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Developmental trends in alcohol use initiation and escalation from early- to middle-adolescence: Prediction by urgency and trait affect

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Abstract

Studies on adolescent drinking have not always been able to distinguish between initiation and escalation of drinking, because many studies include samples in which initiation has already occurred; hence initiation and escalation are often confounded. The present study draws from a dual-process theoretical framework to investigate: if changes in the likelihood of drinking initiation and escalation are predicted by a tendency towards rash action when experiencing positive and negative emotions (positive and negative urgency); and whether trait positive and negative affect moderate such effects. Alcohol naïve adolescents (n=944; age: M=12.16, SD=.96; 52% female) completed 6 semi-annual assessments of trait urgency and affect (wave-1) and alcohol use (waves 2–6). A two-part random-effects model was used to estimate changes in the likelihood of any alcohol use vs. escalation in the volume of use amongst initiators. Main effects suggest a significant association between positive affect and change in level of alcohol use amongst initiators, such that lower positive affect predicted increased alcohol involvement. This main effect was qualified by a significant interaction between positive urgency and positive affect predicting changes in the escalation of drinking, such that the effect of positive urgency was augmented for those high on trait positive affect, though only at extremely high levels of positive affect. Results suggest risk factors in the development of drinking depend on whether initiation or escalation is investigated. A more nuanced understanding of the early developmental phases of alcohol involvement can inform prevention and intervention efforts.

Keywords

alcohol; adolescence; urgency; affect; personality

Introduction

There is consensus that alcohol use is best conceptualized from a developmental framework, though there is a dearth of studies testing levels of escalation in early drinking milestones (Jackson & Sartor, 2014). Since the majority of adult drinkers first experiment with alcohol

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in adolescence, a full understanding of the etiology of addiction necessitates investigations of the early developmental phases of alcohol involvement; including initiation of alcohol use and early escalation in volume of drinking (Chassin, Colder, Hussong, & Sher, 2016).

Although there is a plethora of evidence suggesting that dysregulatory traits are robust individual-level correlates of alcohol involvement (Clark, Thatcher, & Tapert, 2008; Dick et al., 2010; Rogosch, Chassin, & Sher, 1990; Tarter, 1988), there is increasing consensus that psychological dysregulation is the result of distinct and interactive mechanisms (de Wit, 2008; Harnett, Lynch, Gullo, Dawe, & Loxton, 2013; Littlefield, Stevens, & Sher, 2014; Zucker, Heitzeg, & Nigg, 2011). The heterogeneous nature of liability for dysregulated action suggests that there is a need to "unpack" the specific mechanisms of individual-level risk for drinking (Duckworth & Steinberg, 2015; Nigg, 2015). Dual-process accounts of dysregulated action have the potential to "unpack" heterogeneity in alcohol involvement. The dual-process framework suggests that specific mechanisms of dysregulated action consist of two functionally distinct psychological processes: individual differences in capacity for regulation/control and individual differences in emotional reactivity (Beauchaine, 2015; Ernst, 2014; Luciana, 2006; Posner & Rothbart, 2000; Spear, 2011). The purpose of this study was to investigate the development of alcohol use from early- to middle-adolescence, by drawing from the personality literature to investigate the predictive role of regulation/control and emotional reactivity. More specifically, in this study we tested if individual differences in the predisposition to rash action when experiencing emotional states (trait urgency) interacts with individual differences in the predisposition to experience affective states (trait affect) to predict the initiation of drinking and/or early escalation in volume of alcohol use.

Regulation/control: Positive and negative urgency traits

In efforts to elucidate heterogeneity in the liability for alcohol involvement, the personality literature has distinguished between two dysregulatory traits: positive and negative urgency (Cyders et al., 2007). Positive urgency represents a predisposition to engage in rash-action when in a positive mood; negative urgency represents a predisposition to engage in rash-action when in a negative mood. Examining an individual's liability for alcohol involvement as a function of their tendency to engage in rash action when experiencing positive and negative moods can help researchers investigate different pathways to drinking (Settles, Zapolski, & Smith, 2014). Both positive and negative urgency have been shown to predict adolescent drinking (*for a meta-analytic review see* Stautz & Cooper, 2013), which suggests that these two traits may be useful in explaining the role of capacity for regulation/control in the development of adolescent drinking.

However, the urgency constructs do not take into consideration how frequently people tend to experience positive and/or negative moods (Cyders & Coskunpinar, 2010). Hence, it is unknown whether the effects of urgency on alcohol involvement are driven by individual differences in trait affect. Determining whether this is the case would necessitate controlling for affect when examining the association between urgency and alcohol involvement. Alternatively, it may be that having high levels of trait positive/negative urgency in combination with high levels of trait positive/negative affect may place adolescents at

increased risk for drinking. Determining whether this is the case would necessitate testing the interactive effects of urgency by trait affect. There is a dearth of research examining the concurrent and synergistic influence of urgency and affect traits, especially as applied to the early stages of alcohol involvement.

Emotional reactivity: Positive and negative affect traits

Individual differences in emotional reactivity (operationally defined as differences in the liability to experience frequent and intense emotional experiences) have been frequently assessed using trait affect (Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013; Cheetham, Allen, Yucel, & Lubman, 2010; Martel, Nigg, & von Eye, 2009). Trait positive affect represents individual differences in the predisposition to experience positive moods; while trait negative affect represents individual differences in the predisposition to experience negative moods (Watson, Clark, & Tellegen, 1988). Different researchers have postulated different directions of effect for trait positive affect; high trait positive affect has been hypothesized to increase risk for drinking (Cheetham et al., 2010; Simons, Gaher, Correia, Hansen, & Christopher, 2005); as has low trait positive affect (Bowirrat & Oscar-Berman, 2005; Cheetham et al., 2010).

Research on the relationship between trait positive affect and alcohol involvement is equivocal. Positive associations have been reported between trait positive affect and college student drinking (Hussong, Hicks, Levy, & Curran, 2001); as have negative associations in both adolescent and college student samples (Colder & Chassin, 1997; Simons, Wills, & Neal, 2014; Wills, Sandy, Shinar, & Yaeger, 1999). There have also been studies reporting no relationship between trait positive affect and adolescent drinking (Elkins, King, McGue, & Iacono, 2006). In sum, the empirical evidence for the relationship between trait positive affect and drinking is contradictory. Contradictory findings may indicate that prior studies have not considered potential synergistic associations; this study will test the synergistic relationship between positive urgency and trait positive affect.

With respect to negative affect, research with both adolescent and college student samples suggests that trait negative affect is positively associated with alcohol involvement (Colder & Chassin, 1997; Chassin, Pillow, Curran, Molina, & Barrera, 1993; Creswell et al., 2015; Measelle, Stice, & Springer, 2006; Simons, et al., 2014; Wills et al., 1999; Wray, Simons, Dvorak, & Gaher, 2012); though there is also evidence to suggest no association between trait negative affect and college student drinking (Colder, 2001). Although the preponderance of evidence suggests that negative affect is positively associated with alcohol involvement, it is not fully understood whether trait negative affect precedes or is a consequence of alcohol use because most studies investigate this relationship after the initiation and some degree of escalation in drinking has occurred (Cheetham et al., 2010). The present study will capitalize on longitudinal methodology in a sample of alcohol naïve early-adolescents to establish temporal precedence in the prediction of the early stages of alcohol involvement.

Potential synergistic effects of urgency and affect

In addition to the independent effects of urgency and trait affect, these processes may interact such that positive affect may augment the effect of positive urgency – that is, positive urgency may have a stronger impact on drinking among those who frequently experience intense positive mood states. Similarly, high trait negative affect may augment the effect of negative urgency – that is, negative urgency may have a stronger impact on drinking amongst those who frequently experience intense negative mood states.

There is some evidence to suggest that urgency may interact with trait affect to predict behavior. For example, using a sample of 16 to 25 year-olds Racine et al. (2013) found that negative urgency, combined with high levels of trait negative affect, predicted dysregulated eating (binge eating and emotional eating). In a college student sample, Bresin, Carter, and Gordon (2013) found that trait negative affect and negative urgency interact to predict non-suicidal self-injury. Finally, in a college student sample positive urgency has been shown to predict greater levels of negative outcomes on a risk taking task and greater beer consumption following an experimental manipulation to increase positive affect (Cyders et al., 2010). These studies suggest that a joint investigation of urgency and trait affect may help elucidate synergistic mechanisms in the development of alcohol involvement. However, this has yet to be examined with respect to the development of adolescent drinking, and with younger adolescents.

Temporal precedence in the prediction of early-adolescent drinking

The present study seeks to investigate the main and moderated effects of urgency and affect traits on the development of adolescent drinking. When studying the early stages of adolescent drinking, it is imperative to differentiate between changes in the likelihood of drinking and escalation in volume of use amongst initiators (Brown, Catalano, Fleming, Haggerty, & Abbott, 2005; Capaldi, Stoolmiller, Kim, & Yoerger, 2009; Donovan, 2004). Neglecting to account for volume of use amongst initiators can obscure our understanding of the early stages of alcohol use, as different mechanisms may influence the initiation of alcohol use vs. escalation in volume of use (Hoffmann & Bahr, 2010). The current study establishes temporal precedence in the investigation of change in the likelihood of alcohol use initiation and change in volume of use amongst initiators. By using a sample that was recruited when participants were on the cusp of initiation, but had not yet initiated drinking, the current study is positioned to elucidate the early developmental phases of alcohol involvement. However, due to the dearth of research on these constructs disentangling alcohol use initiation vs. escalation in volume of use, we test the same hypotheses for alcohol use initiation and escalation.

Hypothesized main effects—It is expected that high levels of positive and negative urgency will predict more alcohol involvement. It is expected that high levels of trait negative affect will predict more alcohol involvement. Due to the mixed findings reported for trait positive affect, hypotheses are exploratory; with higher or lower levels of trait positive affect potentially predicting more alcohol involvement

Hypothesized moderated effects—It is expected that trait negative affect will moderate the association between negative urgency and alcohol involvement, such that the effect of negative urgency will be augmented among individuals who frequently experience intense negative emotional states. It is expected that trait positive affect will moderate the association between positive urgency and alcohol involvement, such that the effect of positive urgency will be augmented among individuals who frequently experience intense positive emotional states.

Methods

Participants

The current study draws from a larger study of 1,023 adolescents in an ongoing longitudinal project investigating the development of drinking milestones (Jackson et al., 2014). Adolescents were recruited in five cohorts from six public middle schools in Rhode Island. In order to establish temporal precedence in the initiation of drinking, the present study uses data from adolescents who reported never having had a full drink of alcohol at wave-1. Seven percent of the sample had initiated drinking by wave-1, and were removed from the analysis. The present study was based on n=944 adolescents who had never had a full drink of alcohol at wave-1, with an average age of 12.16 (SD= .96), and was evenly split in gender (52% female). Twelve percent of the sample identified as Hispanic; 77% as White, 7% as multi-racial, 5% as African-American, 3% as Asian, 2% as Native American, 6% as “other.”

Procedures

Information about the study was provided via the school setting (*for a detailed description please see* Jackson, Colby, Barnett, & Abar, 2015). Adolescents who expressed interest in the study and who had written informed parental consent were invited to attend a two-hour in-person group orientation session. During each session, project staff described the study and adolescents completed a computer-based 45-minute baseline survey. Follow-up assessments were conducted using a web-based survey that took approximately 45 minutes to complete. For follow-up assessments, participants were informed that the survey was open, and they used a unique user identification number and password to access the survey. Multiple reminders were given during the two-week survey window. After the baseline assessment (wave-1), the sample was followed for 5 waves including semi-annual data collection for two years (waves 2–5) and another survey one year later (wave 6). Local IRB approval was obtained for this study; and participants were compensated $25 at baseline, and $20 for each follow-up. Response rates were: 92% for wave-2, 88% for wave-3, 85% for wave-4, 83% for wave-5, and 83% for wave-6. Participants lost to attrition were more likely to be male; have less positive affect at waves 3 and 6; and have more negative affect at waves 3, 4, and 6.

Measures

Of relevance to this investigation are self-report measures of trait positive/negative urgency and affect (wave-1), and subsequent self-reported alcohol use (waves 2–6). Positive urgency was assessed by 6-items assessing the tendency to act rashly when in a positive mood (e.g., “*I am surprised by the things I do while in a great mood*”); negative urgency was assessed by

6-items assessing the tendency to act rashly when in a negative mood (e.g., "*When I am upset I often act without thinking*") (UPPS-P; Cyders et al., 2007; Whiteside & Lynam, 2001). Response options ranged from "*agree strongly*" (1) to "*disagree strongly*" (4). The scale was scored such that higher scores indicate higher levels of urgency. Cronbach's alpha was .85 for positive urgency; .84 for negative urgency.

Positive affect was assessed by 5-items assessing the frequency of experiencing positive emotional states (e.g., "*cheerful, proud, joyful, delighted, & lively*"); negative affect was assessed by 5-items assessing the frequency of experiencing negative emotional states in the past two weeks (e.g., "*sad, upset, scared, miserable, & lonely*") (The Positive and Negative Affect Scale for Children; Laurent et al., 1999). Response options ranged from "*Very slightly or not at all*" (1) to "*Extremely*" (5). Cronbach's alpha was .89 for positive affect and .81 for negative affect.

Alcohol involvement was assessed using a Quantity-Frequency measure (Sobell & Sobell, 2004), assessing frequency (average number of drinking days) and quantity (average drinks per drinking day) over two time period; the past 6 months for waves 2–5 and the past 12 months for wave-6. Quantity by frequency of drinking was calculated by multiplying the raw quantity and raw frequency variables with each other. After constructing the multiplicative quantity by frequency variables, we changed values in each variable greater than 3 standard deviations from the within-time mean to equal 3 standard deviations in order to reduce the influence of extreme cases (Tabachnick & Fidell, 1996). Extreme cases were judged relative to the mean and standard deviation of the time point they were assessed from (e.g., wave-2 QxF was recoded relative to the 3 standard deviation value of wave-2 QxF; wave-3 QxF was recoded relative to the 3 standard deviation value of wave-3 QxF). The following number of cases were recoded to equal 3 standard deviations: 9 at wave-2, 5 at wave-3, 11 at wave-4, 5 at wave-5, and 25 at wave-6.

Approach to Analysis

When investigating drug use in early-adolescence, outcomes are expected to be non-normally distributed because of a high concentration of values indicative of no use (Hoffmann & Bahr, 2010). This is to be expected given variability in initiation and given that youth have not yet established regular patterns of use. The nature of the distribution is not simply a nuisance that violates assumptions of conventional growth models (e.g., growth models that assume the presence of normally distributed data), but rather is an important feature of the phenomenon. Hence, a two-part random-effects model was used (Olsen & Schafer, 2001). These models are capable of handling non-normally distributed data by statistically disaggregating alcohol involvement into use vs. no-use in part-1 of the model; and level of use amongst drinkers in part-2 of the model, as well as by using maximum likelihood estimation that is robust to non-normality (MLR; Hox, Maas, & Brinkhuis, 2010) (for a review see Flora, 2011). We followed recommendations by Olsen & Schafer (2001), and began by testing the functional form for each part of the model separately (testing both linear and quadratic effects). A nested model approach was used to evaluate model fit (Bollen & Curran, 2006). An unconditional growth curve model with fixed effects (no variability around means) was used as the baseline comparison model. The Satorra-Bentler

log likelihood chi-square test (Satorra & Bentler, 2001) was used to investigate if the addition of random intercepts and slopes improved model fit. Additionally, for Part 2 of the model we also assessed model fit by using root-mean-square error of approximation (RMSEA; Browne & Cudeck, 1993). Fit indices are not available to evaluate Part 1 of the model, hence we relied on nested model tests alone (Brown et al., 2005). Analyses were conducted in Mplus version 7.11; full information maxim likelihood estimation was used to model missing data (as opposed to using listwise deletion) (Muthen & Muthen, 2013). To compare our findings to previous studies that have tested the effects of urgency and affect traits independently, we ran both bivariate and multivariate models. Because they were significantly associated with drinking, age and gender were included as covariates. Significant interactions were probed by testing simple slopes at high and low levels of positive affect (Aiken & West, 1991).

Results

Correlations and descriptive statistics are presented in Table 1. The following prevalence rates of drinking were observed: At wave-2 13 youth (2%) reported drinking; at wave-3 22 youth (3%) reported drinking; at wave-4 30 youth (4%) reported drinking; at wave-5 45 youth (6%) reported drinking; and at wave-6 130 youth (16%) reported drinking. Frequency of drinking and quantity per drinking occasion are reported in Table 2. Nested model tests were used to evaluate model fit separately for each part of the model (see Table 3). The best fitting models consisted of a random intercept and slope for any use, and a fixed intercept and random slope for volume of use. The two-part model suggested that: change in any use was linear (mean= .88, $p<.001$; variance = .50, $p= .01$); and change in volume of use was linear (mean = .17, $p=.001$; variance = .01, $p= .057$). Change for any use did not correlate with change in volume of use ($r = -.03$, $p= .92$).

The bivariate associations between predictors and outcomes are presented in Table 4. Older age, being female, higher scores on trait positive urgency, negative urgency, and negative affect were associated with steeper changes in likelihood of use. In addition, older age and being male was associated with faster escalation in volume of use amongst drinkers.

Multivariate associations between predictors and outcomes are presented in Table 5; pictorial depiction of multivariate effects is presented in Figure 1. Older age and female gender predicted steeper changes in likelihood of use. Male gender and lower levels of trait positive affect predicted increased alcohol involvement amongst initiators. There was a significant interaction effect of positive urgency by positive affect predicting change in volume of use amongst drinkers. When the interaction was probed at 1SD above and below the mean of positive affect, simple slopes were not significant. To examine effect of positive urgency at intense levels of positive affect, the interaction was probed at 2SD above and below the mean of positive affect. Simple slope tests suggest that positive urgency positively predicted change in volume of use at high levels of positive affect ($\beta= .05$, $SE= .03$, $p= .05$), but not at low levels of positive affect ($\beta= -.13$, $SE= .08$, $p= .11$).

Discussion

The current study tested the individual and synergistic effects of positive and negative urgency and positive and negative trait affect on the early developmental phases of alcohol use; specifically changes in probability of initiation and early escalation in volume of drinking from early- to middle-adolescence. This study extends previous work by disentangling initiation from early escalation in volume of drinking during the early phases of alcohol involvement. Our results suggest that changes in who experiments with alcohol does not systematically overlap with changes in how much experimenters drink. This potentially indicates that drinking is sporadic in this population, and that initiation and escalation may be distinct drinking milestones. We also extend previous work by prospectively examining positive and negative urgency's relationship with alcohol initiation, as previous work has focused on alcohol consumption and problems (Stautz & Cooper, 2013), or the initiation of drinking in cross-sectional samples (Gunn & Smith, 2010).

Due to the heterogeneous nature of liability towards dysregulated action, it has been suggested that the unique effects of personality variables should be tested when investigating substance use (Gullo, Loxton, & Dawe, 2014). Hence we ran two sets of models; running separate models for each predictor vs. controlling for other predictors. Running separate models for each predictor suggested that increases in the likelihood of initiation correlated with higher levels of positive urgency, higher levels of negative urgency, higher levels of negative affect, older age, and female gender. These results suggest that positive urgency may be a risk factor for the initiation of drinking, potentially indicating a positive reinforcement pathway (Settles et al., 2014). The effects of negative urgency and negative affect as risk factors for the initiation of drinking may be indicative of a negative reinforcement pathway. These models also suggested that faster escalation in volume of use correlated with older age, and male gender.

However, the more conservative analyses testing the effect of each predictor above and beyond the effects of all other variables in the model suggested that the initiation part of the model was predicted by older age and female gender; there were no significant effects of positive urgency, negative urgency, positive affect, or negative affect. These analyses also suggested a faster escalation in volume of use amongst initiators was predicted by lower levels of positive affect, potentially indicating that youth may escalate their drinking to increase low levels of positive affect. However, main effects were qualified by a significant interaction between positive urgency and positive affect predicting faster escalation in volume of use amongst initiators. The interaction suggested that positive urgency predicts more alcohol involvement at high levels of positive affect, though only at extremely high levels of positive affect (this synergistic effect may only apply to the 2.5% of the population who score above 2 standard deviations of trait positive affect). These results are consistent with the theoretical view of positive urgency as being particularly relevant for rash action when experiencing extreme levels of positive affect (Cyders et al., 2007). Risk towards the early escalation in volume of drinking may require a relatively extreme personality style, and this personality style may be characterized by a liability to engage in rash positive mood dependent action.

It is important to note that running separate models for each predictor vs. controlling for other variables in the model yielded substantially different findings. Although there is a dearth of research disentangling early developmental changes in alcohol involvement, running separate models for each predictor aligns more closely to previous findings in the literature (e.g., Adams, Kaiser, Lynam, Charnigo, & Milich, 2012; Gunn & Smith, 2010; Karyadi & King, 2011; Phillips, Hine, & Marks, 2009), suggesting that positive urgency, negative urgency, and trait negative affect are associated with alcohol involvement. These effects of urgency are consistent with personality models of dysregulated action (Cyders & Smith, 2008), and the effect of trait negative affect is consistent with models suggesting that drinking may be motivated by negative reinforcement processes (Greeley & Oei, 1999). However, these models preclude inferences regarding the incremental value of these constructs; and to assess incremental value we concurrently modeled all personality predictors in the same model.

The more stringent test of controlling for other predictors has been suggested to be a better fit with the heterogeneous nature of dysregulated action (Gullo et al., 2014), as this approach captures the unique overlap of these mechanisms with alcohol involvement. This approach suggested that lower levels of positive affect predicted faster escalation in level of drinking amongst initiators. Although positive urgency did not predict escalation in level of drinking at mean levels of positive affect, it did at extremely high levels of positive affect. This supports “dual-process” models of dysregulated action, which suggest that risk for alcohol involvement is the result of the synergistic influence of both regulatory and reactive processes (e.g., Steinberg & Chein, 2015; Jonker, Ostafin, Glashouwer, van Hemel-Ruiter, & de Jong, 2014).

The lack of effects of negative urgency and affect when controlling for other predictors calls into question a causal direction from negative emotionality to drinking, at least from early- to middle-adolescence. Positive reinforcement may be more important for the early stages of alcohol use, with a negative reinforcement pathway not becoming evident until later stages of use (Hussong, Jones, Stein, Baucom, & Boeding, 2011; Scalco et al., 2014). Future work that follows adolescents as they transition into late-adolescence and emerging adulthood is needed to investigate if negative reinforcement becomes more prominent later in development.

Opting to control vs. not control for other personality predictors has substantial implications for our theoretical understanding of personality as a predictor of substance use (Gullo et al., 2014). On the one hand, as there is a plethora of different personality models used to predict alcohol use, not controlling for other personality variables may result in an overestimation of the extent to which different personality constructs are involved in the etiology of drinking (i.e., type I error). Gullo et al. (2014) support this position and argue that the literature is saturated by a plethora of potentially redundant personality variables predicting substance use, and argue that reducing the number of variables involved in substance use can move the literature towards a more parsimonious understanding of personality risk factors. On the other hand, including too many covariates in any model may obscure findings due to excessive multicollinearity. This issue is not likely to be solved via statistical means, and

future theoretically-based work is needed to provide guidance as to the most optimal approach to investigate the personality-substance use link.

Though an examination of gender was not a primary aim of this study, some interesting findings emerged. The effect of gender depended on the facet of drinking under investigation; being female correlated with steeper changes in the likelihood of initiation, whereas being male correlated with faster escalation in volume of use amongst initiators. These results suggest that gender differences in the development of drinking may depend on the facet of alcohol use that is being investigated (Jackson, 2010). Females progress faster in the initiation of alcohol use, potentially because females transition through puberty earlier than males (Spear, 2010) which may facilitate opportunities to experiment with alcohol from early- to middle-adolescence. However, once initiation occurs, males escalate their level of use faster (Chen & Jacobson, 2012). Previous research suggest that females experience more severe acute negative effects from drinking (e.g., cognitive and motor effects of drinking at low doses) (Nolen-Hoeksema, 2004), which may protect against the escalation of use. Alternatively, there is evidence that social sanctions against drunkenness are greater for women than men, and hence socially constructed gender roles may account for these findings (Nolen-Hoeksema, 2004). Future research exploring the mechanisms of gender differences is needed in efforts to inform the development of gender sensitive, etiologically informed interventions.

Strengths, limitations, and future directions

The large sample of youth with limited experience with alcohol is a strength of this study, as it allows us to establish temporal precedence and assert the directionality of effects with greater confidence. Additionally, the prospective nature of the study is a strength as it allows for the investigation of changes in alcohol use from early- to middle-adolescence, as is the analytic framework that facilitates the investigation of changes in probability of drinking vs. escalation in volume of drinking. Within the context of these strengths are some limitations, some of which are shared with the broader literature on adolescent drinking. Our measurement of key constructs relied exclusively on self-report, which may be prone to memory/recall biases or social desirability. Future studies that rely on more objective approaches to measuring personality (e.g., performance-based tasks) are needed. Another limitation involves the low representation of racial/ethnic minorities in the sample. Previous research suggests that liability to dysregulated action may be influenced by chronic environmental adversity (Bickel, Moody, Quisenberry, Ramey, & Sheffer, 2014; Shonkoff, 2012); as minorities are exposed to higher levels of systemic adversity, future studies may benefit from selecting higher representation of minority groups to determine if similar pathways are important in alcohol use initiation and escalation. Additionally, the lack of consideration of the environment prevents an understanding of the dynamic interplay of contextual and individual-level factors. Future studies may benefit from examining if the effects of individual level risk factors are more important in different contexts (e.g., across neighborhoods that differ by socioeconomic status). Finally, our results may not generalize to youth who initiate drinking prior to the middle school years.

In sum, the present study provides evidence that the correlates of the early developmental stages of drinking likely depend on the specific facet of alcohol use under consideration. Additionally, when controlling for different sources of liability for dysregulated action, low positive affect emerged as a predictor of drinking, suggesting that mood enhancement may be a mechanism of action in the early stages of drinking. These findings suggest that targeted prevention efforts may benefit from shaping youth to develop non-drug using sources of positive reinforcement. However, targeted prevention efforts may need to differentiate between various forms of liability for alcohol use, as for a small percentage of the population the escalation in level of use may be driven by a tendency to engage in rash, positive mood dependent action. It may be the case that a broad repertoire of non-drug using rewarding activities can delay the early escalation of drinking amongst adolescents who experiment with alcohol.

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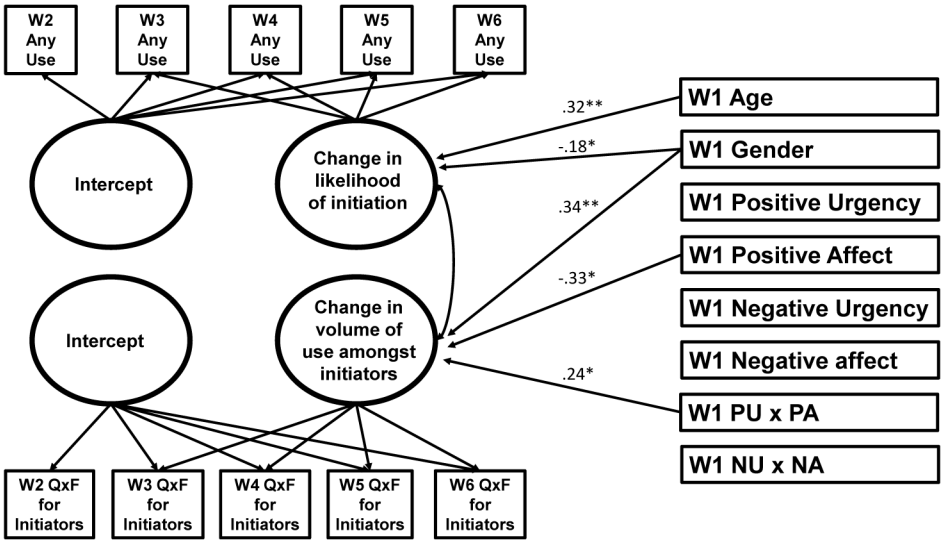

Figure 1.

Visual depiction of multivariate effects

Note: QxF= Quantity x frequency of drinking; PU x PA= positive urgency by positive affect interaction; NU x NA= negative urgency by negative affect interaction; gender coded 0=female 1=male; **= p≤.01; *= p≤.05

Table 1

Correlations and descriptive statistics

Variable	1	2	3	4	5	6	7	8	9
1. Positive Urgency	--	.70**	−.08*	.27**	.02	.05	.06	.04	.15**
2. Negative Urgency		--	−.11**	.37**	.08*	−.02	.03	−.02	.15**
3. Positive Affect			--	−.28**	−.12**	.03	−.02	.03	−.05
4. Negative Affect				--	.07*	−.00	.04	−.03	.10**
5. W2 QxF					--	.10**	.28**	−.00	.24**
6. W3 QxF						--	.81**	.88**	.15**
7. W4 QxF							--	.69**	.22**
8. W5 QxF								--	.21**
9. W6 QxF									--
Mean (SD)	1.66 (.67)	1.98 (.76)	2.69 (.97)	.88 (.78)	.09 (.99)	.29 (3.68)	.30 (2.37)	.47 (3.96)	1.82 (5.50)
Skew	.97	.38	−.75	1.13	18.49	23.65	13.65	20.41	4.06
Kurtosis	.34	−.83	.03	1.00	409.4	622.0	233.5	492.3	19.03

Note:

** = p≤.01;

* = p≤.05;

QxF = quantity by frequency of drinking

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Table 2

Frequency and Quantity of drinking

Mean age (SD)	Wave-1 12.16 (.96)	Wave-2 12.62 (.95)	Wave-3 13.15 (.94)	Wave-4 13.63 (.94)	Wave-5 14.16 (.96)	Wave-6 15.14 (.95)
Frequency						
No drinking	100%	98%	97%	96%	94%	84%
1–2 times	0%	1%	1%	3%	4%	7%
3–5 times	0%	0.5%	1%	0%	1%	5%
1 per month	0%	0.5%	0.5%	1%	0.5%	2%
> 1 per month	0%	0%	0.5%	0%	0.5%	2%
Quantity						
No drinking	100%	98%	97%	96%	94%	84%
< 1 drink	0%	1%	1%	1%	2%	2%
1 drink	0%	1%	1%	2%	2%	4%
2 drinks	0%	0%	1%	0%	1%	4%
3 drinks	0%	0%	0%	1%	1%	3%
4 drinks	0%	0%	0%	0%	0%	2%
5 drinks	0%	0%	0%	0%	0%	1%
6 drinks	0%	0%	0%	0%	0%	0%

Note: Waves 1–5 = past 6 months, wave-6 = past year

Table 3

Summary of nested model tests for any use (Part 1) and conditional mean of use (Part 2)

	AIC	BIC	Scaled difference χ^2 (*df*)	P-value	RMSEA
Part 1 of model					
Fixed-intercept fixed-slope	1649.67	1659.33			
Fixed-intercept random-slope	1510.06	1524.54	158.22 (1)	.0001	---
Random-intercept random-slope	1437.63	1461.76	203.21 (2)	.0001	---
Fixed quadratic slope	1439.35	1468.31	0.26 (1)	.61	---
Part 2 of model					
Fixed-intercept fixed-slope	462.66	484.32			
Fixed-intercept random-slope	462.03	486.78	2.98 (1)	.08	.05
Random-intercept random-slope	462.12	493.06	3.17 (2)	.20	.03
Fixed quadratic slope *	463.86	491.71	0.20	.65	.00

Note: Scaled difference χ^2 compares results from the nested model with the previous comparison model;

* the quadratic growth model was tested relative to the fixed-intercept random-slope model

Table 4

Bivariate associations

	Change in likelihood of use			Change in level of use amongst drinkers		
Variable	**β(Standardized)**	**β_{SE}**	***Sig.***	**β(Standardized)**	**β_{SE}**	***Sig.***
Age	.34 (.36)	.07	<.01	.04 (.40)	.02	.02
Gender	−.27 (−.19)	.10	<.01	.08 (.40)	.03	<.01
PU	.29 (.27)	.07	<.01	.04 (.29)	.02	.06
PA	−.00 (−.00)	.04	.95	−.02 (−.26)	.01	.07
NU	.27 (.28)	.06	<.01	.01 (.10)	.02	.50
NA	.13 (.15)	.05	.01	.01 (.07)	.02	.56

Note: PU= Positive urgency; PA= Positive affect, NU= Negative urgency, NA= Negative affect; Gender coded 1= male 0= female

Table 5

Multivariate associations

	Change in likelihood of use			Change in level of use amongst drinkers		
Predictor	**β(Standardized)**	**β_{SE}**	***Sig.***	**β(Standardized)**	**β_{SE}**	***Sig.***
Age	.33 (.32)	.07	<.01	.03 (.32)	.02	.10
Gender	−.33 (−.18)	.10	<.01	.06 (.34)	.03	.05
PU	.11 (.12)	.06	.08	.03 (.34)	.02	.10
PA	.04 (.04)	.05	.43	−.03 (−.33)	.01	.03
NU	.11 (.12)	.07	.11	−.02 (−.27)	.02	.22
NA	.06 (.07)	.05	.20	−.00 (−.02)	.01	.90
PU x PA	−.04 (−.04)	.05	.44	.02 (.24)	.01	.03
NU x NA	−.04 (−.05)	.04	.28	.01 (.15)	.01	.27

Note: PU= Positive urgency; PA= Positive affect, NU= Negative urgency, NA= Negative affect; Gender coded 1= male 0= female