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Negative Urgency, Pubertal Onset and the Longitudinal Prediction of Alcohol Consumption During the Transition from Preadolescence to Adolescence

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NEGATIVE URGENCY, PUBERTAL ONSET AND THE LONGITUDINAL PREDICTION OF ALCOHOL CONSUMPTION DURING THE TRANSITION FROM PREADOLESCENCE TO ADOLESCENCE

THESIS

A thesis submitted in partial fulfillment of the
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By

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ABSTRACT OF THESIS

NEGATIVE URGENCY, PUBERTAL ONSET AND THE LONGITUDINAL PREDICTION OF ALCOHOL CONSUMPTION DURING THE TRANSITION FROM PREADOLESCENCE TO ADOLESCENCE

Alcohol use in early adolescence is associated with numerous concurrent and future problems, including diagnosable alcohol use disorders. The trait of negative urgency, the tendency to act rashly when distressed, is an important predictor of alcohol-related dysfunction in youth and adults. The aim of this study was to test a model proposed by Cyders and Smith (2008) specifying a puberty-based developmental increase in negative urgency, which in turn predicts subsequent increases in early adolescent drinking. In a sample of 1,910 youth assessed semi-annually from spring of 5th grade through spring of 8th grade, we found support for this model. Pubertal onset was associated with both a mean increase and subsequent rises in negative urgency over time. Drinking frequency at any wave was predicted by prior wave assessments of drinking frequency, negative urgency, and pubertal onset. The slope of increase in drinking also increased as a function of pubertal onset. This model applied to negative urgency but not to other impulsivity-related traits. These findings highlight the importance of personality change in early adolescence as part of the risk matrix for early onset alcohol consumption.

KEYWORDS: Personality, Longitudinal, Drinking, Negative Urgency, Pubertal Onset

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By

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June 30, 2014

DEDICATION

To mom and dad. Thank you for giving me strength, direction, and inspiration. (And maybe a few loans).

To Nirvana and Alice in Chains, whose enjoyably depressing music was my constant companion while I worked.

To the memory of Judson Eli Wickham. Enjoy your orange, Jud.

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Chapter One: Introduction

The aim of this study was to evaluate a model of one aspect of risk for early adolescent drinking behavior that integrates both biological and personality processes. Specifically, we examined the relationships between the biological event of pubertal onset and subsequent changes in high-risk personality traits, and between these trait changes and subsequent shifts in drinking behavior. In brief, the rationale for this research is as follows. Early adolescent alcohol consumption is significantly associated with current and future dysfunction, including diagnostic status and engagement in other high-risk behaviors (DeWit, Adlaf, Offord, & Ogborne, 2000; Grant & Dawson, 1997; Gruber, DiClemente, Anderson, & Lodico, 1996; Guo, Collins, Hill, & Hawkins, 2000; Guttmannova et al., 2012; SAMHSA, 2012). Furthermore, the number of youth who drink, and the frequency with which they do so, increases in a somewhat linear fashion across the adolescent years (Chung et al., 2012). One aspect of risk for early adolescent drinking involves personality, particularly personality traits that are associated with rash or impulsive action (Gunn & Smith, 2010; Settles, Zapolski, & Smith, 2014; Stautz & Cooper, 2013). Among the best trait predictors of early adolescent drinking is the trait of negative urgency (the tendency to act rashly when extremely upset: Gunn & Smith, 2010; Stautz & Cooper, 2013). Cyders and Smith (2008) argued that pubertal onset is associated with mean and slope increases in negative urgency during early adolescence. This theoretical contention has not previously been tested.

The aim of this paper was to test the Cyders and Smith (2008) theoretical contention that pubertal onset is associated with increases in negative urgency, and further that changes in negative urgency are associated with subsequent changes in drinking behavior. To introduce this empirical investigation, we first briefly review research indicating that early adolescent alcohol consumption has deleterious effects on subsequent functioning and quality of life. After introducing the trait of negative urgency

and considering related traits, we review the basis for the hypothesis that pubertal onset leads to increases in negative urgency in particular. We then present our model relating changes in negative urgency to subsequent changes in drinking behavior, and introduce the specifics of the current investigation.

Early Adolescent Drinking

A small but significant portion of youth have already consumed more than a few sips of alcohol prior to age 12, with estimates that approximately 9% or 10% of 11-year-olds have done so (Donovan, 2007; Gunn & Smith, 2010). From age 11 through the rest of adolescence, the prevalence of use within the past year rises steadily to 67% by age 18 (Chung et al., 2012). This early use, and the trend of increasing use, is quite important clinically. For both boys and girls age 12, reports of having consumed alcohol just one or more days in the preceding year had 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 et al., 2012). The success of this indicator as a predictor of concurrent problems was not limited to age 12; it provided the best sensitivity and specificity through age 15 for both sexes.

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, Adlaf, Offord, & Ogborne, 2000; Grant & Dawson, 1997; Gruber et al., 1996; Guo et al., 2000; Guttmannova et al., 2012). Further, among adolescents in treatment for alcohol and substance use disorders, the majority report first using substances between the ages of 12 and 14 (SAMHSA, 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.

Negative Urgency and Other Impulsivity-Related Traits

Negative urgency is understood to reflect individual differences in the disposition to act in rash, impulsive ways when distressed (Cyders & Smith, 2008; Whiteside & Lynam, 2001). Urgency theory holds that individuals high in the trait are inclined to respond to distress with immediate action that is designed to distract from, or reduce, the distress (Cyders & Smith, 2008). Such actions are chosen because they provide the immediate benefit of relief from distress, not because they help meet long-term needs and goals. Often, such actions can be described as rash or impulsive. Examples of behaviors that serve the negative reinforcement of relief from distress that are predicted prospectively by negative urgency include alcohol consumption (Settles, Cyders, & Smith, 2010), smoking (Doran, Khoddam, Sanders, Schweizer, Trim, & Myers, 2013), and binge eating and purging (Fischer, Peterson, & McCarthy, 2013; Pearson, Combs, Zapolski, & Smith, 2012). Concerning alcohol consumption, meta-analyses of early adolescents highlight the predictive role of negative urgency in drinking behavior (Stautz & Cooper, 2013), and meta-analyses of late adolescents and adults find that negative urgency predicts heavy quantity of consumption and problem drinking behavior (Coskunpinar, Dir, & Cyders, 2013).

Negative urgency concerns a disposition toward emotion-driven rash action, and is thus different from most other impulsivity-related personality traits. For example, sensation seeking refers to a need to seek stimulation, not to a tendency to act when emotional. Similarly, neither lack of planning (acting without forethought) nor lack of perseverance (inability to maintain a focus on a task when faced with potential distraction) are emotion-based (Cyders & Smith, 2008; Whiteside & Lynam, 2001). Negative urgency shares very little variance with these other three traits (Cyders & Smith, 2007; Smith et al., 2007). Negative urgency is highly related to positive urgency, which is the tendency to act rashly when in an unusually positive mood; indeed, the two

traits can be considered facets of an overall urgency trait domain (Cyders & Smith, 2007). Negative and positive urgency, though highly correlated, play different predictive roles for some behaviors. Negative urgency predicts binge eating and purging, but positive urgency does not (Cyders et al., 2007; Pearson et al., 2012; Pearson, Zapolski, & Smith, 2014). More broadly, in prospective research, negative urgency predicts increases in negative mood-based rash action and positive urgency predicts increases in positive mood-based rash action (Cyders & Smith, 2010). Positive urgency does not appear to operate via a negative reinforcement mechanism.

Thus, among this set of five traits, negative urgency is one of two traits that is emotion-based and the only trait that (a) focuses on negative affect-driven rash action and (b) appears to facilitate actions that provide immediate negative reinforcement (in the form of distress relief). See Cyders and Smith (2007, 2008) and Whiteside and Lynam (2001) for the model specifying these five traits; Smith and Guller (in press) provide a discussion of other, similar models.

Adolescent Increases in Negative Urgency and the role of Pubertal Onset

There is a great deal of evidence that individual differences in personality are relatively stable over the life span (Caspi & Roberts, 2001; McCrae & Costa, 1994; Roberts & DelVecchio, 2000). However, it is also true that the greatest stability occurs beginning around age 30; prior to age 30, personality does change to a modest degree over time, particularly during periods of important developmental transitions (Bleidorn, 2012; Neyer & Asendorpf, 2001; Roberts, 2006). Bleidorn (2012) documented personality change over just six months in youth making the transition from high school to adult life. Roberts, Caspi, and Moffitt (2001) note that personality traits appear to be particularly malleable at younger ages, such as the transition into middle school from elementary school. This thesis is designed to test the theoretical position that the post-pubertal, early adolescent years are a period during which the trait of negative urgency

does change. Specifically, we believe there are two factors that contribute to increases in negative urgency during the early adolescent years.

The first factor is initial levels of negative urgency, which can be reliably and validly assessed among pre-adolescents (Gunn & Smith, 2010; Zapolski, Stairs, Settles, Combs, & Smith, 2010). Youth high in negative urgency tend to respond to distress with immediate action, designed to provide prompt negative reinforcement in the form of relief or distraction from their distress (Cyders & Smith, 2008). Each time an individual engages in such actions, which provide immediate relief, the chosen behavior is reinforced. Over time, negative urgency – based rash actions become increasingly likely. At the same time, on each such occasion the individual is not learning other, more adaptive, long-term responses to distress. Thus, rash actions become increasingly likely and problem-solving skills do not develop in the same way as they do in other youth. In this way, the trait is reinforced and becomes stronger over time (Pearson, Guller, Spillane, & Smith, 2011).

The second proposed influence on increases in negative urgency is the experience of pubertal onset. One characteristic of brain development following pubertal onset is that development of motivational and emotional subcortical connections occurs faster than development of connections that support prefrontal cortex (PFC) activity (Casey & Caudle, 2013). This imbalance in rate of development is important because certain aspects of PFC activity modulate emotional reactivity (Maxwell & Davidson, 2007). One result of this imbalance is that adolescents, compared to children and adults, rely more on motivational/emotional subcortical brain activity to guide behavior. Thus, when teens are experiencing intense emotion, they are more likely than children or adults to act in rash or impulsive ways (Casey & Caudle, 2013; Spear, 2001). Given the heightened negative affect associated with adolescence (Brooks-Gunn et al., 1994;

Compas et al., 1995; Nelson et al., 2002), post-pubertal teens appear to experience an increase in negative affect-driven rash action, i.e., an increase in negative urgency.

The Current Study

We tested the following model. Pubertal onset occurs at different times for different youth. When it occurs, it is expected to predict subsequent increases in both the mean and the rate of increase in negative urgency across early adolescence. Because negative urgency is a risk factor for early adolescent drinking, the mean and slope increases in this trait will predict subsequent mean and slope increases in adolescent drinking behavior. Our expectation was that this puberty-based risk process was specific to negative urgency and thus would not operate for positive urgency (because of the absence of negative reinforcement), sensation seeking, lack of planning, or lack of perseverance. To test this model, we studied all five traits, pubertal status, and drinking behavior in adolescents (n = 1910) longitudinally across the developmental period from the end of elementary school through the end of middle school.

Chapter Two: Methods

Participants

A total of 1910 children completed questionnaires in seven waves from the spring of 5th grade (the last year of elementary school in the participating school districts) through the spring of 8th grade (the last year of middle school), collected every six months. Participants in the study consisted of students from urban, rural, and suburban backgrounds, all from public school systems. The sample was approximately equally divided between boys (*n* = 972) and girls (*n* = 938). The breakdown of students by ethnicity was as follows: 61.6% European American, 17.0% African American, 6.9% Hispanic/Latino, 3% Asian American, and 11.5% of students reporting other ethnic backgrounds. We oversampled for African American and Hispanic children, and the sample represents those groups at a higher rate than is characteristic of the local population. The majority of the 5th graders, 66.8%, were 11 years of age; 22.8% were 10 years of age, 10% were age 12, and both 9 and 13-year-olds made up 0.2% of the participants.

Measures

Demographic and background questionnaire. This brief measure provided demographic information including age, grade level, gender, and ethnicity. Participants were asked to hand-write their current age and grade level, circle their sex and indicate which label(s) best described their ethnic background.

The Pubertal Development Scale (PDS, Petersen, Crockett, Richards, & Boxer, 1988). This self-report scale ascertained pubertal development status for participants, and is scored on a likert scale. Questions differed for boys and girls, and assessed information such as body hair, menstruation, and breast development, depending on subject gender. There were four questions for boys (“Do you have facial hair yet?”) and five questions for girls (“Have you begun to have your period?”).

Internal consistency ratings of the PDS show Cronbach's *α* 's ranging from .67 to .76 for 11-year-olds (Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987). Inter-rater reliability estimates show good agreement with the gold standard – a physician administered assessment of pubertal status using Tanner ratings – with *r* values ranging from .61 to .67 (Brooks-Gunn et al., 1987; Coleman & Coleman, 2002). As is frequently practiced, we dichotomized pubertal status, with a mean score of 2.5 demarcating pre- and post-pubertal onset (Culbert, Burt, McGue, Iacono, & Klump, 2009).

The UPPS-P-Child Version (Zapolski et al., 2010). This self-report measure was used to measure the five impulsivity-related traits. The measure uses a four-point likert-type scale, with answer choices spanning from "not at all like me" to "very much like me." Sample items and wave 1 internal consistency estimates for each scale are the following (for each scale, internal consistency estimates increased after wave 1). For negative urgency, a sample item is "When I am upset I often act without thinking" (α = .85). For positive urgency, "When I am very happy, I tend to do things that may cause problems in my life" (α = .89). For sensation seeking, "I like new, thrilling things, even if they are a little scary" (α = .79). For lack of planning, "I tend to blurt out things without thinking" (α = .77). For lack of perseverance, "Once I get going on something, I hate to stop," which is reverse scored (α = .65).

The Drinking Styles Questionnaire (Smith, McCarthy, & Goldman, 1995). This self-report measure was used to assess drinking behavior. We measured drinking frequency because it has been shown to be the best predictor of alcohol use disorder symptoms in youth this young (Chung et al., 2012). We used a single item, asking "Which of the following best describes how often you drink alcohol?" Response options are: "I have never had a drink of alcohol," "I have only had 1, 2, 3, or 4 drinks of alcohol in my life," "I only drink alcohol 3 or 4 times a year," "I drink alcohol about once a month," "I drink alcohol once or twice a week," and "I drink alcohol almost daily." The

single item measure has proven to be stable over time (Smith et al., 1995), and there is good evidence for its validity (Gunn & Smith, 2010; Settles, Fischer, Cyders, Combs, Gunn, & Smith, 2012).

Procedure

Data collection. At wave 1, the questionnaires were administered in 23 public elementary schools during school hours. In subsequent waves, the measures were administered in 15 public middle schools, again during school hours (in addition, children who had moved completed the measures by mail). We used a passive consent procedure. The families of each of 1,988 5th grade children in each of the 23 participating elementary schools were sent a letter introducing the study through the U.S. Mail. Families were asked to return an enclosed, stamped letter or call a phone number if they did not want their child to participate. At each wave of the study, participants completed active assent forms for their participation. Out of 1,988 5th graders in the participating schools, 1910 participated in the study (95.8%). A total of 78 students did not participate due to one of the following reasons: families declined participation for their child; students declined assent; or a variety of other reasons, such as language disabilities that precluded completing the questionnaires.

Data collections took place in the spring of 5th grade, and then in the fall and spring of 6th, 7th, and 8th grades, for a total of 7 data collection waves. Questionnaires were administered in classrooms, the school cafeteria, or the school library. Participants were assured that their responses would be kept strictly confidential: Neither teachers nor parents would have access to their responses. Researchers introduced the federal certificate of confidentiality to the participants and noted that the certificate legally protected the privacy of their responses. The procedure took 60 minutes or less.

Participants who moved during the course of the study were contacted and invited to continue to participate. Those who agreed did so by mail or by secure website.

Participants assessed during school hours were not paid for their participation, but those who had moved were paid $30 per wave.

Data analytic method. During the first stage of analysis, we calculated the overall frequency of drinking behavior and pubertal onset at each wave. We also calculated the bivariate correlations among pubertal onset, drinking behavior and the five personality traits.

To test our theoretical model, we used a multilevel modeling approach in a series of steps. This method provided several advantages. First, we were able to model both within-person change over time and between-person variability in growth patterns. Pubertal onset occurs at different times for different youth, so we modeled it as a time-varying predictor. In the first step, we tested whether, within persons, negative urgency changed as a function of time, pubertal onset, and time since pubertal onset. Between persons, we tested whether negative urgency differed by sex. In the second step, we tested whether, within persons, pubertal onset was associated with increases in the mean and slope of drinking behavior. In the third step, we began with the model used in the first step and added drinking frequency measured both concurrently with negative urgency and one wave (6 months) later than negative urgency. This step enabled us to test our hypothesis that, within persons, change in negative urgency would predict a mean increase in subsequent drinking behavior (controlling for prior drinking behavior) as well as a slope increase in subsequent drinking behavior (again controlled for prior drinking behavior). We also tested whether sex moderated any of the predictive effects.

To determine if our model of personality and subsequent drinking change was specific to negative urgency, we ran the same set of models four additional times, replacing negative urgency in the model with positive urgency, sensation seeking, lack of planning, and lack of perseverance. We used Mplus (Muthén & Muthén, 1998-2010) for these analyses.

The process of modeling change as a function of a time-varying predictor can be depicted in equation form. We begin with an equation reflecting general, linear change in a trait as a function of time (for simplicity, leaving out additional predictors):

$Y_{ij} = \pi_{oi} + \pi_{1i}TIME_{ij} + \varepsilon_{ij}$, (1)

where Y reflects person i's trait score at time j; π_{oi} reflects the intercept of the growth curve, π_{1i} reflects the slope of the growth curve, and ε reflects normally distributed error. In the above figure, I have depicted this initial slope as 0. When one adds pubertal onset (PO) as dichotomous,

$Y_{ij} = \pi_{oi} + \pi_{1i}TIME_{ij} + \pi_{2i}PO + \varepsilon_{ij}$, (2)

where π_{2i} captures the magnitude of the shift when PO goes from 0 to 1. Because PO is treated as dichotomous, the resulting equation is identical to equation (1) when PO is zero. When PO is 1, the equation becomes

$Y_{ij} = \pi_{oi} + \pi_{2i} + \pi_{1i}TIME_{ij} + \varepsilon_{ij}$, (2a)

indicating a higher intercept. To capture the hypothesized higher slope, one adds a second time variable, which counts time starting at PO

$Y_{ij} = \pi_{oi} + \pi_{1i}TIME_{ij} + \pi_{2i}PO + \pi_{3i}POTIME + \varepsilon_{ij}$, (3)

where π_{3i} reflects the rate of increase as a function of POTIME (time beginning with PO, calculated as PO x TIME). When PO is 0, POTIME is also 0, and the equation is again equation (1). When PO is 1, POTIME takes on nonzero values, and the equation becomes

$Y_{ij} = \pi_{oi} + \pi_{2i} + \pi_{1i}TIME_{ij} + \pi_{3i}POTIME + \varepsilon_{ij}$, (3a)

reflecting both a higher intercept and change in Y as a function of two time variables, time plus time beginning with PO. The result can be thought of as two line segments: one before PO and one beginning with PO, as depicted in Figure 2.1. One can construct a parallel equation for drinking behavior (where the second time variable would be POTIME + 1).

Figure 2.1

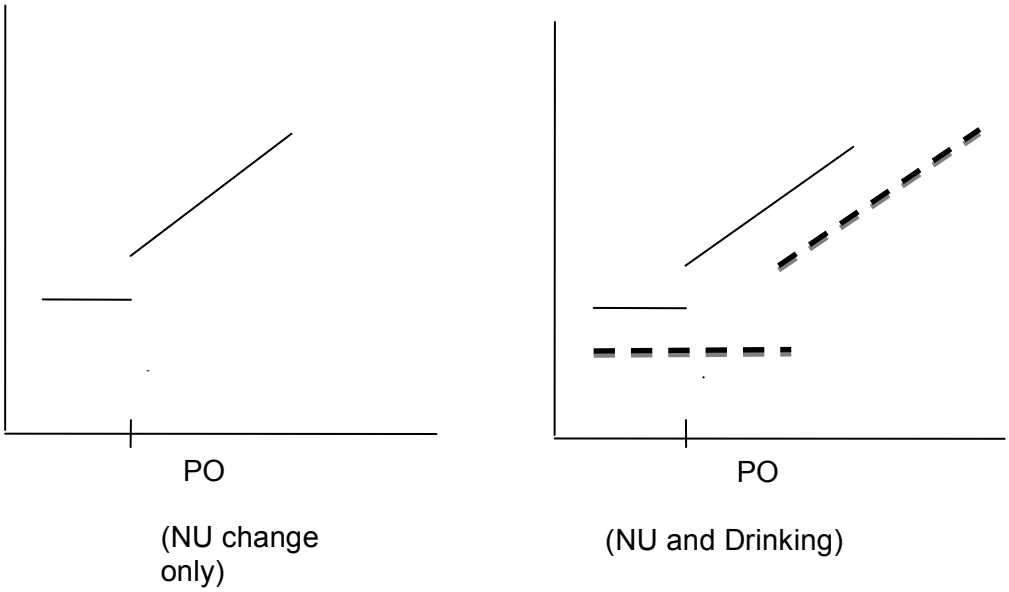

Figure 2.1. Figural representation of the hypothesized sequential process by which pubertal onset (PO) leads to changes in negative urgency (NU), which in turn leads to changes in drinking behavior. The solid line represents negative urgency, and the left panel of the figure represents a mean increase in negative urgency with pubertal onset, followed by a slope increase that reflects increasing levels of negative urgency over time. In the right panel of the figure, the dotted line represents drinking behavior.

Chapter Three: Results

Participant Retention

Of the 1,910 participants, 96.5% participated at wave 1 and 82% participated at wave 7). At each wave, participating and non-participating participants did not differ on any study variables, so we inferred that data were missing at random. We therefore used the expectation maximization (EM) procedure to impute missing values, a procedure shown to more accurately approximate population data than traditional, alternative methods, such as case deletion 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

The sample of 1,910 children includes 972 boys and 938 girls. Table 3.1 provides the following information: the percentage of youth who had experienced pubertal onset by each wave, drinking frequency by wave, and mean scores on each of the 5 impulsivity-related traits at each wave.

Correlations Among Traits, Behaviors and Pubertal Status Across Waves

Correlations among pubertal status, negative urgency, and drinking frequency across all 7 waves are presented in Table 3.2. All correlations involving pubertal status are point biserial correlations due to the dichotomous nature of the variable. Correlations involving all other variables are product-moment correlations. The cutoff for statistical significance was set to p<.001 because of the large sample size.

Model Tests

We first present results of the test of whether pubertal onset predicted mean and slope increases in negative urgency. We then provide results of the test of whether pubertal onset predicted mean and slope increases in drinking behavior. Next, we provide results of the test of whether negative urgency predicted subsequent mean and slope increases in drinking behavior. We then summarize the parallel tests we conducted for each of the other four personality traits. For each analysis described below, we tested whether any of the observed effects were moderated by sex. None were.

Change in negative urgency across early adolescence. We first tested whether there was, in fact, significant variability in change in negative urgency across the 7 waves. We thus examined between-person variability in the growth of negative urgency over time, applying both linear and quadratic growth models. There was significant variability in growth patterns of negative urgency over time ($p < .001$). The presence of this variability indicates the value of identifying determinants of that variability. In the current study, we identified pubertal onset as such a predictor. Mean levels of negative urgency did not increase as a function of time, but did increase with pubertal onset ($\beta = .06$, $p < .001$); this finding reflects a mean increase in negative urgency associated with the onset of puberty. Negative urgency also increased over time since pubertal onset ($\beta = .04$, $p < .001$), indicating an increase in the slope of growth in negative urgency following pubertal onset. Thus, our hypotheses were confirmed.

Change in drinking behavior. We identified significant variability around linear and quadratic growth curves for drinking behavior ($p < .001$). We found that drinking behavior increased as a function of time ($\beta = .21$, $p < .001$), pubertal onset ($\beta = .07$, $p < .001$) and time since pubertal onset ($\beta = .06$, $p < .001$). While existing research has shown that drinking behavior tends to increase over time during early adolescence

(Chung et al., 2012), the current findings indicate that the time-varying covariate of pubertal onset is associated with mean and slope increases in drinking frequency.

Negative urgency predicting change in drinking. We anticipated increases in negative urgency to concurrently and prospectively predict increases in drinking behavior. Negative urgency did predict increases in drinking behavior both concurrently (β = .13, $p < .001$) and prospectively (β = .02, $p < .001$). The prospective effect is above and beyond prediction from prior drinking behavior, which also predicted subsequent drinking (β = .13, $p < .001$), pubertal onset (β = .04, $p < .001$), and time since pubertal onset (β = .13, $p < .001$). Together, this set of findings indicates that drinking frequency in a given wave was predicted from negative urgency, drinking frequency, and pubertal onset all measured the prior wave. In addition, the rate of increase in drinking increased beginning the wave following pubertal onset. Each of these findings is consistent with our model.

Tests of Specificity of the Relationship Between Pubertal Onset and Negative Urgency

We next tested whether any of the other four impulsivity-related traits (positive urgency, sensation seeking, lack of planning, and lack of perseverance) underwent the same pattern of change in relation to pubertal onset. Our hypothesis was that the effects described above would be specific to negative urgency. For each of these traits, there was significant variability in trait growth over time ($p < .001$).

Positive urgency did not increase as a function of time, but did increase with pubertal onset (β = .05, $p < .001$), indicating a mean increase in the trait following pubertal onset. Positive urgency change was unrelated to time following pubertal onset. Unlike negative urgency, the slope of change in positive urgency did not become more positive following pubertal onset.

Sensation seeking increased as a function of time (β = .09, $p < .001$), and pubertal onset was associated with a positive mean increase in the trait (β = .07, $p < .001$). However, time since pubertal onset was significantly negatively related to change in sensation seeking (β = -.06, $p < .001$).

Mean trait levels of lack of planning increased as a function of time (β = .18, $p < .001$), did not have a mean change with pubertal onset, and time since pubertal onset was negatively associated with change in lack of planning (β = -.06, $p < .001$).

Lack of perseverance increased as a function of time (β = .05, $p < .001$) and decreased as a function of pubertal onset (β = -.04, $p < .001$); that is, the mean level of the trait declined with the onset of puberty. There was no association between pubertal time and lack of perseverance. Thus, none of the other four traits manifested both mean and slope increases following the onset of puberty.

Although none of the other four traits showed the pattern of change related to pubertal onset shown by negative urgency, it is of course important to investigate their roles in predicting drinking behavior. Each of the following prospective prediction findings included control for prior drinking. Positive urgency was positively associated with drinking concurrently (β = .10, $p < .001$) and prospectively (β = .02, $p < .001$). Sensation seeking was associated with concurrent changes in drinking (β = .05, $p < .001$), but did not predict future changes in drinking. Lack of planning was associated positively with changes in drinking both concurrently (β = .06, $p < .001$) and prospectively (β = .04, $p < .001$). Lack of perseverance was not associated with concurrent changes in drinking but did positively predict subsequent changes in drinking (β = .05, $p < .001$).

Table 3.1

Descriptive Statistics for Pubertal Statuorientations, Drinker Status, and Five Personality Trait Contributors to Rash Action

Pubertal Status	Drinker Status	NU	PU	SS	LPI	LPs
	%	%	mean	mean	mean	mean	mean
			(sd)	(sd)	(sd)	(sd)	(sd)
Wave 1	23.2	10.3	2.21	2.14	2.63	2.01	2.04
			(.70)	(.74)	(.70)	(.55)	(.48)
Wave 2	32.1	11.4	2.11	2.04	2.63	2.10	2.09
			(.69)	(.76)	(.74)	(.58)	(.52)
Wave 3	42.0	14.4	2.15	2.06	2.66	2.20	2.11
			(.72)	(.79)	(.73)	(.59)	(.54)
Wave 4	50.5	17.1	2.19	2.06	2.70	2.14	2.03
			(.71)	(.78)	(.71)	(.57)	(.53)
Wave 5	62.8	21.6	2.18	2.06	2.70	2.22	2.09
			(.72)	(.79)	(.74)	(.57)	(.57)
Wave 6	62.8	31.0	2.19	2.06	2.76	2.18	2.04
			(.69)	(.77)	(.71)	(.52)	(.52)
Wave 7	73.4	32.1	2.21	2.06	2.73	2.20	2.10
			(.70)	(.78)	(.73)	(.56)	(.58)

Note: NU: negative urgency; PU: positive urgency; SS: sensation seeking; LPI: lack of planning; LPs: lack of perseverance. *N* =1910.

Table 3.2

Bivariate Correlations Among Study Variables in Waves 1 and 7

	PUB-1	PUB-7	NU-1	NU-7	PU-1	PU-7	SS-1	SS-7	LPL-1	LPL-7	LPS-1	LPS-7	DR-1	DR-7
PUB-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PUB-7	.112*	-	-	-	-	-	-	-	-	-	-	-	-	-
NU-1	.113*	.035	-	-	-	-	-	-	-	-	-	-	-	-
NU-7	.110*	.090*	.349*	-	-	-	-	-	-	-	-	-	-	-
PU-1	.126*	.023	.627*	.336*	-	-	-	-	-	-	-	-	-	-
PU-7	.122*	.054	.281*	.673*	.354*	-	-	-	-	-	-	-	-	-
SS-1	.076*	.095*	.269*	.148*	.316*	.145*	-	-	-	-	-	-	-	-
SS-7	.022	.086*	.075*	.330*	.120*	.289*	.443*	-	-	-	-	-	-	-
LPL-1	.066*	.036	.358*	.189*	.308*	.173*	.134*	.089*	-	-	-	-	-	-
LPL-7	.061*	.017	.193*	.175*	.175*	.202*	.072*	-.076*	.309*	-	-	-	-	-
LPS-1	-.020	-.024	-.040*	.047	-.039	.041	-.295*	-.138*	.425*	.169*	-	-	-	-
LPS-7	.029	-.020	.065*	-.077*	.045	-.046	.069*	.349*	.158*	.657*	.265*	-	-	-
DR-1	.153*	-.010	.217*	.109*	.180*	.092*	.138*	.022	.180*	.102*	.081*	.063*	-	-
DR-7	.136*	.069*	.161*	.327*	.129*	.262*	.149*	.175*	.147*	.182*	.024	.045	.246*	-

Note: PUB, pubertal onset; NU, negative urgency; PU, positive urgency; SS, sensation seeking; LPL, lack of planning; LPS, lack of perseverance; DR, drinking; each number following the variable represents the wave in which the data was collected (i.e., NU-1 = Negative Urgency, wave 1). Correlations with puberty are point-biserial correlations, and all others are pearson correlations. * $p < .001$.

Chapter Four: Discussion

In this study, we found empirical support for a novel model that helps explain part of the well-known finding that alcohol use increases dramatically across the early adolescent years (Chung et al., 2012). Specifically, pubertal onset led to mean and slope increases in negative urgency; these trait changes in turn led to mean and slope increases in drinking behavior across early adolescence. That is, the wave at which pubertal onset was reported was associated with both mean and slope increases in negative urgency. Negative urgency, in turn, predicted the mean level of drinking frequency the following wave, as well as the slope of increase in drinking beginning that following wave. This prediction occurred in the context of the rigorous control of predicting drinking each wave from drinking the prior wave (6 months earlier). It thus appears that one part of the explanation for increased drinking during early adolescence may lie in the intersection between the biological event of pubertal onset and associated changes in the high risk personality trait of negative urgency.

This pattern of findings is consistent with the developmental model proposed by Cyders and Smith (2008). The experience of pubertal onset is known to be associated with increases in negative affect and in rash, risky behavior (Casey & Caudle, 2013; Compas et al., 1995). Cyders and Smith argued that these changes reflected a developmental increase in negative urgency. We found support for this contention as well as for the contention that the developmental increase in the trait helps account for subsequent increases in drinking behavior. This finding is quite important clinically, because early adolescent alcohol consumption is associated with a host of co-occurring and future problems (Chung et al., 2012; DeWit et al., 2000; Grant & Dawson, 1997; Jessor, 1987).

Cyders and Smith (2008) argued that, in a context in which negative affect occurs frequently, each time a person acts rashly to alleviate his or her distress, the rash action is negatively reinforced (due to distraction from the original source of distress). Therefore, over time, rash actions such as drinking become more likely. In addition, on each such occasion the person misses an opportunity to learn alternative, more adaptive ways of coping with distress. Thus, there is a combination of reinforcement for the disposition toward negative urgency and a lack of development of alternatives to negative urgency-based rash action. This process results in a profile of increasing risk over time.

In important ways, this phenomenon was specific to the trait of negative urgency. The slope of change in negative urgency became more positive over time following pubertal onset. This effect was not observed for any of the other four traits studied. In fact, pubertal onset was negatively associated with the slopes of sensation seeking and lack of planning. Pubertal onset was unrelated to the slopes of positive urgency and lack of perseverance. This specificity lends further support to our model.

It is important to appreciate that other traits also predicted drinking behavior. Positive urgency, sensation seeking, and lack of planning were each associated with concurrent drinking behavior. Positive urgency, lack of planning, and lack of perseverance predicted subsequent drinking behavior, controlling for prior drinking behavior. None of these three traits changed as a function of pubertal onset in the way that negative urgency did. Thus, although their roles in the developmental process appear to differ from that of negative urgency, they did predict subsequent drinking in this early adolescent sample. Their possible functional roles in relation to the development of early adolescent drinking merit further investigation.

None of the effects summarized above were moderated by sex; that is, we found no evidence that any of the identified processes differed for girls and boys. It is certainly

possible that a longer-term prospective study, investigating the emergence of diagnosable alcohol abuse and dependence, would reveal important sex differences. Nonetheless, it was striking that the same process appeared to operate for both sexes.

We studied the predictive roles of each of the five traits separately, running different multilevel models for each trait. We elected to do so for three reasons. First, the theoretical model driving this work concerned a specific puberty-based process for negative urgency, and we judged it important to test that process directly. Second, it did seem important to understand whether each trait, individually, changed as a function of time and pubertal status. Third, at this early stage of investigation of the intersection of developmental trait change and drinking risk, it seemed premature to investigate those parts of each trait that are independent of the other four traits, which is what would be involved in modeling change in, and prediction from, all five traits at once. In prior correlational work with both early adolescents and college students, the predictive roles of sensation seeking, lack of planning, and lack of perseverance were not present when those traits were controlled for negative and positive urgency (Cyders, Flory, Rainer, & Smith, 2009; Settles et al., 2014).

The findings of this study should be considered in the context of its limitations. We had some missing data. Although there was no indication that missing-ness biased the study's results, we cannot know with certainty whether any findings would differ had there been no attrition. We assessed each trait, pubertal status, and drinking behavior by questionnaire. Our method precluded detailed responses to questions about the survey and the kind of clarification that could result from an interview format. However, there is good evidence for the reliability and validity of each measure used. A strength of the study is that we studied youth across 7 waves, from the end of elementary school through the end of middle school. However, the absence of information about trait change and drinking behavior change during the high school years limits the conclusions

we can draw. Although we did model the effects of pubertal onset as a time-varying predictor, which allowed us to model that effect in a person-specific way, our data analytic plan did not allow for the possibility that different youth proceed along different developmental trajectories with respect to both traits and drinking behavior. Trajectory analyses, which are designed to determine the value of modeling distinct developmental groups, can provide a valuable addition to the findings of this study.

In one way, the model we tested is complex and elaborate. At the same time, we isolated and studied just one specific developmental process. Comprehensive models of risk will need to integrate the current findings with many other risk processes that have been identified in the literature. 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), children's engagement in internalizing behaviors (Hussong, Jones, Stein, Baucom, & Boeding, 2011), and learned expectancies for reinforcement from alcohol (Smith, Goldman, Greenbaum, & Christiansen, 1995) all predict early drinking. It is likely that risk reflects developmental transactions among all of these variables, pubertal status, and others, both within and across time.

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