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Longitudinal Test of a Developmental Model of the Transition to Early Drinking

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Abstract

This paper reports on a longitudinal test of a developmental model of early drinking that specifies transactions among personality, learning and behavior in the risk process. The model was tested on 1906 children making the transition from elementary school to middle school across three time points: the spring of 5th grade, the fall of 6th grade, and the spring of 6th grade. In a transaction that has been referred to as Acquired Preparedness, individual differences in the trait positive urgency at the end of 5th grade were associated with increases in expectancies for social facilitation from alcohol at the start of 6th grade, which then predicted drinker status at the end of 6th grade. In addition, the alcohol expectancy and drinker status predicted each other reciprocally across time. Multiple factors appear to transact to predict early drinking behavior.

This paper reports on a test of a theoretical model to predict alcohol consumption behavior at the start of middle school from characteristics of children when they are in elementary school. The model specifies transactions among personality, learning, and behavior as one set of risk processes that contribute to the overall risk for early drinking. To introduce this test, we first describe the rationale for studying the transition to middle school.

Early Adolescent Drinking and the Transition to Middle School

The transition into middle school represents an important contextual change related to the move from childhood to adolescence. Middle school children encounter larger, more impersonal school contexts (Barber & Olsen, 2004; Eccles et al., 1993) and they experience a new level of independence from their parents (Eccles & Midgley, 1989). Even if they have not experienced pubertal onset themselves, many middle schoolers have, which contributes to a setting in which the needs and drives associated with physically mature bodies are manifest. For these reasons, this transition has been described as a potential turning point in development (Graber & Brooks-Gunn, 1996); that is, a period characterized by significant behavioral and developmental change. The importance of the transition from elementary

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school to middle school for drinking behavior is clear. Researchers have documented that this transition period is related to one of the largest increases in drinking rates for any one year period of adolescence (Donovan, 2007).

Thus, consumption of alcohol during this transition is of considerable importance. For both boys and girls age 12-15, reports of having consumed alcohol one or more days in the preceding year has sensitivity of 1.0 and specificity of .95 (girls) or .94 (boys) in the concurrent prediction of any past-year DSM IV alcohol use disorder symptom (Chung, Smith, Donovan, Windle, Faden, & Martin, 2012). Alcohol consumption during the middle school years is also associated with several other problem behaviors, including early onset marijuana use, early sexual intercourse, and low value on academic achievement (Jessor, 1987). In addition, early consumption is a significant predictor of diagnostic status and alcohol problems in later adolescence and adulthood (DeWit et al., 2000; Grant & Dawson, 1997; Guttmannova et al., 2012). Alcohol consumption at this early age is therefore not only a good marker of current dysfunction, but also of risk for significant future dysfunction. It is therefore important to understand the characteristics of elementary school children that predict engagement in middle school drinking. We sampled children prior to middle school (fifth grade), at the beginning of middle school (fall of sixth grade), and at the end of the first year of middle school (spring of sixth grade). We focused on understanding how individual differences influence drinking during this transitional period.

The Risk Model Tested in the Current Study

The model we tested included two core hypotheses. The first was that learning about the reinforcing effects of alcohol, measured as alcohol expectancies, and drinking behavior are mutually influential over time. In this longitudinal study, we thus anticipated that expectancies for reinforcement from drinking at one time would positively predict subsequent drinking behavior, and that drinking behavior at one time would positively predict subsequent alcohol reinforcement expectancies. The second derives from the acquired preparedness (AP) model of risk (Smith & Anderson, 2001), which holds that high risk personality traits bias psychosocial learning by contributing to the formation of high risk alcohol expectancies, which in turn predict drinking behavior. Longitudinal evidence consistent with this hypothesis involves a finding that alcohol expectancies appear to mediate the influence of prior personality on subsequent drinking. We next introduce the specific personality risk factor we selected for study, provide an overview of our expectancy model, and describe the specific transactional processes we studied.

Personality Risk: Positive Urgency

There has been strong evidence to suggest that specific, unidimensional personality traits exist that predispose individuals to engage in rash or impulsive acts (Barrett, 1993; Buss & Plomin, 1975; Cyders & Smith, 2007; Dickman, 1990; Gray & McNaughton, 2000; Smith et al., 2007; Whiteside & Lynam, 2001; Wills, Pokhrel, Morehouse, & Fenster, 2011). Positive urgency is among the traits associated with rash or disinhibited behavior, and is defined as a personality trait reflecting the disposition to act in rash, impulsive ways when experiencing unusually positive moods (Cyders, Smith, Spillane, Fischer, Annus, & Peterson, 2007; Cyders & Smith, 2007, 2008).

We focused on positive urgency for several reasons. First, when studied together with other personality traits related to rash action, it prospectively predicts higher levels of alcohol consumption and problem drinking later in development, such as among college students (Cyders, Flory, Rainer, & Smith, 2009; Cyders Zapolski, Combs, Settles, Fillmore, & Smith, 2010; Settles, Cyders, & Smith, 2010). It also cross-sectionally predicts drinker status among 5th graders (Gunn & Smith, 2010). Second, the limited research available on the context of very early adolescent drinking suggests that much of this drinking may occur at small parties or in the home with other peers (Anderson & Brown, 2011); situations likely characterized by positive mood. Third, high levels of positive mood as a risk factor for problematic youth behavior has perhaps been under-appreciated, despite emerging evidence of its role (Cyders & Smith, 2008; Gunn & Smith, 2010; Steinberg, 2004).

Learning Risk: The Expectancy that Alcohol Leads to Positive Social Experiences

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). There are different expectancy models. In the one we employ, reports of explicit expectancies are understood to provide markers of memory-based associative learning (Goldman, Darkes & DelBoca, 1999; Goldman, Reich, & Darkes, 2006). Thus, high scores on a scale reflecting the expectancy that alcohol facilitates positive social interactions are thought to reflect a strong learned association between drinking and positive social experiences. In an alternative model, endorsement of explicit expectancies is understood to indicate likely planned or deliberative behavior (Ajzen & Fishbein, 1980): Part of what contributes to a drinking decision is the cognition that drinking facilitates social experience. Our model assigns less weight to deliberative action and more to learned associations of a behavior (such as drinking) and a reward (such as positive social experience). The association influences the behavior (Bolles, 1972; Tolman, 1932), and one may or may not experience oneself as choosing the behavior explicitly to obtain the expected outcome. Considerable support for this model, and for the explicit measurement of alcohol expectancies as markers of learned associations, has accrued over several decades (Bolles, 1972; Goldman, Christiansen, Brown, & Smith, 1991; Goldman et al., 1999; Tolman, 1932). It is important to note, though, that the current study did not constitute a test comparing the two expectancy models.

A substantial body of research has demonstrated that positive alcohol expectancies predict increased drinking frequency (Goldberg, Halpern-Felsher, & Millstein, 2002; Ouellette, Gerrard, Gibbons, & Reis-Bergan, 1999; Smith, Goldman, Greenbaum, & Christensen, 1995a), quantity, and the onset of problem drinking (Christiansen, Smith, Roehling, & Goldman,, 1989) among adolescents. The expectancy that alcohol facilitates positive social interactions has consistently been shown to be associated with alcohol consumption among younger children and adolescents in the 5th and 6th grade (Anderson, et al., 2005; Gunn & Smith, 2010). This finding is not surprising, because the development of social relationships is experienced by children as a crucially important task during the transition to adolescence (Havighurst, 1972; Masten et al., 1995).

Transactions among Risk Factors

Reciprocal influence between expectancies and drinking—Because expectancies that alcohol facilitates positive social experiences are understood to represent learned associations between drinking and reward, expectancy endorsement at one time point should predict subsequent drinking behavior. In the same way, drinking experience should of course influence learned associations between drinking and outcomes. In prior work, a reciprocal relationship between drinking and the social facilitation expectancy was shown longitudinally in children undergoing a different developmental transition than those in the current study, i.e., across the years from 7th grade through 9th grade (the first year of high school: Smith et al., 1995a). This study would be the first to show the same reciprocal relationship across the transition from elementary to middle school, thus providing evidence for reciprocal drinking – expectancy relationships earlier in development and during an important developmental transition period.

Positive Urgency and expectancy transaction: Acquired Preparedness—According to the AP model of risk (Smith & Anderson, 2001), individual differences in personality can lead individuals to experience objectively similar events differently; thus, individuals can learn different things and form different expectancies even from similar events or similar learning histories. As a function of personality risk, individuals are differentially prepared to acquire high-risk expectancies (Smith & Anderson, 2001; Smith, Williams, Cyders, & Kelley, 2006). Versions of the AP model of drinking risk have been supported both concurrently (Anderson, Smith, & Fischer, 2003; Barnow et al., 2004; McCarthy, Kroll, & Smith, 2001) and prospectively (Corbin, Iwamoto, & Fromme, 2011; Settles et al., 2010; Wardell, Read, Colder, & Merrill, 2012) in late adolescents and adults. Four recent studies have also demonstrated this process (a) prospectively during the transition to middle school for eating disorder risk (Pearson, Combs, Zapolski, & Smith, 2012), (b) concurrently for drinking risk in the 5th grade (Gunn & Smith, 2010), (c) concurrently for smoking risk in the 5th grade (Combs, Spillane, Caudill, Stark, & Smith, 2012), and (d) prospectively for smoking risk among college students (Doran, Khoddam, Sanders, Schwieer, Trim, & Myers, 2012). The model has not yet been tested longitudinally for drinking risk in early adolescents or across the elementary school to middle school transition.

In this specific application of the AP model, we hypothesized that individual differences in positive urgency at the end of 5th grade would predict increased expectancies for social facilitation from drinking at the start of 6th grade, which in turn would predict increased drinking by the end of 6th grade. The increased likelihood of learning that alcohol facilitates positive social relationships may occur through multiple mechanisms. First, socializing is understood to facilitate positive moods (Watson, Clark, McIntyre, & Hamaker, 1992). In social settings, those high in positive urgency may engage in rash acts to further enhance their positive mood, such as consuming alcohol, and find such events highly reinforcing socially, thus contributing to expectancy associations between drinking and positive social experience. Cyders et al. (2007, 2010) provide evidence for such a process in college students. Second, these children may be more likely than others to attend to evidence that rash or risky behaviors such as alcohol consumption are reinforcing. Thus, they may be more likely to associate drinking with positive, reinforcing social experiences and therefore be more likely to drink when provided the opportunity. Third, it may be that children high in positive urgency are more likely to experience social contexts that transmit positive messages about alcohol's effects on social interactions. That is, elevations in positive urgency may influence both exposure to, and attention to, positive messages about alcohol's social effects. Indeed, positive urgency has been shown to predict social facilitation expectancies longitudinally in college students (Settles et al., 2010) but this relationship has not been demonstrated in younger children.

Early pubertal onset—Although pubertal onset is not a focus of our model, it is important to consider it in any model concerning the transition into middle school. Early pubertal onset, often defined as occurring before 75% of one's peers (Lynne-Landsman, Graber, & Andrews, 2010), predicts early alcohol use and other addictive behaviors (Dick, Rose, Viken, & Kaprio, 2000Lanza & Collins, 2002; Tschann et al., 1994; Westling, Andrews, Hampson, & Peterson, 2008). Its presumed influence is thought to reflect biological, social and contextual factors, and even to represent parental psychopathology (Dick et al., 2000; Ellis, 2004; Ellis & Garber, 2000).

Controls for Other Risk Factors

To test whether this risk model operates above and beyond the influence of other source of risk, we also tested the viability of our model when including other potentially important risk factors. We included two additional personality risk factors and three additional alcohol expectancies.

Personality: Negative Urgency and Sensation Seeking—Negative urgency reflects the disposition to act rashly when experiencing intense negative mood (Cyders & Smith, 2008; Whiteside & Lynam, 2001) and can be understood as a facet, along with positive urgency, of a general emotion-based disposition toward rash or impulsive acts (Cyders & Smith, 2007). Negative and positive urgency tend to correlate substantially, although discriminant prediction between the two, as a function of mood status, has been shown (Cyders et al., 2007; Cyders & Smith, 2010). To test the predictive influence of positive urgency over and above that of negative urgency is a rigorous control, chosen to strengthen the test of whether specifically positive mood-based rash action is important for risk. Sensation seeking refers to the tendency to seek out novel, thrilling stimulation and does not appear to be affect-driven, in the way that the urgency traits appear to be (Whiteside & Lynam, 2001). It is a well-documented risk factor (Zuckerman, 1994); it is thus important to test whether positive urgency predicts beyond sensation seeking.

Psychosocial Learning: Additional Alcohol Expectancies—We measured three other expectancies for the consequences of drinking: Alcohol leads to wild and crazy behavior, alcohol leads to sedation and impairment, and alcohol increases negative arousal. These expectancy domains emerged from extensive investigation into children's alcohol expectancies (Dunn & Goldman, 1996, 1998), and each correlates bivariately with alcohol consumption (Cruz & Dunn, 2003).

The Current Study

In a sample of 1906 children progressing from the spring of the 5th grade (wave 1), through the fall of 6th grade (wave 2) to the spring of 6th grade (wave 3), we tested the two hypotheses of reciprocal expectancy-drinking prediction and the AP model using a model-building framework that we describe below. We then tested whether effects consistent with those hypotheses remained present in a comprehensive model that included early pubertal onset, negative urgency and sensation seeking, and the three additional alcohol expectancies.

Invariance Across Sex and Race

We also tested whether the final, best-fitting model that included each hypothesized pathway was invariant across sex and race. We did not hypothesize sex or race differences, but we considered it important not to presume invariance without testing for it.

Methods

Sample

Participants were 1906 5th graders from urban, rural, and suburban backgrounds, recruited from 23 public school systems. The sample was equally divided between girls (49.9%) and boys. At wave 1, most participants were 11 years old (66.8%), 22.8 % were 10 years old; 10 % were 12 years old; and .2 % were either 9 or 13 years old. The ethnic breakdown of the sample was as follows: 60.9%, European American, 18.7% African American, 8.2 % Hispanic, 3% Asian American, and 8.8% other racial/ethnic groups.

Measures

Drinking Styles Questionnaire (DSQ: Smith, McCarthy, & Goldman, 1995b) was used to measure self-reported drinking frequency. The DSQ measures drinking frequency with a single item asking how often one drinks alcohol. We dichotomized the item to reflect drinker status versus non-drinker status.

The Pubertal Development Scale (PDS: Petersen et al., 1988)—This scale consists of five questions for boys and five questions for girls. Sample questions are, for boys, "Do you have facial hair yet?" and, for girls, "Have you begun to have your period?" Individuals respond on a 4 point scale. The scale has acceptable reliability estimates (α's ranging from .67 to .76 for 11 year olds), and scores on it correlate highly with physician ratings and other forms of self-report (*r* values ranging from .61 to .67: Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987; Coleman & Coleman, 2002). The PDS permits dichotomous classifications as pre-pubertal or pubertal, with mean scores above 2.5 indicative of pubertal onset. As is common (e.g., Culbert, Burt, McGue, Iacono, & Klump, 2009), dichotomous classification was used in the current study.

UPPS-R-Child Version, Positive Urgency, Negative Urgency, Sensation Seeking (Whiteside & Lynam, 2001; Zapolski et al., 2010)—All three scales consist of 8 items and responses are on a four-point Likert scale from 1 (not at all like me) to 4 (very much like me). For positive urgency, a sample item is: "When I am very happy, I tend to do things that may cause problems in my life.” In the current sample, the internal consistency reliability estimate for the positive urgency subscale was .89 at wave 1. For negative urgency, a sample item is: “When I am upset I often act without thinking.” Internal consistency reliability estimate at wave 1 was .85. For sensation seeking, a sample item is: “I like new, thrilling things, even if they are a little scary.” Internal consistency at wave 1 was .79. For all three scales internal consistency estimates were slightly higher in waves 2 and 3.

Memory Model-Based Expectancy Questionnaire (MMBEQ: Dunn & Goldman, 1996) provides an extensive assessment of alcohol expectancies in children. We assessed four domains: positive social, negative arousal, sedation, and “wild and crazy” behaviors. The scale begins with the stem, “Drinking alcohol makes people —.” Children then read items that complete the stem (e.g., “active,” “friendly,” “wild,” “mean”) and then circle one of four responses: “never,” “sometimes,” “usually,” or “always.” Thus, items are scored on a Likert-type scale. Each of the subscales is correlated with drinking levels (Dunn, 2003; Dunn & Goldman, 1996, 1998). Sample items and internal consistency reliability estimates from wave 1 data are as follows: positive social, 18 items (“friendly,” “fun,” “outgoing”), $\alpha = .84$; negative arousal, 7 items (“mad,” “mean”), $\alpha = .82$; sedation, 7 items (“sleepy,” “slow”), $\alpha = .80$; and wild and crazy (we used 5 of 7 items: “loud,” “crazy”), $\alpha = .73$. The two items we dropped from this scale (“Drinking alcohol makes people calm”, and “Drinking alcohol makes people quiet”) are reverse scored. They had very low item-total correlations in this sample and so were removed. Estimates of internal consistency were slightly higher in waves 2 and 3.

Procedure

Participants were administered questionnaires at three time points: Spring of the 5th grade (wave 1), fall of the 6th grade (wave 2), and spring of the 6th grade (Wave 3). The questionnaires were administered in 23 public elementary schools at wave 1, then in 15 middle schools at waves 2 and 3. A passive-consent procedure was used. Each family was sent a letter, through the U.S. Mail, introducing the study. Families were asked to return an enclosed, stamped letter or call a phone number if they did not want their child to participate. Out of 1,988 5th graders in the participating schools, 1,906 participated in the study (95.9%). Reasons for non-participation included declination of consent from parents, declination of assent from children, and language or cognitive difficulties.

Questionnaires were administered by study staff in the children’s classrooms or in a central location, such as the school cafeteria, during school hours. The questionnaires took 60 minutes or less to complete. Children who left the school system were asked to continue to participate. Those who consented did so either by completing hard copies of questionnaires delivered through the mail or by completing the measures on a secure web site. This procedure was approved by the University’s IRB and by the participating school systems.

Data Analysis

We tested a sequence of models using structural equation modeling (SEM) in *Mplus* (Muthén &, Muthén, 1998-2010). We used maximum likelihood parameter estimates and an adjusted chi-square statistic that is robust to non-normality (the MLR method). To test mediation, we used the indirect test provided by Mplus (Muthén & Muthén, 1998-2010), which computes the product of the two regression coefficients as described by MacKinnon, Lockwood, Hoffman, West, & Sheets (2002). To measure model fit, we relied on four fit indices: 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).

Results

Participation Retention

Of the 1,906 participants, 1,843 first participated at wave 1 and the remaining 63 first participated at wave 2 (those 63 were recruited prior to wave 1 but were absent on each testing day during wave 1). Thus, of 1,988 children approached, 92.7% participated for the first time during wave 1 and 3.2% participated for the first time during wave 2. 94.6% of those who participated in wave 1 participated in wave 2, and 98.0% of those who participated in wave 2 also participated in wave 3. Of the full sample of 1,906, 96.7% participated in wave 1, 94.8% participated in wave 2, and 92.9% participated in wave 3. A total of 1,730 (90.8%) participated in all three waves. Individuals who participated in all three waves of the study did not differ from those who participated in only one or two waves on any demographic, criterion, or trait variable. Therefore, we inferred that data were missing at random. Missing data were imputed using the expectation maximization (EM) procedure, which has been shown to produce more accurate estimates of population parameters than do other methods, such as deletion of missing cases or mean substitution (Enders, 2006).

Possible Effects due to School Membership

In order to determine whether there was significant covariance among the study variables due to participants attending the same school, we calculated intraclass coefficients for each variable (using elementary school membership, n = 23, as the nesting variable). Intraclass coefficients ranged from .03 (positive urgency) to .00. We therefore concluded that school membership was essentially unrelated to study variables.

Descriptive Statistics

At wave 1, more girls than boys had experienced pubertal onset (27.9% of girls and 21.6% of boys: $\chi^2(1) = 10.13$, $p < .001$). Despite this significant difference, we defined pubertal onset at wave 1 (spring, 5th grade) as early: rates for both sexes approximated the early quartile for pubertal development within the sample (24.8% of the sample as a whole had experienced pubertal onset). Table 1 presents the mean endorsement levels of positive urgency and expectancies at each time point, again, separately for boys and girls, as well as the specific drinking frequencies reported at waves 1, 2, and 3 separately for boys and girls.

There was a significant linear increase in drinking frequency from wave 1 to wave 3 (F (1, 1905) = 4.99, p = .01) as well as significant quadratic change in drinking frequency from wave 1 to wave 3 (F (1, 1905) = 15.16, p <.001). The pattern was that there was essentially no significant change in drinking from wave 1 to wave 2, but an increase in drinking from wave 2 to wave 3. Boys were more likely than girls to drink at wave 2, t (1858) = 2.32, p < .01, and wave 3, t (1861) = .21, p < .01, but the rate of change in drinking did not differ for boys and girls.

Bivariate Correlations

Table 2 presents bivariate correlations among biological sex, age, early pubertal onset, drinker status, positive urgency, negative urgency, and all four alcohol expectancies at waves 1, 2, and 3. As anticipated, each of the variables measured at three time points correlated with the same variable measured at the other time points. Early pubertal onset was positively associated with positive urgency, social facilitation expectancies, and drinker status both cross-sectionally and prospectively. Additionally, positive urgency, social facilitation expectancies, and drinker status were also all positively associated across all three time points. Age was modestly associated with each variable, both cross-sectionally and prospectively.

Model Tests

The first model we tested specified cross-sectional associations among positive urgency, positive social alcohol expectancies, and drinker status (as well as with pubertal onset at wave 1). Longitudinally, this model specified only (a) autoregressions among each variable, e.g., wave 1 positive urgency predicted wave 2 and wave 3 positive urgency and wave 2 positive urgency predicted wave 3 positive urgency; and (b) prediction from early (wave 1) pubertal onset to wave 2 and wave 3 drinker status. After preliminary analyses indicated no effects of age or sex, those variables were not included further. Fit indices for this model were: $\chi^2(28) = 190.95$; CFI = .95; NNFI = .92; RMSEA = .05 (90% confidence interval: .05 - .06), SRMR = .06. This model explained 33% of the variance in wave 3 drinker status.

The second model added in reciprocal prediction between alcohol expectancies and drinker status. This change involved modeling four new pathways: wave 1 expectancies to wave 2 drinker status; wave 2 expectancies to wave 3 drinker status; wave 1 drinker status to wave 2 expectancies; and wave 2 drinker status to wave 3 expectancies. All four new pathways were statistically significant. Using the scaled chi-square test of model change (necessary for non-normal distributions: Muthén &, Muthén, 1998-2010), this model fit significantly better than the first model (change in $\chi^2(4) = 56.80$, p < .001). Fit indices for this model were: $\chi^2(24) = 129.46$; CFI = .97; NNFI = .94; RMSEA = .05 (90% confidence interval: .04 - .06), SRMR = .05. This model explained 34% of the variance in wave 3 drinker status.

To test the third model, we proceeded in two steps. First, we included just a direct pathway from wave 1 positive urgency to wave 3 drinking. The wave 1 positive urgency to wave 3 drinking direct effect was initially significant (b = .06, p < .05), above and beyond all other predictive influences. We then added in one additional pathway, from wave 1 positive urgency to wave 2 positive social alcohol expectancies, in order to test the AP mediational model of wave 1 positive urgency to wave 3 drinker status, mediated by wave 2 positive social expectancies. The previously significant direct effect from wave 1 positive urgency to wave 3 drinker status then became non-significant and near zero (new direct effect b = .01, p = .321). The additional pathway was statistically significant, as was the test of mediation: $z = 3.02$, $p = .001$, $b = .01$ (90% confidence interval .004 - .02). Because wave 1 positive urgency predicted wave 2 positive social alcohol expectancies, we then included one additional path, from wave 2 positive urgency to wave 3 expectancies. This model fit better than model 2: change in $\chi^2(1) = 15.57$, $p < .001$). Fit indices for this model were: $\chi^2(22) = 91.62$ CFI = .98; NNFI = .95; RMSEA = .04 (90% confidence interval: .03 - .05), SRMR = .03. Figure 1 depicts the final model with the mediational pathway included. It explained 35% of the variance in wave 3 drinker status.

To understand the effect sizes of each predictor of wave 3 drinker status in the final model, we calculated odds ratios (OR) for each predictor: wave 1 drinker status OR = 4.32, $p < .001$ (95% confidence interval: 2.99 – 6.24); wave 2 drinker status OR = 11.20, $p < .001$ (95% confidence interval: 7.79 – 16.10); early pubertal onset OR = 1.55, p < .005 (95% confidence interval: 1.11 – 2.15); and wave 2 alcohol expectancy OR = 2.72, $p < .001$ (95% confidence interval: 1.94 – 3.83).

Test of Model Controlling for other Risk Factors

We conducted two additional model tests to assess whether the above effects were maintained with the addition of numerous controls. In the first, we added direct predictive effects from wave 1 negative urgency and wave 1 sensation seeking to wave 3 drinker status. Neither trait was significantly predictive (*b* = .02 and .01, respectively). In the second, we included our original model plus (a) prediction from wave 1 negative urgency and sensation seeking to all four wave 2 alcohol expectancies and wave 3 drinker status; and (c) prediction from all four wave 2 alcohol expectancies to wave 3 drinker status. This model fit the data well: $\chi^2(174) = 795.65$; CFI = .96; NNFI = .94; RMSEA = .04 (90% confidence interval: .04 - .05), SRMR = .05. This model also explained 35% of the variance in wave 3 drinker status: Inclusion of the additional predictors did not improve prediction of drinking behavior. None of the newly added alcohol expectancies, measured at wave 2, significantly predicted wave 3 drinker status. Neither negative urgency nor sensation seeking predicted wave 2 alcohol expectancies. In this model, early pubertal onset did not predict wave 2 or wave 3 drinker status beyond the other predictors.

It was the case that drinking experience predicted changes in multiple expectancies. Wave 1 drinker status predicted subsequent lower endorsement of the wave 2 expectancy that alcohol leads to negative arousal ($b = -.08$, $p < .001$) and the wave 2 expectancy that alcohol leads to sedation and impairment ($b = -.06$, $p < .01$). These effects were not maintained in prediction from wave 2 drinker status to wave 3 expectancies, and drinker status did not predict change in the alcohol expectancy for wild and crazy behavior.

Most importantly, prediction from our model was maintained, although slightly weaker, controlling for these additional factors. Concerning reciprocal prediction between the alcohol expectancy for positive social experiences and drinking behavior, three of the four effects remained significant: drinker status at wave 1 predicted positive social expectancy at wave 2 ($b = .07$, $p < .01$), drinker status at wave 2 predicted positive social expectancy at wave 3 ($b = .08$, $p < .001$), and positive social expectancy at wave 2 predicted drinker status at wave 3 ($b = .09$, $p < .001$). Concerning the AP model, wave 1 positive urgency predicted wave 2 positive social expectancy ($b = .05$, $p < .05$), wave 2 positive social expectancy predicted wave 3 drinker status, as noted, and the predictive influence of wave 1 positive urgency on wave 3 drinker status was mediated by wave 2 positive social expectancy: $z = 1.73$, $p < .05$, $b = .01$ (90% confidence interval .001 - .016). Because none of the key control variables had effects significantly different from zero, in Figure 1 we present the original values without inclusion of the control variables.

Model Invariance Across Sex and Race

Using the final structural model, we conducted two invariance tests. We tested whether the model was invariant across both sex and race (comparing African Americans and European Americans). In each case, we specified the model using two groups (boys and girls; African Americans and European Americans) and compared two models. The first specified the same model for both groups but did not constrain individual paths to be equal. In the second model we constrained all prospective paths to be equal across group. In both cases, the constrained model did not result in significantly worse fit than the unconstrained model, indicating invariance across both sex and race.

Discussion

Alcohol consumption by children in middle school is a marker of the presence of at least one alcohol use disorder symptom (Chung et al., 2012), is associated with involvement in other problem behaviors (Jessor, 1987), and predicts subsequent alcohol use disorder diagnoses in later adolescence and adulthood (DeWit et al., 2000; Grant & Dawson, 1997; Guttmannova et al., 2012). Thus, understanding of the precursors of this early problematic behavior is crucial for targeted prevention and early intervention efforts. This report describes a successful test of a personality and learning-based risk model to predict this problematic drinking behavior during the transition from elementary school to middle school.

Positive social alcohol expectancies are understood to reflect learned associations between drinking and the reward of positive social experience, and have been previously shown to be important in understanding drinking behaviors of youth during mid-adolescence (Smith et al., 1995a). Thus, positive social experience is likely to be a potent reinforcer for youth and a more important possible consequence of drinking than the consequences represented by other expectancies (negative arousal, sedation/impairment, wild and crazy behavior). Consistent with this understanding, in this sample, only positive social expectancies predicted subsequent drinking behavior, and drinking behavior predicted subsequent social expectancy change. Possibly, learning about the social rewards associated with drinking, and drinking itself, mutually influence each other over time, resulting in greater drinking and increased risk in the form of expectancy endorsement.

One striking characteristic of the reciprocal prediction between drinking and expectancy is that the direction of prediction reflected increased risk over time: drinker status predicted future increases in the expectancy for positive social experience, and the expectancy predicted subsequent drinker status. There was no evidence of a corrective process, in which exposure to alcohol led to lower risk expectancy endorsement. A similar reciprocal predictive process has been shown previously in children from grades 7 through 9 (Smith et al., 1995a), but the current study is the first we know of to address what Windle et al. (2008) referred to as the important gap in the literature concerning whether such influences operate across the transition from elementary to middle school. To know that such drinking – expectancy reciprocal influences appear to be operating at such a young age may prove useful for prevention specialists. Further efforts toward the development of effective alcohol expectancy challenges appropriate to children may prove useful (Cruz & Dunn, 2003).

We also found evidence for a hypothesized transaction among personality, learning, and behavior. Consistent with the AP model of risk, the high-risk trait of positive urgency predicted subsequent change in high-risk alcohol expectancies, which in turn predicted subsequent drinking behavior. Statistical findings were consistent with the hypothesis that expectancies mediated the predictive influence of positive urgency on later drinking. This finding is important for at least three reasons. First, the AP model provides a useful integration of what have often been the separate personality and learning risk literatures. Substantively, the possibility that psychosocial learning is influenced not just by experience, but also by prior personality, speaks to the importance of personality in the risk process. Youth high in positive urgency are more disposed than others to form high-risk expectancies, thus increasing their risk for early drinking. If learned associations between alcohol and reward develop not only as a function of environmental exposure, but also due to dispositional characteristics of individuals, it may prove necessary for interventions to address those high risk characteristics. Second, the AP transactional process appears to operate in young children. Thus, there is little reason to think that the effects observed in the current study are due to scar effects from prior dysfunction and in that way artifactual.

Third, the current test of the AP process was rigorous, in that (a) we only tested for the presence of the transactional process after controlling for prior drinker status, early pubertal onset, and reciprocal drinking – expectancy prediction; and (b) the effect was present even when controlling for other personality and alcohol expectancy risk factors. Neither negative urgency nor sensation seeking predicted drinker status in children this young. Those traits may play a bigger role as children get older, a possibility consistent with positive findings for their roles in mid-adolescent and adult samples (Settles et al., 2010; Zuckerman, 1994).

The AP process explained an additional 1% of the variance in wave 3 drinking. This net effect is small, but the fact that it occurred above and beyond important controls in a relatively short period of time is noteworthy. It is of course the case that the AP risk process needs to be integrated with many other processes to improve the ability to identify high risk youth. A number of other risk processes have been identified. For example, low parental monitoring and responsiveness (Baumrind, 1985), greater parental drinking (Wong, Brower, Fitzgerald, & Zucker, 2004), parental alcoholism (Russell, 1990), children's sleep loss (Wong et al., 2004), children's engagement in externalizing behaviors (Clark, Parker, & Lynch, 1999; McGue, Iacono, Legrand, & Elkins, 2001), and children's engagement in internalizing behaviors (Hussong, Jones, Stein, Baucom, & Boeding, 2011) all predict early drinking. In the current study, we selected one set of risk factors and tested a model of their transactional nature in the risk process. It is likely that risk reflects transactions among all of these variables, personality, expectancy, and others, both within and across time.

The findings of this study raise a number of important questions. If positive urgency influences positive social expectancy formation, what is the mechanism of influence? Does the mechanism involve context? That is, to what degree does elevated positive urgency influence which contexts one is exposed to? Does the mechanism involve attention? To what degree does the trait influence attention to the reinforcing and not the punishing effects of drinking? Does positive urgency interact with contextual factors to influence risk? With respect to application, how might interventions reduce the tendency to act rashly when in a very positive mood? In light of the many benefits of positive mood (Isen, 1984, 1987), how might one reduce positive urgency without reducing positive mood? This goal may be possible to achieve, because it does appear that positive urgency is not associated with baseline levels of positive mood (Cyders et al., 2010).

The support for this risk model was invariant across sex. Thus, although boys are generally more likely to drink than girls (Donovan, 2007), the overall risk processes identified by this model appear to be similar. The model was also invariant across race; there were no significant differences between African American and European American children on any hypothesized pathway. However, because the sample size allowed only for comparisons between European Americans and African Americans, examination of the model in other racial groups could not be conducted and is certainly warranted.

It is important to note the study's limitations. First, although we tested prospective relationships consistent with an underlying causal model, this study did not provide a direct test of causality. Second, each attribute was measured by self-report and not by interview. Third, we did not include assessment of the context of drinking; further understanding of context (Anderson & Brown, 2011) is of course crucial. Fourth, this study did not address the specific hypothesized mechanisms through which positive urgency may influence social facilitation expectancies. Fifth, some children had already begun drinking by the end of 5th grade. This study did not account for the very earliest stages of early adolescent drinking. Sixth, drinker status was measured by self-report on a single variable and did not permit assessment of magnitude of increase or decrease in drinking over time; improved measurement in future studies would be beneficial. Finally, this study does not allow for identification of different developmental pathways that might be taken by different children. Inclusion of later time points and utilization of person-centered analytic approaches may therefore be useful in identifying (a) the long-term implications of the risk processes identified in this study, (b) moderators of these risk processes, and (c) different risk processes for different children.

In summary, the current study adds to what is known about characteristics of children that predict the important problem of very early drinking. Individual difference factors, including those related to personality and psychosocial learning, should be integrated with other knowledge to develop more comprehensive models of the risk process.

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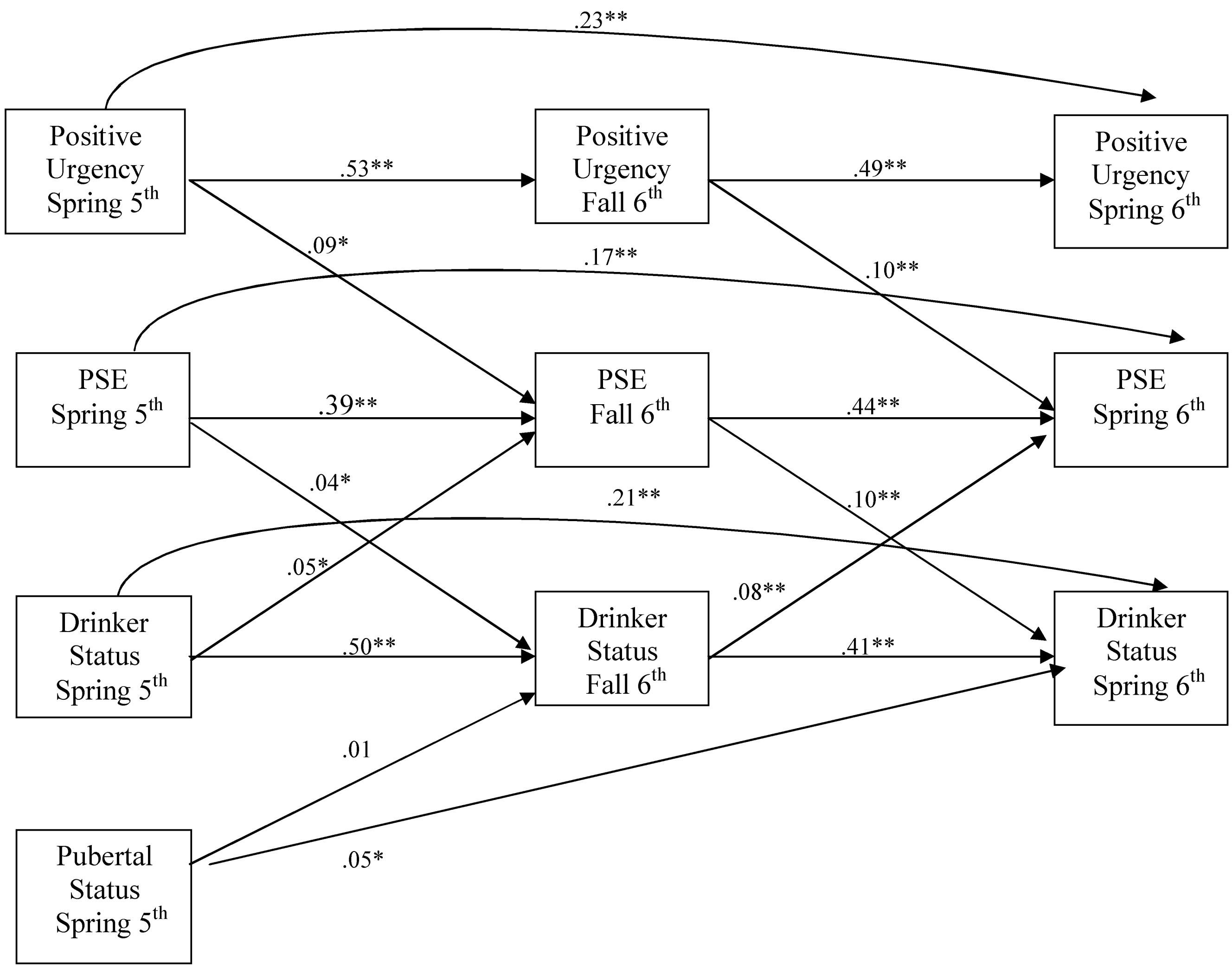

Figure 1.
A depiction of the full model tested (model 3). For ease of presentation, cross-sectional associations and disturbance terms are not depicted, nor are age or sex, which were not predictive. Solid straight line arrows reflect pathways hypothesized in the model; all were significantly greater than zero with standardized weights. PSE= positive social facilitation expectancies. *p < .05; **p < .001; n = 1,906.

Table 1

Mean levels of positive urgency, expectancies, and drinker status for boys and girls at each time point

	Spring, 5th grade	Fall, 6th grade	Spring, 6th grade
	Mean (SD)	**Mean (SD)**	**Mean (SD)**
Positive Urgency			
Boys	2.17 (.75)	2.09 (.73)	2.06 (.77)
Girls	2.11 (.75)	2.00 (.77)	2.06 (.79)
Overall	2.14 (.75)	2.05 (.75)	2.07 (.78)
Expectancies			
Boys	1.53 (.37)	1.69 (.40)	1.69 (.40)
Girls	1.51 (.38)	1.64 (.40)	1.62 (.42)
Overall	1.52 (.37)	1.67 (.40)	1.66 (.41)
Drinker Status			
Boys			
Non-drinker	815 (88.5%)	790 (87.5%)	745 (84.2%)
Drinker	106(11.5%)	113 (12.5%)	140 (15.8%)
Girls			
Non-drinker	847 (91.9%)	814 (90.1%)	768 (86.8%)
Drinker	75 (8.1%)	89 (9.9%)	117 13.2%)

Note: sample sizes are based on full imputation, except for with respect to drinker status, where sample sizes reflect the number participating at each wave (wave 1 n = 1843; wave 2 n = 1806, wave 3 n = 1770).

Table 2

Bivariate Correlations Among Study Variables

	Sex	Age	Pub	DS1	DS2	DS3	PU1	PU2	PU3	NU1	NU2	NU3	SS1	SS2	SS3	PS1	PS2	PS3	NA1	NA2	NA3	SI1	SI2	SI3	WC1	WC2	WC3
Sex		−.05	.06*	−.05*	−.04	−.05*	−.03	−.04	−.02	.00	−.02	.05*	−.24**	−.25**	−.27**	−.03	−.04	−.06**	−.06**	−.02	.02	−.01	.01	.05*	.03	.05*	.10**
Age			.16**	.06*	.07*	.07*	.06*	.05*	.07*	.05	.08**	.06*	.01	.01	.01	.08**	.06*	.10**	.02	−.01	−.04	.00	−.03	−.04	.04	.00	−.01
Pub				.14**	.09**	.12**	.14**	.15**	.12**	.13**	.13**	.12**	.09**	.06*	.06**	.13**	.12**	.08**	.09**	.03	.02	.08**	.02	.01	.13**	.08**	.06*
DS1					.45**	.35**	.18**	.15**	.12**	.22**	.19**	.17**	.14**	.16**	.11**	.20**	.18**	.20**	−.04	−.06**	−.07**	−.02	−.06*	−.07**	.05*	−.01	−.02
DS2						.44**	.16**	.20**	.15**	.19**	.25**	.21**	.12**	.15**	.09**	.13**	.20**	.20**	−.03	−.04	−.06**	−.01	−.04	.06**	.02	.03	−.01
DS3							.14**	.21*	.21**	.15**	.24**	.25**	.12**	.15**	.15**	.16**	.24**	.36**	.02	−.05*	−.05*	.04	−.01	−.05*	.06*	.04	.03
PU1								.53**	.49**	.63**	.42**	.42**	.32**	.20**	.19**	.21**	.18**	.18**	.10**	.00	.03	.06*	.01	.00	.12**	.08**	.10**
PU2									.62**	.46**	.68**	.52**	.19**	.33**	.23**	.20**	.30**	.29**	.10**	.02	−.00	.08**	.01	−.04	.13**	.12**	.08**
PU3										.39**	.48**	.69**	.19**	.25**	.36**	.16**	.24**	.29**	.11**	.01	.04	.08**	.01	.02	.15**	.09**	.12**
NU1											.56**	.52**	.26**	.17**	.14**	.23**	.17**	.18**	.09**	.03	.02	.06*	.03	.01	.15**	.08**	.09**
NU2												.66**	.18**	.32**	.19**	.24**	.29**	.25*	.06**	.02	−.01	.05*	.04	−.02	.11**	.12**	.0**
NU3													.16**	.21**	.31*	.17**	.24**	.28**	.10**	.02	.03	.07**	.03	.03	.14**	.11**	.10**
SS1														.66**	.59**	.14**	.11**	.10**	.10**	.03	.02	.08**	.05*	.03	.10**	.06*	.02
SS2															.72**	.12**	.16**	.16**	.09**	.09**	.04	.07**	.11**	.04	.10**	.13**	.06*
SS3																.08**	.13**	.17**	.12**	.09**	.08**	.09**	.12**	.09**	.13**	.13**	.08**
PS1																	.43**	.39**	.04	−.07**	−.08**	.08**	−.04	−.02	.27**	.10**	.08**
PS2																		.56**	−.03	−.10**	−.12**	.01	−.05*	−.05*	.13**	.23**	.14**
PS3																			−.02	−.12**	−.06*	.03	−.05*	.04	.14**	.14**	.29**
NA1																				.41**	.35**	.72**	.33**	.28**	.62**	.29**	.23**
NA2																					.49**	.33**	.75**	.35**	.28**	.64**	.29**
NA3																						.31**	.40**	.75**	.27**	.33**	.64**
SI1																							.42**	.36**	.64*	.31**	.27**
SI2																								.47**	.30**	.66**	.31**
SI1																									.29**	.36**	.67**

	Sex	Age	Pub	DS1	DS2	DS3	PU1	PU2	PU3	NU1	NU2	NU3	SS1	SS2	SS3	PS1	PS2	PS3	NA1	NA2	NA3	SI1	SI2	SI3	WC1	WC2	WC3
WC1																										.43**	.38**
WC2																											.47**
WC3																											

Note. n = 1906;

Sex: 0 = male, 1 = female, Age = chronological age; Pub = wave 1 pubertal status; DS1 = wave 1 drinking status, DS2 = wave 2 drinking status, DS3 = wave 3 drinking status, PU1 = wave 1 positive urgency, PU2 = wave 2 positive urgency, PU3 = wave 3 positive urgency, NU1 = wave 1 negative urgency, NU2 = wave 2 negative urgency, NU3 = wave 3 negative urgency, SS1 = wave 1 sensation seeking, SS2 = wave 2 sensation seeking, SS3 = wave 3 sensation seeking, PS1 = wave 1 positive social facilitation expectancies, PS2 = wave 2 positive social facilitation expectancies, PS3 = wave 3 positive social facilitation expectancies, NA1 = wave 1 negative arousal expectancies, NA2 = wave 2 negative arousal expectancies, NA3 = wave 3 negative arousal expectancies, SI1 = wave 1 sedation and impairment expectancies, SI2 = wave 2 sedation and impairment expectancies, SI3 = wave 3 sedation and impairment expectancies, WC1 = wave 1 wild and crazy expectancies, WC2 = wave 2 wild and crazy expectancies, WC3 = wave 3 wild and crazy expectancies.

* $p < .05$;

** $p < .001$.;