction, Nesic and Duka (2006) observed that stressed women did not show the physiological reactivity to alcohol-related cues that stressed men did, and they also drank less following these cues than did the men. Thus, the gender differences in coping-motivated drinking in the present study might also be the result of physiological
differences in cue reactivity between men and women.

These gender-specific findings, coupled with the differential findings for the affect dimensions of intensity and lability, add additional support to the contention that the typical generic approaches to intervention (e.g., Thombs, Dotterer, & Raub, 2004), which have done little to reduce binge drinking thus far, must be replaced with a more tailored approach (Wechsler et al., 2002). The fact that the likelihood of binge drinking in men appears to be partially related to the intensity of experienced positive affect and the lability of affect in general offers some insight into the role that these dimensions of affect play, and can inform potential intervention strategies to counter binge drinking in men. According to these results, a man is more likely to binge drink on days in which his level of positive affect is high, but only if he typically experiences positive emotions very strongly, or he tends to drink to enhance positive moods. On the other hand, he is also more likely to binge drink if his moods change frequently and he typically uses drinking as a means of coping. From a prevention standpoint, interventions aimed at stabilizing volatile mood swings might benefit those men whose labile affect might make them more prone to drink to cope with their frequently changing moods. Contrarily, insight into the fact that strong positive moods can also lead to binge drinking might benefit those men who report experiencing strong positive emotions or who tend to drink to enhance such emotions when they are present. Women, on the other hand, whose binge drinking appears to be influenced directly by state affect, could be cautioned about the possibility that experiencing a particularly positive day emotionally might make them more prone to the over-consumption of alcohol that night.
Limitations

These findings must be considered in light of certain limitations. Although event level data collection methodologies provide a large amount of data for analysis, the fact that only 117 individuals were assessed might have limited the power to detect level 2 (between-person) effects by gender. On the other hand, the fact that statistically significant level 2 effects were found for the men, who comprised a smaller portion of the overall sample ($n = 39; 33.3\%$) than the women ($n = 78$), suggests that power was likely not attenuated to a significant degree. Furthermore, the participants used in the present study constitute a convenience sample of college undergraduates. Although this limits the generalizability of these findings, the sample is at least representative of a target population for whom heavy alcohol consumption has been considered normative.

All data obtained in the present study were self-reported. As such, they were subject to the usual potential for biased reporting. Assessing affect in real-time via momentary assessments did at least make it more ecologically valid, as it did not require retrospective recall on the part of participants. Of additional concern is the possibility of undue participant burden given that multiple daily assessments (average of 5 per day over a 28 day period) were completed. In light of this, a number of steps were taken in order to minimize participant burden and maximize protocol compliance. First, the length of time used in the present study was in line with those used in previous research (e.g., Park, Armeli, & Tennen, 2004). Second, participants had the option to turn off the palmtop computer temporarily when they could not be interrupted, such as during class periods. Third, the standardized instruction provided to each participant at the outset of the ED
phase of the study should have familiarized the participants with the protocol and prepared them to meet its requirements and expectations. Fourth, compensation for participation in the study was based on compliance. Nevertheless, these incentives were tied only to the number of reports completed. The accuracy of those reports could not be controlled, however. Moreover, because drinking levels were assessed after the consumption of alcohol, including episodes of excessive consumption and likely intoxication, errors in these reports were likely present to an unknown extent. Although the morning reports also assessed the prior day’s consumption as a back-up, these reports were retrospective in nature and thus potentially inaccurate as well.

It is well established that individuals will change their behavior by virtue of the fact that they are being monitored, and the use of an ED to record behavior constitutes a type of behavioral monitoring. A particular concern in the present study was that participants may have altered their drinking as a result of this continued monitoring. Previous research with undergraduate drinkers has shown, however, that, although participant reactivity to an ED is a valid concern and does occur, the magnitude of this reactivity is minimal and does not invalidate the results obtained (Hufford, Shields, Shiffman, Paty, & Balabanis, 2002).

A limitation inherent in correlational research is the inability to unequivocally determine causation. In the present study it was assumed that mood affected drinking. It is also plausible that drinking affects subsequent moods, suggesting the probability of a reciprocal relationship between the two factors. Because of the real time nature of the affect assessments used in the present study, and the fact that they were made temporally
proximal to the drinking episodes to which they were being related, they can allow for at least the assumption of causality, which can be tested in future experimental research.

Finally, the present study investigated the role of affect in the prediction of binge drinking. Other factors not assessed here have been shown to be significant predictors of alcohol consumption and/or problems in previous research, and may demonstrate even stronger associations with binge drinking than those revealed here for affect (see Baer, 2002). Some of the other factors that have been associated with alcohol outcomes include other individual difference characteristics such as impulsivity/sensation-seeking (e.g., Baer, 2002; Simons, 2003; Simons & Carey, 2006) and social-environmental factors, such as peer use, affiliation with a Greek organization, and ease of availability and discounted alcohol (e.g., Weitzman, Nelson, & Wechsler, 2003). Additionally, the two drinking motives not tested in the present study, social and conformity, likely also contributed to the outcome and may have explained some of the variability not captured by coping and enhancement motives.

Conclusions and Future Directions

The present study adds to our knowledge of the role of affect in problematic alcohol consumption in a population particularly at risk. The differential effects seen with the two dimensions of experienced mood, intensity and lability, and the differential effects of state and trait affect by gender, suggests that the relationships among these predictors and risky drinking is more complex than has been previously shown. A more detailed assessment of the particular dynamics of a person’s affective experience is
necessary if accurate assumptions about its potential to contribute to problematic alcohol consumption are to be made and the appropriate intervention strategies are to be designed. The present study partially addressed this issue, which needs to be explored further and in even greater depth in the future.

Replication of these results, particularly those obtained from the exploratory analyses involving affective lability, is necessary before firm conclusions can be drawn from them. Future research should also include a larger and more diverse sample, in order to determine whether these results generalize to populations other than college undergraduates. Emotion-specific analyses could potentially explain some of the conflicting findings reported in previous research (e.g., Hussong et al., 2001, 2005; Swendsen et al., 2000), as well as the inconsistent findings seen in the present study, which examined data aggregated into positive and negative affect. Possible interactions between specific emotions and the trait dimensions of affect intensity and affective lability may explain some of these inconsistencies. The inclusion of gender as a predictor would also allow for formal hypothesis testing of any observed gender differences. Finally, a controlled experiment, employing positive and negative mood inductions of specific emotions in a laboratory setting, might confirm a causative role for affect in the prediction of binge drinking. The trait dimensions of affect intensity and affective lability should also be analyzed. The present study revealed that these trait dimensions of affect may differentially influence the decision to binge drink, and their inclusion in an experimental paradigm could potentially confirm and more precisely define their role in problematic alcohol consumption that the present study has only begun to illuminate.
References


