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Longitudinal Validation of the Acquired Preparedness Model of Drinking Risk

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Abstract

This paper reports on the first longitudinal test of the Acquired Preparedness (AP) model of alcoholism risk, which holds that individual differences in key personality traits influence drinking behavior by influencing alcohol-related learning. The authors studied 418 individuals making the transition to the independence of college across three longitudinal waves. Each of two longitudinal models predicting typical drinking quantity provided support for the AP process. In the first, drinking quantity at the end of the first year of college was predicted by positive urgency (the tendency to act rashly when experiencing extremely positive affect) at the start of college, and that predictive relationship appeared to have been mediated by expectancies that alcohol provides positive, arousing effects. In the second, drinking quantity was predicted by negative urgency (the tendency to act rashly when experiencing extremely negative affect) at the start of college, and that relationship appeared to have been mediated by the motive to drink alcohol to cope with subjective distress.

Keywords

Alcohol consumption; risk processes; longitudinal; personality; learning; acquired preparedness

Two important categories of risk factors for problem drinking are disposition and psychosocial learning. Although each type of risk factor has received empirical support individually (for traits: Cyders, Flory, Rainer, & Smith, 2009a; Sher & Trull, 1994; Tarter, 1988; for learning: Cooper, 1994; Fromme & D'Amico, 2000; Oullette, Gerrard, Gibbons, & Reis-Bergan, 1999; Smith, Goldman, Greenbaum, & Christiansen, 1995), disposition alone cannot explain drinking behavior, nor can psychosocial learning explain why individuals exposed to the same environments differ in their drinking. The acquired preparedness (AP) model of risk is an attempt to integrate these two categories of risk factors to provide a more complete account of the risk process (Smith & Anderson, 2001). The model holds that personality traits influence

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the learning process, with the implication that traits are distal risk factors that indirectly influence drinking through alcohol-related learning (Smith & Anderson, 2001).

In this study, we conducted the first three-wave, longitudinal test of the model. To predict increased drinking quantity during the transitional first year of college, we tested two parallel AP models. The first was that individual differences in positive urgency (the tendency to act rashly when experiencing extremely positive affect) at the start of college would predict subsequent high-risk learning (learning to associate drinking with positive, arousing effects), which would then predict increased quantity of consumption. The second was that individual differences in negative urgency (the tendency to act rashly when experiencing extremely negative affect) at the start of college would predict a different form of high-risk learning (learning to drink to cope with negative affect), which would then also predict increased quantity of consumption.

To introduce this test of the AP model, we first summarize the theory underlying it. Then, after reviewing the reasons for studying the risk process during the first year of college, we provide a rationale for our choice to study positive and negative urgency as personality risk factors. We then briefly review evidence for the role of alcohol expectancies and drinking motives as learning factors in the risk process. Following this introduction, we describe our specific test of the AP model.

Person-Environment Transaction Theory and the AP Model

The Acquired Preparedness (AP) model is an extension of person-environment transaction theory that integrates dispositional and learning risk factors (Caspi, 1993; Caspi & Roberts, 2001). The intent of the model is to describe a risk process from disposition through psychosocial learning. Person-environment transactions are processes by which personality interacts with environmental events to influence subsequent behavior. One type of transaction is known as a selective person-environment transaction: in part, individuals select environments as a function of their personalities. Thus, variation in exposure to high-risk environments is understood to be partly a function of disposition-based selection of such environments. A second type of transaction is known as a reactive person-environment transaction: individual differences in personality cause individuals to have different reactions to the same environmental event (Caspi, 1993). Thus, two individuals may not experience an objectively common event in the same way.

The AP extension of this theory further holds that when two different individuals experience the same event differently from each other, they can learn different things from that common event (Smith & Anderson, 2001). The label “acquired preparedness” comes from the concept that individuals are differentially prepared to acquire certain learning experiences as a function of their personalities (Smith & Anderson, 2001). In a longitudinal, laboratory study, Smith, Williams, Cyders, and Kelley (2006) demonstrated this process. Individuals exposed to precisely the same learning, who then experienced precisely the same outcomes from a common behavioral trial, nevertheless formed different expectancies from the experience; their different expectancies could be predicted by prior differences in their personalities (Smith et al., 2006).

Past studies of the AP model of drinking risk have either been either fully or partly cross-sectional (Anderson, Smith, & Fischer, 2003; Barnow et al., 2004; Fu, Ko, Wu, Cherng, & Cheng, 2007; McCarthy, Kroll, & Smith, 2001; Meier, Slutzke, Arndt, & Cadoret, 2007; Trembach, Belyaev, & Lysenko, 2004) and they have not used the urgency traits as predictors. This report describes the first test of the model using a 3 wave longitudinal design, which is necessary to test whether traits predict changes in learning across one interval, and then whether the learning measures predict increased drinking across another interval. Such a test is

necessary to demonstrate the temporal sequence hypothesized by the AP model. Figure 1 provides a depiction of the model.

The problem of college student drinking

We chose to test the AP model with first year college students for two reasons. First, the transition from high school to college is an important one in which young adults experience more freedom and independence (Schulenberg, O'Malley, Bachman, Wadsworth, & Johnston, 1996). One consequence of this increased independence may be an increased likelihood of engaging in risky behaviors. In fact, there is evidence that the rates of some types of risky behavior increase when adolescents leave home (Buddie & Testa, 2005), and many first year college students drink heavily, increase their frequency and volume of consumption, and drink in new contexts (Hingson, Heeren, Winter, & Wechsler, 2005; Johnston, O'Malley, & Bachman, 2001; Wechsler, Kuo, Lee, & Dowdall, 2000a; Wechsler, Lee, Kuo, & Lee, 2000b; Wechsler et al., 2002).

Second, the rates of alcohol consumption and high-quantity drinking for American college students are extremely high (Hingson et al., 2005; Johnston, et al., 2001; Wechsler et al., 2002). The consequences associated with this drinking are significant and of clinical concern: they include high rates of death from alcohol-related injuries, assault, rape, suicide attempts, vandalism, and negative academic consequences (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Hingson et al., 2005; Presley, Leichliter, & Meilman, 1998; Wechsler et al., 2002).

Positive and Negative Urgency

We chose to use the traits positive urgency (the tendency to act rashly when experiencing positive affect) and negative urgency (the tendency to act rashly when experiencing negative affect) in this test of the AP model because there is considerable evidence that these two dispositions, more than other impulsivity-related traits, tend to predict heavier drinking per occasion and problem levels of alcohol consumption (Cyders et al., 2009a; Cyders & Smith, 2008a; Fischer, Anderson & Smith, 2004; Fischer & Smith, 2008; Smith et al., 2007). The two traits do not appear to be simple proxies for affective state. Both correlate more highly with externalizing expressions of emotionality than with internalizing expressions of emotionality (Cyders & Smith, 2008a), and negative urgency differentiates individuals with alcohol disorders from individuals with depression, whereas traits representing internalizing expressions of emotionality do not (Fried, Fischer, Combs, & Smith, 2009).

Positive and negative urgency are substantially related and are considered separate facets of a higher-order dimension reflecting emotion-based dispositions to rash action (Cyders & Smith, 2007, 2008a). Both relate to high quantity consumption, but positive urgency relates, both concurrently and prospectively, to rash acts undertaken while in positive mood states (Cyders & Smith, 2007; Cyders & Smith, 2009) and negative urgency relates, both concurrently and prospectively, to rash acts undertaken while in negative mood states (Cyders & Smith, 2007, 2009). It therefore seems possible that the two traits refer to different processes by which risk for heavy consumption is increased.

Psychosocial Learning: Alcohol Expectancies and Drinking Motives

One way to measure alcohol-related learning is to assess alcohol expectancies. Expectancies are thought to represent summaries of one's learning history about the outcomes of one's behavioral choices (Bolles, 1972; Tolman, 1932). A substantial body of research has demonstrated that positive alcohol expectancies predict both increased drinking (Ouellette et al., 1999; Smith et al., 1995) and the onset of adolescent problem drinking (Smith, 1994).

Experimental studies have also demonstrated that lowering expectancies leads to lower levels of alcohol consumption (Darkes & Goldman, 1993, 1998, but see Jones, Corbin, & Fromme, 2001).

Another way to measure alcohol-related learning is to assess drinking motives. Cooper (1994) and Cooper, Agocha, and Sheldon (2000) have shown that motives to drink to enhance one's social experience, to help one cope with subjective distress, to enhance positive mood, and to conform to the behavior of others covary with usual quantity consumed and other drinking variables. To drink heavily "to forget your worries" (an item reflecting the motive to drink to cope with subjective distress) reflects, in part, one's prior learning that alcohol consumption would be a means of achieving that end. Although there are important distinctions between expectancies and motives (Cooper, 1994; Leigh, 1989), both constructs do reflect the influence of psychosocial learning and are used to indicate learning influences for the present purpose.

The Current Test of the AP Model

The AP model driving the test described in this report includes two different processes. First, individuals high in positive urgency are more likely to act in rash, impulsive, ill-advised ways when experiencing an unusually positive affect. Presumably, they experience their impulsive acts as reinforcing, perhaps in part because those acts provide their own, additional immediate reinforcement (Cyders & Smith, 2008a; Cyders et al., 2007). High positive urgency individuals are thus more likely than others to select involvement in college drinking and to behave rashly in those contexts (many of which are celebratory: Del Boca, Darkes, Greenbaum, & Goldman, 2004), such as by drinking larger amounts. They are also more likely to experience their drinking as reinforcing. As a result, their expectancies that alcohol provides positive, arousing effects are reinforced and strengthened. Because learned expectancies are thought to influence behavior, their enhanced expectancies make heavy consumption more likely in the future. Thus, positive urgency's influence on drinking behavior is, at least in part, through the trait's influence on expectancy formation.

Second, individuals high in negative urgency are more likely to act in rash, ill-advised ways when unusually upset. They find their rash acts reinforcing, perhaps because they provide negative reinforcement by way of distraction from the original distress or due to mood alteration (Fischer, Smith, Spillane, & Cyders, 2005; Heatherton & Baumeister, 1991). For some high negative urgency individuals, heavy alcohol consumption is one of those rash acts, and the consumption provides negative reinforcement in the form of diminished attention to, or diminished salience of, the source of one's original distress (Fischer et al., 2005). As a result, those individuals come to believe that drinking helps them cope with their distress and are motivated to drink to achieve that aim. Those coping motives then make heavy alcohol consumption more likely in the future (Cooper, 1994). Thus, negative urgency's influence on heavy drinking occurs, again at least in part, by virtue of its influence on formation of coping drinking motives.¹

We thus tested two structural models, one involving positive urgency and the other involving negative urgency. In each case, the model was as follows: The trait (positive or negative urgency) measured at the beginning of the first year of college would predict increased endorsement of the learning measure (positive, arousing expectancies or drinking to cope) at the end of the fall semester; the learning measures would predict increased drinking quantity at the end of the spring semester; and the longitudinal relationship between wave 1 trait scores and wave 3 drinking quantity would be mediated by wave 2 learning. Drinking quantity was the outcome variable because (a) by theory, the two urgency traits are understood to be relevant to the rash act of high quantity consumption; and (b) empirically, the traits have been shown

to predict drinking quantity (Cyders & Smith, 2008a; Cyders et al., 2009a; Fischer & Smith, 2008; Whiteside & Lynam, 2003).

The two model tests included the following controls. When testing the positive urgency model, we included negative urgency as well, to test whether the predictive process was specific to positive urgency. Likewise, when testing the negative urgency model, we included positive urgency for the same reason. We also included measures of frequency of good moods and frequency of bad moods at time 1, to confirm that the urgency traits predicted subsequent learning and drinking quantity beyond prediction by mood state.

Method

Participants

Participants were 418 first year students at a large, public mid-western university. Seventy-five percent (313) of the sample was female. Age ranged from 18 to 32 (mean = 18.2, SD = 0.76); 88% of the sample was Caucasian, 8% African American, 2% Asian American, 1% Hispanic American, and 2% Other. The sample was somewhat diverse socioeconomically: 29.67% of students came from families where neither parent graduated college and 15.8% reported coming from families with incomes less than \$39,00, but over 57% of fathers and 53% of mothers did graduate from college and 45.5% reported family incomes of \$80,000 or greater. Of the 418 students who began the study, 370 (89%) completed wave two; of those, 293 (79%) completed wave three. The retention rate from time 1 to time 3 was 70%. The same sample was studied and reported on in Cyders et al. (2009a).²

Measures

The A.E. Max (Goldman & Darkes, 2004) is a 24-item self-report measure that assesses expectancies about the effects of alcohol consumption. We measured expectancies for positive arousing effects. This scale combines subscales that alcohol makes one more social, attractive, and horny. Test takers rate the frequency with which they expected that alcohol would result in each effect on a 7-point Likert-type scale ranging from 0 (never) to 6 (always). The scale has been shown to be internally consistent and to significantly predict alcohol use after 1 year in a college-age sample (Goldman & Darkes, 2004).

¹Researchers have identified several alcohol expectancies (including expectancies for negative arousal and sedation: Goldman & Darkes, 2004) and several drinking motives (including motives to enhance pleasure, to facilitate sociability, and to conform: Cooper, 1994). We chose the expectancy for positive, arousing effects from drinking and the motive to cope with distress because those two constructs appeared to reflect the kind of learning that we considered most likely as a function of positive and negative urgency, respectively. For example, items reflecting positive, arousing expectancies include reference to being horny, outgoing, and appealing, all of which potentially relate to the kinds of rash acts characteristic of high positive urgency individuals (Zapolski, Cyders, & Smith, 2009). Items reflecting drinking to cope include "To forget about your problems," "To forget your worries," and "To cheer up when you are in a bad mood;" these items appear to reflect learning that alcohol consumption alleviates subjective distress and so reflect experiences of salience to high negative urgency individuals.

We had considered other possibilities. For example, the motive to enhance positive mood was considered as a possible consequence of positive urgency, but items on that scale ("Because it's fun;" "Because it gives you a pleasant feeling") did not seem to us to reflect the positive urgency tendency toward rash, ill-advised action. We also considered expectancies for negative arousal as a possible consequence of negative urgency, but items on that scale (referring to arrogance, cockiness, and being dangerous) did not seem to reflect the negative urgency tendency toward rash action secondary to distress.

²The goal of Cyders et al. (2009a) was to test theory concerning the different hypothesized roles of positive urgency and sensation seeking. The theory was that sensation seeking would predict subsequent frequency of consumption, because high sensation seekers tend to seek the stimulation of both alcohol consumption and parties where alcohol consumption is likely; in contrast, positive urgency was thought to predict quantity of consumption, because high levels of consumption often reflect rash or ill-advised action. Consistent with that theory, positive urgency at the start of the first year of college uniquely predicted drinking quantity measured at the end of that year, whereas sensation seeking uniquely predicted drinking frequency measured at the end of the year. Because the present study is on the same sample, successful prediction of wave 3 drinking quantity in this study is not an independent replication of Cyders et al. (2009a). The present study had the different goal of testing the AP model with both positive and negative urgency.

The Drinking Motives Questionnaire (DMQ; Cooper, 1994)—Among the four motives for drinking assessed by the DMQ, we studied the motive to drink to cope with distress. The scale has five items that are responded to on a 5-point Likert-type scale. It has been shown to be internally consistent and it correlates with typical quantity consumed (Cooper, 1994).

Drinking Styles Questionnaire (DSQ; Smith, McCarthy, & Goldman, 1995)—The DSQ gathers information about an individual's alcohol use. Following Cyders et al. (2009), we measured drinking quantity on a five point scale (from *I don't drink alcohol at all* to *I usually drink a lot of alcohol (more than 9 beers or drinks)* on any given occasion). As reported by Cyders et al. (2009a), the stability estimate over the 8 month time frame from time 1 to time 3 was .68. Although the DSQ was originally developed for use with an early adolescent population, the scale has been shown to be a valid and reliable measure for use with a late adolescent/college population and has been shown to be stable across assessment periods (Fischer, Anderson & Smith, 2004).

The UPPS-P Positive Urgency and Negative Urgency Measures (Lynam, Smith, Cyders, Fischer, & Whiteside, 2007)—Positive urgency is measured by a 14 item Likert-type scale to measure one's tendency to act rashly in response to intense positive affective states. Items are assessed from 1 (*agree strongly*) to 4 (*disagree strongly*). The measure has good internal consistency reliability, which was reported to be .94 and .95 during the developmental stage, and factor analyses confirmed the unidimensionality of the scale (Cyders et al., 2007). The measurement of positive urgency is stable across assessment method and time (Cyders & Smith, 2007; Cyders et al., 2007). Sample items include *When I am very happy, I sometimes do things that can have bad consequences* and *Others would say I make bad choices when I am in a good mood*. Negative urgency is measured by a 12 item Likert-type scale to measure one's tendency to act rashly in response to intense negative mood states. Estimates of internal consistency reliability have consistently exceeded .80 and factor analyses have confirmed the unidimensionality of the scale (Cyders et al., 2007; Smith et al., 2007; Whiteside & Lynam, 2001). Sample items include *When I feel bad, I will often do things I later regret in order to make myself feel better now* and *I often make matters worse because I act without thinking when I am upset*. For both scales, the items are reverse scored, so that higher scores indicate higher levels of the trait.

Measure of Typical Good and Bad Mood—For this longitudinal investigation, we included two, single-item measures of typical mood state: *How often do you experience a very good mood?* and *How often do you experience a very bad mood?* The response scale is a five-point, Likert-type scale. In the current study, the test-retest stability of the good mood item was $r = .55, p < .001$, across a three-month interval. The test-retest stability of the bad mood item was $r = .42, p < .001$, also across a three-month interval.

Procedure

Participants were recruited through an online research participation website which advertised a longitudinal study for first-year college students. Participants were sampled three times during their first year of college: at the beginning of the fall semester, at the end of the fall semester, and at the end of the spring semester. All participants were enrolled in an Introduction to Psychology course and agreed to complete all three sessions. Participants provided contact information at the first session. We then contacted them via email and/or phone to schedule their second and third sessions. Upon arrival, participants completed demographic information and the above mentioned scales, as part of a larger self-report assessment. All participants were assessed using a group format. For their participation in the first two sessions, participants received course credit for the Introduction to Psychology course. For their participation in the third session, participants received \$10.

Data Analysis

Two structural equation modeling (SEM) analyses provided the primary tests of our hypotheses. The analyses tested the AP process across the three waves: we tested whether (a) positive or negative urgency at wave 1 predicted increased levels of positive, arousing alcohol expectancies or drinking to cope at wave 2; (b) wave 2 expectancies or coping motives predicted increased drinking quantity at wave 3; and (c) the influence of wave 1 positive or negative urgency on wave 3 drinking quantity was mediated by wave 2 alcohol expectancies or coping motives, respectively.

We represented positive urgency and negative urgency as latent variables, because we understand each item on the positive urgency measure to be an indicator of the positive urgency construct and each item on the negative urgency measure to be an indicator of the negative urgency construct. We used three parcels (i.e., groups) of items as indicators of each trait: that is, the measured indicators for each of the two latent variables were not individual items, but rather were averages of a set of items. There were three such indicators for each latent variable. We took this approach for the following reasons. First, the reliability of a parcel of items is greater than that of a single item, so parcels can serve as more stable indicators of a latent construct. Second, as combinations of items, parcels provide more scale points, thereby more closely approximating continuous measurement of the latent construct. Third, there is reduced risk of spuriously positive correlations, both because fewer correlations are being estimated and because each estimate is based on more stable indicators. Fourth, use of parcels reduces the number of degrees of freedom to be estimated in the model, thus facilitating our estimation of this model with our sample size. These advantages have been described by Little, Cunningham, Shahar, and Widaman (2002). The crucial relevant caution about using parcels is that they could mask multidimensionality in an item set (Hagtvet & Nasser, 2004; Little et al., 2002). Both positive and negative urgency have been shown to be unidimensional in independent, prior factor analyses (Cyders et al., 2007; Cyders & Smith, 2007; Smith et al., 2007), so that concern is significantly mitigated.

We treated alcohol expectancies, drinking motives, and drinking quantity as measured variables. The measure of expectancies for positive, arousing effects from alcohol consumption includes several different effects (horny, social, attractive) that we do not view as alternative indicators of the same latent construct; rather, we view the measure of positive, arousing expectancies as a summary term for a range of such anticipated effects. We treated the measure of coping motives the same way. Items on the scale may be seen as reflecting different forms of coping: the motive to drink “Because you feel more self-confident and sure of yourself” and the motive to drink “to forget about your problems” may reflect different constructs, so we treated the measure as a summary of different coping motives. We measured drinking quantity with a single item, thus precluding extraction of a drinking quantity latent variable.

To measure model fit, we relied on four fit indexes: the Comparative Fix Index (CFI), the Nonnormed Fit Index (NNFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Guidelines for what constitutes good fit vary. CFI and NNFI values above either .90 or .95 are thought to represent very good fit (Hu & Bentler, 1999; Kline, 2005). RMSEA values of .06 or lower are thought to indicate a close fit, .08 a fair fit, and .10 a marginal fit (Browne & Cudeck, 1993; Hu & Bentler, 1999), and SRMR values of approximately .09 or lower are thought to indicate good fit (Hu & Bentler, 1999). We examined overall fit across the four indexes.

Results

Participant Attrition

Individuals who participated in all three waves did not differ from those who did not on any demographic, drinking, or trait variable. We therefore concluded that data were missing at random, and imputed missing data using the expectation maximization (EM) procedure (Enders, 2006). We did so because several monte carlo studies have compared traditional means of handling missing data, such as deletion of missing cases and mean imputation, to new data imputation procedures, including the EM method (Enders, 2006). Consistently, those studies have found that the EM procedure produces less biased estimates of full sample values. This resulted in a total sample size of 418 for the SEM procedure.

Descriptive Statistics

Table 1 presents mean endorsement levels of positive arousing expectancies, coping motives, and drinking quantity at times 1, 2, and 3. Expectancy endorsement did not increase significantly across the first year of college. However, the motive to drink to cope with subjective distress increased linearly across the year ($F(1, 416) = 5.59, p < .05$), although the increase did not appear to be substantial. There was also a significant linear increase in drinking quantity across the three waves ($F(1, 416) = 10.28, p < .01$). The mean drinking quantity score at wave 1 corresponds to drinking approximately 1–3 beers or drinks per drinking episode; that value increased to 2–3 beers or drinks per episode by wave 3. Most students (78.7%) described themselves as drinkers at wave 1. The means are broken down by sex; men and women did not differ in mean expectancy endorsement, mean coping endorsement, mean drinking quantity at any wave, nor did they differ in the rate of change in those measures.

Prospective Models of the Prediction of Drinking Behaviors

The positive urgency AP model—Figure 2 depicts the positive urgency model with all tested pathways represented by either curved arrows (for cross-sectional associations) or straight arrows (for longitudinal associations). For pathways that were significantly greater than zero, we have included the maximum likelihood estimates in the figure. The model fit the data well: CFI = .99, NNFI = .98, RMSEA = .05 (90% confidence interval: .03 – .06), SRMR = .03, and the AP hypothesis was supported. Positive urgency at wave 1 predicted increases in expectancies for reinforcement from drinking at wave 2 ($p < .01$). Expectancies for reinforcement from drinking at wave 2 then predicted increased quantity of consumption at wave 3 ($p < .01$). Statistical tests of mediation were consistent with the hypothesis that the longitudinal association between wave 1 positive urgency and wave 3 drinking quantity was mediated by wave 2 expectancies ($z = 1.73, p < .05$, indirect $b = .01$). This demonstration of the predicted sequence of longitudinal predictions occurred despite the stability of drinking quantity across the first year of college, and over and above prediction from negative urgency and typical mood state. In preliminary analyses, we also included sex in the model, but sex did not predict change in any variable and so was excluded from the final model. The depicted model explained 56% of the variance in wave 3 drinking quantity. Table 2 presents the correlations among the model variables at time 1. In addition, sex correlated at time 1 with drinking quantity ($r = .12, p < .01$: men drank more than women).

The negative urgency AP model—Figure 3 depicts the negative urgency model with all tested pathways represented by either curved arrows (for cross-sectional associations) or straight arrows (for longitudinal associations). As before, for pathways that were significantly greater than zero, we have included the maximum likelihood estimate in the figure. This model also fit the data well: CFI = .99, NNFI = .98, RMSEA = .06 (90% confidence interval: .04 to .08), SRMR = .03, and the negative urgency version of the AP model was also supported. Wave 1 negative urgency predicted increased endorsement of coping motives at wave 2 ($p < .01$),

wave 2 coping motives predicted increased wave 3 drinking quantity ($p < .01$), and the mediation test was consistent with the hypothesis that the longitudinal relation between wave 1 negative urgency and wave 3 drinking quantity was mediated by wave 2 coping motives ($z = 2.37, p < .01$, indirect $b = .02$). Again, despite the stability of drinking quantity across the prospective period and additional prediction from positive urgency and from typical mood state, the AP-predicted mediational sequence was demonstrated. As in the prior model, sex was dropped from the model because it did not predict change in any variable over time. The model explained 58% of the variance in wave 3 drinking quantity. Although positive urgency did not predict subsequent drinking motives, it did significantly predict time 3 drinking quantity directly. Again, table 2 presents the correlations among variables at time 1.

Additional Mediational Pathways—Examination of prospective pathways between drinking quantity and expectancies or motives suggested the presence of another mediational pathway of potential importance. We thus explored the possibility that part of the influence of drinking quantity at the start of college on drinking quantity at the end of the first year of college is mediated by changes in positive alcohol expectancies or the motive to drink to cope with distress. This possibility is consistent with the idea that expectancies and motives reflect, in part, learning: drinking quantity predicts changes in two markers of learning, which then predict subsequent behavior. We tested two models. The first is depicted in figure 2: wave 1 drinking quantity predicted increased endorsement of alcohol expectancies at wave 2 ($p < .01$); wave 2 expectancies predicted increased drinking quantity at wave 3 ($p < .01$); and the statistical test of mediation was consistent with a mediation process ($z = 2.30, p < .05$, indirect $b = .02$). It appears that higher typical quantity consumed predicted increased positive alcohol expectancy endorsement over time, which in turn predicted yet higher typical consumption.

The second model is depicted in figure 3: wave 1 drinking quantity predicted increased wave 2 coping motives ($p < .01$), wave 2 coping motives predicted increased drinking quantity at wave 3 ($p < .01$), and the statistical test of mediation was consistent with a mediation process ($z = 2.19, p < .05$, indirect $b = .02$). It seems that higher volume of consumption led to increased endorsement of the motive to drink to cope with distress, which in turn led to further increased volume of consumption.

Discussion

This paper described the first fully prospective test of the AP model of drinking risk. The AP model offers an integration of dispositional and psychosocial learning risk factors by providing a mechanism by which disposition influences the learning process, and in that way indirectly influences drinking level. According to the model, what one learns is a function of both one's experiences and the disposition one brings to those learning experiences (McCarthy et al., 2001; Smith & Anderson, 2001). Previously, a laboratory study that held learning constant demonstrated differential learning as a function of disposition (Smith et al., 2006); the contribution of the present field study was to document that the two-stage predictive relationships implied by the model (disposition to learning, learning to drinking quantity) exist.

According to this version of the model, one dispositional risk factor for increased quantity of alcohol consumption during the transition into college is positive urgency, or the tendency to act rashly when experiencing extremely positive moods. The model holds that positive urgency influences increases in quantity consumed at least partly indirectly; that is, positive urgency leads to increased expectations that alcohol has positive, arousing effects, and the expectations, in turn, lead to increases in drinking quantity. For many students, the college environment may provide some of their first opportunities to experience contexts in which celebratory drinking occurs (Del Boca et al., 2004) and to engage in rash, ill-advised levels of consumption in those contexts. When exposed to these new learning events, students who tend to act rashly in

response to extremely positive moods are more likely to form strong expectancies that alcohol brings positive, arousing effects. These strong expectancies, in turn, make students more likely to drink heavily.

A second dispositional risk is negative urgency, or the tendency to act rashly when distressed. Negative urgency is thought to lead to increased drinking quantity indirectly as well, by leading to increased motives to drink to cope with subjective distress, which in turn lead to increased drinking quantity. Individuals who tend to act rashly when distressed are understood to be more likely to drink heavily in response to negative affect, to experience negative reinforcement from that drinking (Fischer et al., 2005), and hence drink more heavily in the future.

For both the positive and negative urgency models, the results of the present study were consistent with the AP model. Despite the relative stability of drinking quantity across the first year of college, individual differences in positive or negative urgency at the start of college predicted increases in alcohol expectancy or coping motive endorsement, beyond prediction by prior expectancies or motives, initial drinking levels, and frequency of positive and negative moods, by the end of the first semester of college. Alcohol expectancies or coping motives, in turn, predicted increases in quantity consumed from the end of the first semester to the end of the second semester of college. Most importantly, statistical tests of mediation supported the hypothesis that the relationship between initial wave 1 traits and wave 3 drinking quantity was partly explained by wave 2 expectancies or coping motives as mediators. The predictive roles of the two urgency traits were distinct: positive urgency did not also predict coping motives and negative urgency did not also predict positive, arousing expectancies.

The successful prediction did not appear simply to be due to variance shared with affect. The pathways predicted by the positive urgency AP process were significant, even after controlling for typical experience of good moods and typical experience of bad moods. Likewise, the pathways predicted by the negative urgency AP process were significant, even after controlling for typical experience of bad moods and typical experience of good moods. This finding supports the urgency theory view that one should focus not just on affect, but rather on the disposition to act rashly when experiencing intense affect.

Although this three-wave test (in which each predictor predicted subsequent changes in the next measure) is a stringent test of whether the data are consistent with the proposed mediational process, it is important to appreciate that this study did not test mediation directly. Mediation refers to causality: as described above, the AP theory is that traits cause differential learning, which causes differential behavior. This study did not test causal relations, but rather longitudinal relations consistent with the causal model. Of course, experimental tests of causality are difficult to conduct when the putative cause is a personality trait. To help address this problem, Cyders et al., (2009b) experimentally manipulated mood state and found that, when positive mood was induced, only those high in positive urgency drank more alcohol. That finding, together with the present findings, provide good, but of course not definitive, support for the AP model of drinking risk.

The AP process, in which trait variability is thought to cause learning variability, which in turn causes variability in behavior, is not specific to the consumption of alcohol. AP processes have been hypothesized for problem gambling (Cyders & Smith, 2008b) and eating disorders (Combs & Smith, in press), and Combs and Smith (2008) provided longitudinal evidence supporting the AP process of eating disorder risk among middle school girls. It may be that there is a general AP process that describes the integration of disposition and psychosocial learning to explain behavior. Perhaps different traits dispose individuals to different forms of learning, which in turn make different behaviors more or less likely.

These data do not address specific aspects of the hypothesized mechanism by which positive urgency may influence positive alcohol expectancy formation, or by which negative urgency may influence formation of coping motives. Nor does this study address either similarities or differences between the concepts of expectancy and motive (see Cooper, 1994; Cooper et al., 2000; Goldman et al., 1991; Leigh, 1989; Goldman, 1999). Rather, we sought to identify constructs likely to be influenced by positive and negative urgency, respectively. We considered it likely that a disposition to act rashly when in an extremely positive mood might facilitate development of an expectancy that drinking provides positive, arousing effects; and we thought that the tendency to act rashly when distressed might well facilitate learning that drinking helps one cope with one's distress, and hence the motive to drink to that end. We therefore chose these two learning-based constructs for this investigation. Although it may well be that motives are more proximal to behavior than are expectancies (Cooper, 1994), both constructs can be understood to be products of learning. Further examination of these issues, both the mechanism by which traits influence learning and the overlap between and distinctions among expectancies and motives, is necessary.

Additional, significant tests of mediation unrelated to the AP model were observed and are worthy of note. Wave 1 drinking quantity predicted increases in wave 2 learning that alcohol provides benefits, whether in terms of positive, arousing effects, or in terms of help in coping with one's distress. The increased learning then predicted yet higher typical drinking quantity at wave 3. At least for college students, it appears that, as a function of greater typical volume consumed per drinking occasion, one finds that drinking provides either more positive reinforcement (positive, arousing effects), more negative reinforcement (alleviation of distress), or both. It is important to appreciate that higher quantity of consumption did not mitigate the reinforcing effects of alcohol; quite the opposite.

The present findings should be understood in the context of the limitations of the study. The predicted associations proved to be of relatively small magnitude. This problem may not be a serious one, for two reasons. First, although the longitudinal window of 8 months was chosen in order to study the transition into college life, the relatively short time interval may not have allowed as much change in drinking behavior as a longer interval would have. As a result, there was limited variability to be predicted by the trait and learning factors; the relatively low beta weights should be understood within that context.

Second and relatedly, most students had begun drinking prior to college entry. This study did not investigate expectancy formation, motive formation, or drinking onset. Doing so is important. Third, we do not know how well the results of this study generalize to other populations, particularly non-college students. We think it likely that different traits play important roles in different contexts or at different stages in development. Fourth, the sample was predominantly female. It may be the case that tests of the AP model would produce different results in primarily male samples. This possibility merits investigation. However, although men comprised only 25% of the sample, the male n of 105 was certainly adequate to test sex differences. We found no differences in prospective prediction as a function of sex.

Fifth, we have provided no evidence that the urgency traits and the learning factors we studied explain more variance in drinking quantity than do other risk factors. The contribution of this paper was, instead, the provision of empirical support for a process by which traits come to influence drinking behavior. The degree to which the risk factors studied in this research add to prediction by other risk factors is a matter of ongoing investigation (Cyders et al., 2009a; Fischer & Smith, 2008; Smith et al., 2007; Whiteside & Lynam 2003; Whiteside, Lynam, Miller, & Reynolds, 2005). Sixth, retention in the study was not as high as it might have been. Although we have no evidence that attrition was systematic, we cannot know whether the results would have differed with better retention. Seventh, our measurement of each typical

mood state was a single item. Although the measurement was stable over time, a more reliable, comprehensive assessment of typical mood state would have been preferable.

In sum, the present findings support the AP model of drinking risk, which describes a means of integrating dispositional and learning risk processes. Drawing on the basic science literature on person-environment transactions (Caspi, 1993), and extending that concept to the idea of differential learning as a function of personality (Smith et al., 2006), the AP model of drinking risk holds that, as a function of personality, individuals are differentially prepared to undergo high-risk learning experiences. Personality traits of likely importance to the drinking risk process include positive and negative urgency, which reflect emotion-based dispositions toward rash or impulsive action.

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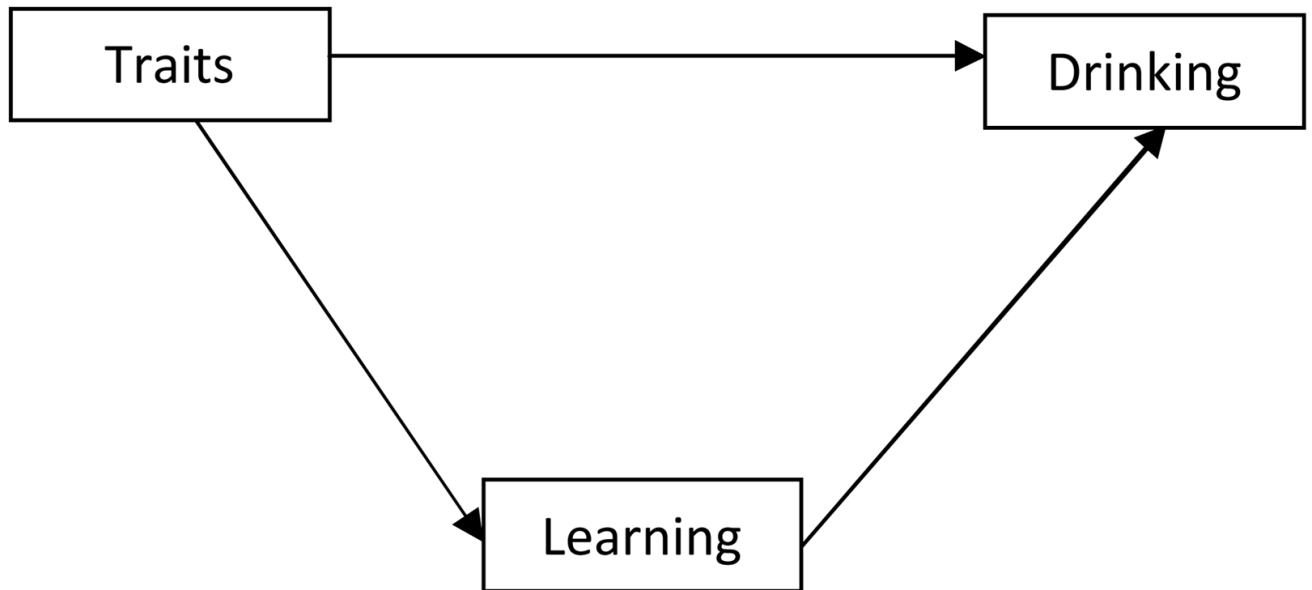


Figure 1.

A simple depiction of the mediational process implied by the AP model of risk. The model holds that personality traits shape high-risk learning, which in turn leads to increased drinking behavior. One implication of this model is that the influence of personality traits on subsequent drinking behavior should be mediated by learning. Thus, a significant portion of the influence of traits on drinking behavior should be through learning, as represented by the sequence of paths from traits to learning and from learning to drinking.

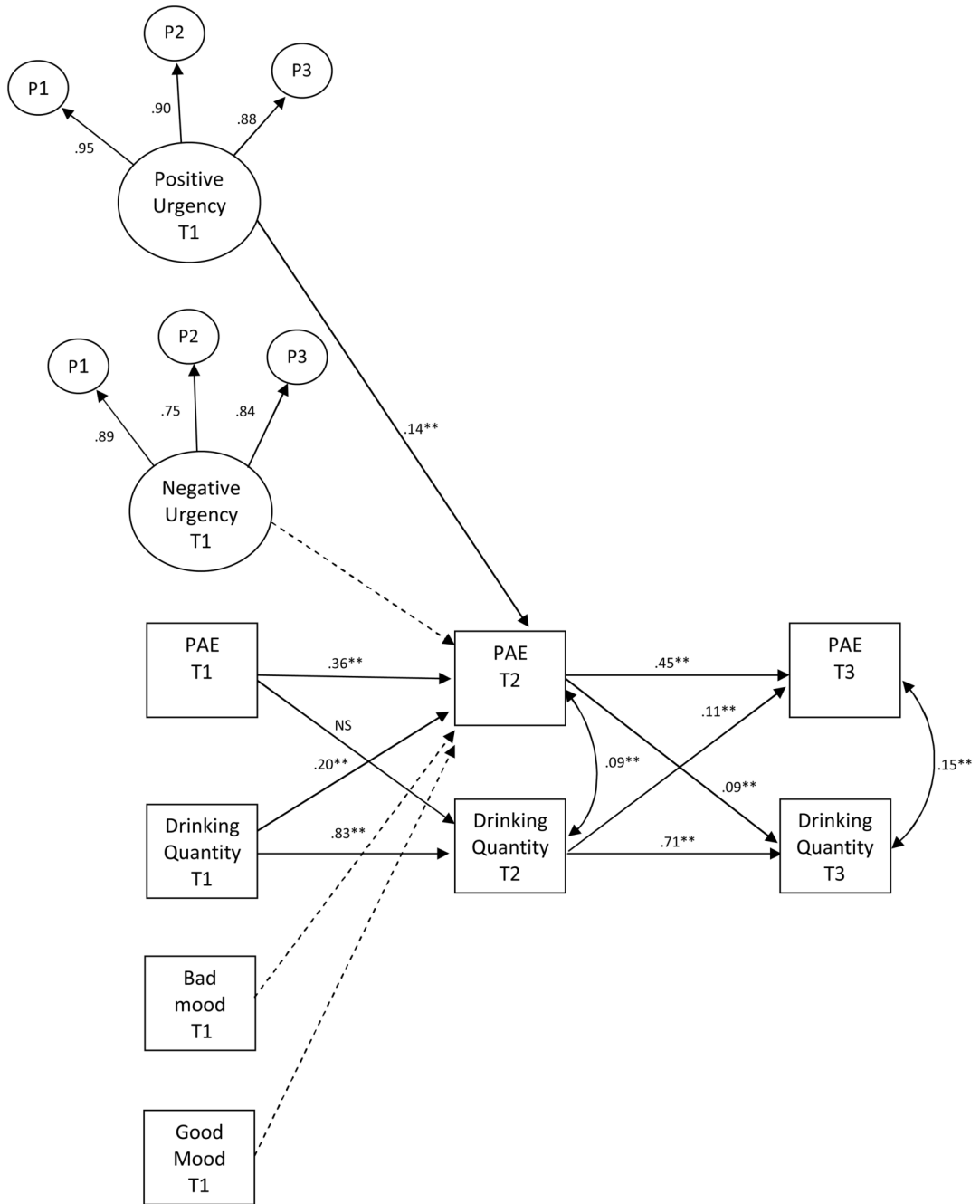


Figure 2. A depiction of the full model tested with respect to positive urgency. Circles reflect latent variables and squares reflect measured variables. The measured indicators of the latent traits are parcels of items: P1 stands for parcel 1 for a given factor. Straight, full arrows reflect factor loadings and prospective prediction pathways that we anticipated would be significantly greater than zero. In addition to factor loadings, these included the autoregression paths, the paths reflecting the AP hypothesis, and paths reflecting mutual prospective influences between positive alcohol expectancies and drinking quantity. Dotted line straight arrows reflect pathways that were included in the model test (not constrained to zero) but that were not expected to be significantly greater than zero. None were. Curved arrows reflect non-time-

lagged associations. Coefficients are standardized. PAE: positive arousing expectancies. Correlations among all variables at time 1 were included in the model but omitted from the figure; they are presented in table 2. Error variances and non-significant paths are not depicted, for ease of presentation. ** $p < .01$, * $p < .05$.

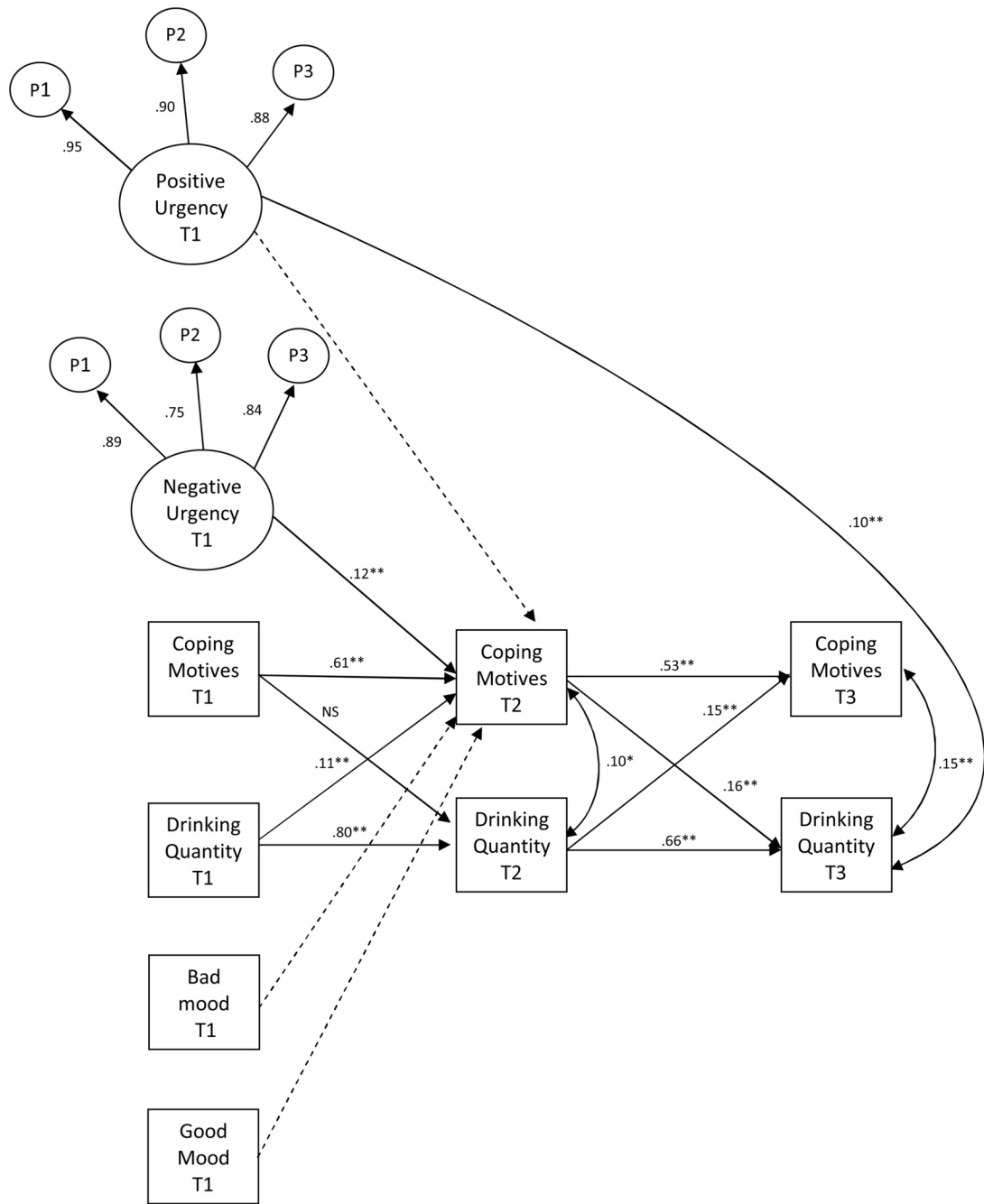


Figure 3. A depiction of the full model tested with respect to negative urgency. Circles reflect latent variables and squares reflect measured variables. The measured indicators of the latent traits are parcels of items: P1 stands for parcel 1 for a given factor. Straight, full arrows reflect factor loadings and prospective prediction pathways that we anticipated would be significantly greater than zero. In addition to factor loadings, these included the autoregression paths, the paths reflecting the AP hypothesis, and paths reflecting mutual prospective influences between coping motives and drinking quantity. Dotted line straight arrows reflect pathways that were included in the model test (not constrained to zero) but that were not expected to be significantly greater than zero. None were. Curved arrows reflect non time-lagged associations, except the

line from time 1 positive urgency to time 3 drinking quantity, which does represent prospective prediction. This path was not originally hypothesized, but was included in the final model. Coefficients are standardized. Correlations among variables at time 1 were included in the model but omitted from the figure; they are presented in table 2. For ease of presentation, error variances and non-significant paths are not depicted.

** $p < .01$, * $p < .05$.

Table 1

Mean levels of expectancies, coping motives, and drinking quantity among first-year college students ($n = 418$.)

	Males ($n = 105$)	Females ($n = 313$)	Overall ($n = 418$)
	Mean (SD)	Mean (SD)	Mean (SD)
<u>Expectancies</u>			
Time 1	2.41 (.50)	2.34 (.48)	2.36 (.48)
Time 2	2.42 (.57)	2.29 (.54)	2.33 (.55)
Time 3	2.38 (.65)	2.37 (.52)	2.38 (.55)
<u>Coping Motives</u>			
Time 1	1.79 (.93)	1.78 (.89)	1.78 (.90)
Time 2	1.86 (.91)	1.83 (.87)	1.84 (.88)
Time 3	1.89 (.77)	1.89 (.75)	1.89 (.76)
<u>Drinking quantity</u>			
Time 1	2.98 (1.41)	2.79 (1.17)	2.84 (1.24)
Time 2	3.09 (1.32)	2.88 (1.11)	2.94 (1.17)
Time 3	3.14 (1.15)	2.94 (0.99)	2.99 (1.04)

Note. Time 1 assessment at beginning of first year of college; Time 2 assessment at the end of the first semester of college; Time 3 assessment at the end of the first year of college. Interval from time 1 to time 3 was approximately 8 months. Values here include imputed values from total sample of $n = 418$. Values were unchanged using non-imputed data.

Table 2

Time 1 Correlations between Positive Urgency, Negative Urgency, Positive Expectancies, Coping Motives, Drinking Quantity, and Positive and Negative Mood (n = 418).

	PUM	NU	PAE	Coping	Quantity	BM	GM
PUM							
NU	.67**						
PAE	.29**	.26**					
Coping	.42**	.48**	.34**				
Quantity	.26**	.31**	.30**	.58**			
BM	.18**	.32**	-.01	.25**	.08*		
GM	-.02	-.10*	.08	-.02	.10**	-.10**	

Note: Time 1 assessment at beginning of first year of college. PUM: positive urgency; NU: negative urgency; PAE: positive arousing expectancies; Coping: drinking to cope with distress; Quantity: typical drinking quantity; BM: frequency of bad moods; GM: frequency of good moods.

* $p < .05$

** $p < .01$