



## Full length article

# A longitudinal study of the reciprocal relationship between ever smoking and urgency in early adolescence



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## ABSTRACT

**Background:** Among early adolescents in the United States (U.S.), the prevalence of cigarette smoking is at its lowest level in recent decades. Nonetheless, given the risks of smoking in early development, it remains critically important to study both risk factors for smoking and risks from smoking. This longitudinal study with U.S. early adolescents examines smoking initiation and tests a model of reciprocal prediction between ever smoking and the personality trait of urgency (i.e., mood-based impulsivity), a trait that increases risk for multiple forms of dysfunction.

**Methods:** Participants ( $n = 1906$ ; 90% 10–11 years old, 50% female, 39% racial minorities at baseline) completed questionnaires 1–2 times per year starting in 5th grade and ending in 9th grade. Structural equation modeling allowed tests of bidirectional relationships between ever smoking and urgency controlling for pubertal status and negative affect at each wave.

**Results:** Incidence of ever smoking increased from 5% to 27% over time, with current smoking around 5% at the last wave. Urgency at each wave predicted ever smoking at the next wave above and beyond covariates and prior smoking (all  $p < 0.01$ ). Likewise, with one exception, ever smoking predicted an increase in urgency at the subsequent wave above and beyond covariates and prior urgency (all  $p < 0.05$ ).

**Conclusion:** Results show that risk for smoking increases with higher levels of urgency and urgency increases secondary to engagement in smoking. Future work should therefore explore urgency as a point of prevention for smoking and smoking cessation as a means to mitigate mood-based impulsivity.

## 1. Introduction

### 1.1. U.S. epidemiology of smoking in early adolescence

Among early adolescents (i.e., youth ages 12–14 or middle school students) in the United States (U.S.), the prevalence of cigarette smoking is at its lowest level in recent decades (Centers for Disease Control and Prevention, 2015), but the overall threat of tobacco use remains a key public health challenge. To illustrate, the prevalence of current smoking (i.e., past 30 days) dropped significantly between 2011 and 2015, with a decline from 4.3% to 2.3% among middle school students (Singh et al., 2016). However, the prevalence of current electronic cigarette use and hookah use increased significantly during this same time period, with a rise from 0.6% to 5.3% and 1.0% to 2.0%, respectively (Singh et al., 2016). As a whole, recent nationwide data show no change in the overall prevalence of current tobacco use among U.S. early adolescents; the prevalence rate in 2015 was 7.4% (Singh

et al., 2016). Furthermore, the debate is ongoing as to whether or not newer, more popular tobacco products (e.g., electronic cigarettes) will function as a “gateway” to smoking and/or maintain nicotine dependence among youth smokers who might otherwise quit (Kandel and Kandel, 2014; Leventhal et al., 2015). Given this, and the known risks of smoking early in development, it remains critically important to understand risk factors for smoking onset.

### 1.2. Impact of smoking in early adolescence

Most adult smokers initiated smoking very early in life, with the average age of onset occurring in early adolescence (Campaign for Tobacco-Free Kids, 2015; U.S. Department of Health and Human Services, 2012). Also noteworthy are findings that nicotine dependence can happen within days or weeks of smoking onset (Campaign for Tobacco-Free Kids, 2015; DiFranza et al., 2000; Gervais et al., 2006) and at relatively low or infrequent levels of use (Rose et al., 2010). Once

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dependence is established, it is very difficult to quit smoking (Bancej et al., 2007; Hughes et al., 2013; Partos et al., 2013). The deleterious effects of smoking are of course profound, and early adolescents are especially vulnerable to the potential for detrimental consequences on brain development, cardiovascular and lung health, physical maturation, and general wellbeing (Counotte et al., 2011, 2009; U.S. Department of Health and Human Services, 2014). Furthermore, smoking in early adolescence increases risk for involvement in other addictive behaviors (Kandel and Kandel, 2014; Merline et al., 2004; Moss et al., 2014) and is associated with other negative outcomes, such as depressed or anxious mood, low academic achievement, family conflict, and interpersonal difficulties (Fleming et al., 2002; Leventhal and Zvolensky, 2015; Morin et al., 2012; O’Loughlin et al., 2009; Windle and Windle, 2001). To date, much of the adolescent smoking research focuses on the developmental period of middle-to-late adolescence (i.e., youth ages 15–20 or high school and college students) (Bancej et al., 2007), and while important, this research cannot fully answer questions about which factors are vital to smoking initiation and maintenance *in early life*. Thus, there is a need to identify factors that predispose some individuals toward this particular risk behavior in early adolescence, with a focus on factors that are likely to be suitable candidates for prevention.

### 1.3. Overview of risk factors for smoking in early adolescence

A large number of risk factors exist for smoking in adolescence, especially if one considers research that covers youth ages 12–20. As a complete summary of the correlates of smoking in adolescence is beyond the scope of this article, the goal herein is to provide a summary of modifiable risk factors that may be particularly relevant in early adolescence. First, parental and other familial influence plays a role such that smoking is most likely among early adolescents who observe family members smoking (Hu et al., 2008; O’Loughlin et al., 2009). This risk is particularly strong if said family members are people with whom the adolescent is closely attached or deeply respects (Fleming et al., 2002). Second, peer influence is also at play via the independent or combined effects of perceived behavioral norms, perceived pressure to smoke, and the existence of close friends or classmates who smoke (Ali and Dwyer, 2009; Fujimoto and Valente, 2012). Third, the experience of negative affect, psychological distress, and emotion/behavior dysregulation is positively associated with smoking in studies with adolescents (Gutman et al., 2011; Hu et al., 2008). Fourth, expectancies about smoking, for instance that it will alleviate negative affect or promote positive affect, predict smoking in early adolescence (Combs et al., 2012; Guller et al., 2015; Heinz et al., 2010; Lejuez et al., 2005). Finally, the multifaceted personality trait of impulsivity (Whiteside and Lynam, 2001) functions as an independent predictor of early adolescents’ smoking (Combs et al., 2012; Doran et al., 2011; Fields et al., 2009; Guller et al., 2014).

### 1.4. Current study

This study focuses on the last risk factor noted above: impulsivity. Since personality is only moderately stable in childhood and adolescence (Hampson and Goldberg, 2006; Hart et al., 2003), there exists the possibility that personality can be influenced by other factors, including behavior. Likewise, it is known that behavior can be influenced by personality (Elkins et al., 2006; Paunonen, 2003; Pederson et al., 2005). Ultimately, this could give rise a reciprocal relationship between behavior and personality – or as is the focus here, a reciprocal relationship between smoking and the facet of impulsivity known as “urgency.” In contrast to other facets of impulsivity, such as low conscientiousness or sensation seeking, urgency refers to rash action in response to intense positive or negative emotion (Cyders et al., 2007; Smith and Cyders, 2016). This theoretical distinction is borne out by very modest correlations between urgency and other impulsogenic traits (Cyders et al., 2007). As adolescents are not yet fully adept at self-regulation of

behavior or emotion (Casey and Caudle, 2013; Eisenberg et al., 2011), there exists the possibility of a particularly strong link between urgency and addictive or risky behavior during this critical developmental period (Smith and Cyders, 2016). In support of this premise, urgency is proven to predict the early onset of, and increased engagement in, drinking, gambling, binge eating, non-suicidal self-injury, and of particular relevance here, smoking (Smith and Cyders, 2016).

Despite all of the above, there is a dearth of literature that addresses the reciprocal, longitudinal relationship between smoking and urgency (or any other facet of impulsivity) in early adolescence (for an exception, see (Malmberg et al., 2013)). To address this gap in the literature, the current study of a large sample of U.S. early adolescents spans multiple years of observation to test a conceptual model whereby smoking predicts urgency and vice versa across time. Two hypotheses capture the longitudinal relationship under investigation: 1) prior engagement in smoking will predict an increase in urgency at a later date and 2) higher scores on urgency will predict a higher likelihood of ever smoking at a later date.

## 2. Material and methods

### 2.1. Sample

Participants were 1906 early adolescents who were drawn from 23 public elementary schools across two school systems in urban, suburban, and rural areas in the southeast U.S. The sample was equally split between girls and boys. At study onset, most participants were 10 or 11 years old (22.8% and 66.8%, respectively); the full age range was 9–13 years old. The racial and ethnic breakdown was 60.9% European American, 18.7% African American, 8.2% Hispanic, 3.4% Asian American, and 8.8% other.

### 2.2. Procedure

All procedures were approved by the authors’ IRB and participating school systems. A passive-consent procedure was used such that each family of a student in the 5th grade classrooms was mailed a letter describing the study and asked to respond (via phone or mail) if they did *not* want their child to participate in the study. Reasons for non-participation included declination of consent from parents, declination of assent from adolescents, and language or cognitive difficulties. Participants were administered questionnaires on eight occasions: spring of 5th grade (wave 1: 2009), fall and spring of 6th, 7th, and 8th grade (waves 2 through 7), and spring of 9th grade (wave 8: 2013). As students progressed through their education, questionnaire administration first occurred in 23 elementary schools at wave 1, then in 15 middle schools at waves 2–7, and finally in 7 high schools at wave 8.

At each wave, study staff administered questionnaires, which took 60 min or less to complete, in classrooms or a central location (e.g., cafeteria) during school hours. Participants who left the participating school systems were asked to continue with the study. Those who continued did so either by completing questionnaires via mail or a secure web site. Retention from wave-to-wave ranged from 94.2% to 98.3%, with 75% retention across the eight waves. Retained and not retained participants did not differ significantly on any study variable. This allowed imputation of missing data via the expectation maximization procedure (Little, 1989), which enabled use of the full sample of 1906.

### 2.3. Measures

#### 2.3.1. Smoking

Participants responded to a question about how often they smoked cigarettes using a scale where 0 = I have never smoked and 5 = I smoke almost daily or every day. Participants were classified as “smoking” if they smoked at least one cigarette in their life (i.e., ever

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