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A Prospective Study of the Acquired Preparedness Model: The Effects of Impulsivity and Expectancies on Smoking Initiation in College Students

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Abstract

Aims—This paper reports on a prospective test of the Acquired Preparedness Model, which posits that impulsivity influences cigarette smoking through the formation of more positive and fewer negative expectancies about smoking effects.

Design—College freshman never-smokers (n = 400; 45% male) completed a baseline interview and quarterly online follow-up assessments for 15 months following baseline.

Findings—Structural equation modeling indicated that the effects of the impulsivity components of sensation seeking and negative urgency on risk of smoking initiation were mediated by expectancies for positive and negative reinforcement from smoking, respectively. Expectancies about negative consequences from smoking predicted initiation but did not mediate the effects of sensation seeking or negative urgency.

Conclusions—Findings are consistent with the Acquired Preparedness Model, and suggest that heightened impulsivity is associated with heightened expectancies for reinforcement from smoking, and thus with greater risk for smoking initiation.

Introduction

Smoking expectancies are individuals' beliefs about the effects of smoking, and are associated with smoking behavior (Brandon, Juliano, & Copeland, 1999; Copeland & Brandon, 2000; Sprujit-Metz, Gallaher, Unger, & Johnson, 2005). For example, positive expectancies about smoking are retrospectively associated with earlier initiation, while negative expectancies about the social consequences of smoking have the opposite effect (Bauman & Chenoweth, 1984; Chassin, Presson, Sherman, & Edwards, 1991). Among

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current smokers, positive expectancies are associated with increased consumption and dependence (Brandon & Baker, 1991) and greater difficulty quitting (Wetter et al., 1994). Positive expectancies refer to the belief that smoking will produce specific benefits. These include both positive reinforcement expectancies (PRE), which are beliefs that smoking will lead to desirable outcomes (e.g., “buzz”, improved concentration), and negative reinforcement expectancies (NRE), which reflect beliefs that smoking will relieve or reduce aversive states (e.g., negative affect) (Wetter, et al., 1994).

Acquired Preparedness Model

The acquisition and development of smoking expectancies has been attributed to both dispositional and learning factors (Brandon, Herzog, Irvin, & Gwaltney, 2004; Niaura et al., 1988). The acquired preparedness model, or APM (McCarthy, Miller, Smith, & Smith, 2001; Smith & Anderson, 2001a), is a theoretical model that integrates the two perspectives. The model posits that individuals vary in terms of the environments they select, and that this is partly a function of personality; similarly, the same environment or experience has different effects on individuals, depending on personality (Caspi, 1993; Settles, Cyders, & Smith, 2010). According to the model, a high level of dispositional impulsivity predisposes individuals to acquiring more positive and fewer negative beliefs and expectancies about substance use (Anderson, Smith, & Fischer, 2003; McCarthy, Kroll, & Smith, 2001; Smith & Anderson, 2001a). While APM research has generally focused on expectancies acquired through early substance use, the theory also explicitly predicts that impulsivity is associated with the formation of more positive pre-initiation expectancies, increasing the likelihood of initiation (Smith & Anderson, 2001b). In sum, the APM predicts that the effect of impulsivity on substance use outcomes is mediated by expectancies; this prediction has consistently been supported for positive expectancies, with more mixed findings for negative expectancies (Anderson, et al., 2003; Hayaki et al., 2011; McCarthy, Miller, et al., 2001; Urban, Kokonyei, & Demetrovics, 2008).

Impulsivity is conceptualized as a multidimensional construct comprised of four factors: lack of perseverance, lack of premeditation, sensation seeking, and urgency, or the tendency to act impulsively while experiencing positive or negative affect (Cyders & Smith, 2007; Whiteside & Lynam, 2001). These factors are thought to be related but distinct, with different neurobiological and environmental causes, and to interact in the development and maintenance of maladaptive and risky behaviors (Lejuez, Aklin, Bornovalova, & Moolchan, 2005). Notably, other conceptualizations of impulsivity exist (Evenden, 1999), and have often been used in APM research (Hayaki, et al., 2011). To date, studies explicitly testing APM predictions regarding impulsivity have generally focused on alcohol use. However, smoking expectancy research has been consistent with the predictions of the APM as well as with findings from the alcohol literature. For example, smoking expectancies have been associated with impulsivity (Doran, McChargue, & Cohen, 2007; Doran, Schweizer, & Myers, 2011; Urban, 2010).

Impulsivity and Cigarette Smoking Expectancies

While the broad construct of impulsivity has been linked to smoking (Burt, Dinh, Peterson, & Sarason, 2000; Masse & Tremblay, 1997) and to expectancies (Doran, et al., 2007; Doran,

Schweizer, et al., 2011; VanderVeen, Cohen, Trotter, & Collins, 2008), most studies have either not distinguished between facets of impulsivity, or have only assessed a single component. Among the latter, sensation seeking has been the best studied, and has been consistently linked to smoking status (Carton, Jouvent, & Widlocher, 1994; Trocki, Drabble, & Midanik, 2009; Zuckerman & Neeb, 1980). Additionally, evidence suggests that negative urgency may be associated with responses to smoking cues (Doran, Cook, McChargue, Myers, & Spring, 2008; Doran, Cook, McChargue, & Spring, 2009). Limited research to date suggests that lack of premeditation and perseverance are not associated with smoking behavior (Spillane, Smith, & Kahler, 2010).

Laboratory studies suggest that the heightened smoking reinforcement expectancies reported in impulsive individuals (Doran, et al., 2007; VanderVeen, et al., 2008) may be consistent with their experiences with nicotine. Perkins and colleagues reported high sensation seeking was associated with greater pleasurable responses to nicotine nasal spray in non-smokers, and generally not in smokers (Perkins, Gerlach, Broge, Grobe, & Wilson, 2000). In a study of responses to nicotine following negative mood induction, more impulsive smokers reported greater negative affect relief after smoking a cigarette with nicotine, but not a placebo cigarette (Doran et al., 2006). Additionally, NRE increased following smoking initiation for college participants high in behavioral undercontrol, a temperamental characteristic similar to impulsivity (Doran, Schweizer, et al., 2011). Finally, recent observational studies suggest that negative urgency may be associated with initiation and experimentation. A study of 1813 5^{th} graders found that negative urgency was strongly related to the likelihood of having smoked in the past six months; one-point increases in negative urgency were associated with 225% and 276% increases in the likelihood of having smoked for girls and boys, respectively (Settles et al., 2012). A follow-up study indicated that this relationship was mediated by reinforcement expectancies (Combs, Spillane, Caudill, Stark, & Smith, 2012). These findings suggest that impulsivity may be associated with expecting and perceiving greater positive and negative reinforcement prior to and early in an individual's smoking career, promoting initiation and progression toward dependence. These effects may be particularly associated with sensation seeking, but initial evidence indicates that negative urgency may also play a role.

Although most studies relevant to the effects of impulsivity and expectancies on smoking have focused on reinforcement expectancies, beliefs about the negative consequences of smoking may also play a role in the association between impulsivity and smoking behavior. From a theoretical perspective the APM suggests that, in addition to stronger expectancies about the positive effects of drugs, impulsivity is associated with reduced processing of information about the negative consequences of use (McCarthy, Kroll, et al., 2001; Patterson & Newman, 1993). Empirical evidence is consistent with this hypothesis. For example, one recent study indicated that the relationships between sensation seeking and both past 30-day and lifetime smoking status in high school students were mediated by beliefs about the risks associated with smoking (Doran et al., 2011). Additionally, negative expectancies about the effects of marijuana use have been shown to mediate the association between a uni-dimensional impulsivity measure and frequency of use (Hayaki, et al., 2011; Vangsness, Bry, & LaBouvie, 2005). Although we are not aware of previous research addressing a potential link between negative urgency and negative consequences expectancies, negative

urgency is defined as a tendency toward rash, ill-advised behavior (i.e., failure to recognize or be swayed by negative consequences) when distressed (Settles, et al., 2012; Whiteside & Lynam, 2001). Conceptually, it is plausible that individuals high in negative urgency may also view smoking as less risky, increasing their vulnerability to experimentation with cigarettes.

Pre-Initiation Expectancies

Nearly all APM research has examined the roles of impulsivity and expectancies in samples that have already initiated use. However, the model also predicts an effect of impulsivity on initiation that is mediated by pre-initiation expectancies. There is preliminary support for the hypothesis that impulsivity is associated with stronger expectancies prior to smoking onset. In a sample of 69 college initiators, behavioral undercontrol was associated with higher expectancies for positive reinforcement from smoking prior to initiation (Doran, Schweizer, et al., 2011). Additionally, alcohol and eating disorder studies clearly indicate that a substantial portion of expectancy formation occurs through observational learning, and precedes the onset of use (Combs, Pearson, & Smith, 2010; Miller, Smith, & Goldman, 1990). Of the components of impulsivity, sensation seeking and positive and negative urgency appear to influence expectancy formation, whereas lack of premeditation and lack of perseverance do not (Gunn & Smith, 2010). Sensation seeking is conceptualized as a tendency to pursue activities that are new or positively reinforcing, and negative urgency as a tendency to act rashly in order to alleviate aversive states, both despite potential long-term consequences (Whiteside & Lynam, 2001). From a theoretical perspective it is plausible that during pre-use expectancy formation sensation seeking youth would be predisposed to greater learning of expectancies for positive reinforcement, and those high in negative urgency would tend to focus on negative reinforcement expectancies. However, to our knowledge these questions have yet to be tested.

Although the APM has been largely supported by previous research, virtually all published studies have been cross-sectional and most have focused on alcohol use and many have used broad conceptualizations of the impulsivity construct. Additionally, to our knowledge there have been no prospective studies of the APM in which participants were non-users at baseline. The purpose of the present study was to test the validity of the APM for smoking initiation in a college sample by testing whether impulsivity would be prospectively associated with a greater likelihood of smoking initiation. Additionally we tested whether, as predicted by the APM, the effect of impulsivity would be mediated by smoking expectancies. Based on previous research, we specifically hypothesized that the sensation seeking and negative urgency components of impulsivity would be associated with initiation of smoking. We expected that the effect of sensation seeking would be mediated by positive reinforcement expectancies, and the effect of negative urgency by negative reinforcement expectancies. Further, we hypothesized that the effects of both sensation seeking and negative urgency would also be mediated by expectancies about the negative consequences of smoking. Support for our hypotheses would suggest that impulsivity predisposes individuals to acquire stronger expectancies about positive and negative reinforcement from smoking prior to use, but weaker expectancies about the deleterious effects of smoking.

Method

Sample

Participants were recruited via flyers posted on the campus of a public university in the southwestern United States. Eligibility criteria included being 18-19 years old (M = 18.3 years, SD = 0.5), enrolled in their first year of college at the time of the baseline interview (March 2008 – November 2010), and never having smoked more than a puff of a cigarette. A total of 548 candidates responded to the flyers, of whom 27% (n = 148) were excluded because they did not meet age and grade (n = 89) or smoking history (n = 59) criteria, yielding a total of 400 participants. The sample was diverse, with 51% identifying as Asian American, 31% as Caucasian, 9% as Hispanic or Latino, 7% multiple races/ethnicities, and 2% other.

Procedure

This study was designed to prospectively assess the effects of impulsivity on initiation and progression via quarterly, online follow-ups over 15 months following a baseline interview. The study was approved by the university's Institutional Review Board and all participants provided informed written consent. Participants were recruited via flyers placed on campus. Once screened for age and smoking history, qualifying participants attended a two-hour session to complete questionnaires and laboratory tasks. Participants were paid $40 for the baseline visit and $10 for each online follow-up, which were created using SurveyMonkey (SurveyMonkey, Palo Alto, CA).

Measures

Smoking Expectancies—The Smoking Consequences Questionnaire (Brandon & Baker, 1991), containing 49 items that describe possible consequences of cigarette smoking, was administered at baseline. Item wording was adapted to account for the fact that all participants were never smokers at baseline (e.g., “When I smoke, the taste is pleasant” was modified to “If I were to smoke, the taste would be pleasant”). Items were modified to utilize a 10-point scale, rather than the original 7-point scale; each item was rated on a scale from 0 (*not true of me at all)* to 10 (*extremely true of me*). We calculated the mean rating of all items in each factor to create four factor scores: positive reinforcement (PRE; 14 items), negative reinforcement (NRE; 12 items), negative consequences (NC; 17 items), and weight control; the weight control subscale was not used in this study. These subscales have been shown to have good reliability and validity in college (Brandon & Baker, 1991) and community (Wetter, et al., 1994) samples, and internal consistency in the present sample was high (Cronbach's α = .85 − .93).

Impulsivity—Impulsivity was measured at baseline using the UPPS Impulsiveness Questionnaire (Whiteside & Lynam, 2001), a 45-item self-report measure composed of four subscales: negative urgency, sensation seeking, lack of perseverance, and lack of premeditation. A more recent modification also includes a positive urgency subscale (Cyders & Smith, 2007), but the original measure was used here. Subscales are scored so that higher values reflect greater impulsivity. Modest correlations (e.g., r = 0.22) have been found between UPPS subscales (Whiteside & Lynam, 2001), indicating that the subscales

assess separate components of the impulsivity construct; subscale correlations ranged from .19 to .40 in this sample. Internal consistency in the present sample was good (Cronbach's α = .83 − .86).

Smoking Behavior—Smoking was assessed at each online follow-up. Participants were asked whether they had smoked cigarettes since their last assessment. Those who responded positively at any of the five follow-ups were classified as initiators. Recent research suggests good reliability and validity for online assessments of smoking, including similar procedures (Ramo, Hall, & Prochaska, in press). To avoid missing data, the online assessment was designed so that the item measuring initiation status required a response.

Analytic plan

Structural equation modeling, implemented via Stata's *sem* module, was used to evaluate a hypothesized model for smoking initiation. The model included only observed variables (i.e., path analysis). The model included sensation seeking and negative urgency as predictors of the binary initiation variable. Although the remaining two facets of impulsivity (lack of premeditation and lack of perseverance) have not been associated with smoking and we did not expect that they would predict initiation in this study, we included both variables as covariates for two reasons. First, few studies have tested them as predictors of smoking behavior. Second, including these as covariates allowed for a more comprehensive test of our hypothesis that sensation seeking and negative urgency are the impulsivity factors that are most relevant to smoking behavior. Positive (PRE) and negative (NRE) reinforcement expectancies were included as mediators of the effects of sensation seeking and negative urgency, respectively, on smoking initiation. Finally, negative consequences expectancies (NCE) were included as a mediator of the effects of both sensation seeking and negative urgency. Analyses were conducted using Intercooled Stata 12.0 (StataCorp LP, College Station, TX), and alpha = .05. The following indices were used to evaluate model fit: (1) root mean square error of approximation, or RMSEA (Steiger, 1990) with 95% confidence interval (CI); (2) standardized root mean square residual, or SRMR (Hu & Bentler, 1999); and (3) Tucker Lewis index, or TLI (Tucker & Lewis, 1973). RMSEA values < .06, SRMR values < .08, and TLI values > .95 were considered as evidence of good model fit (Hu & Bentler, 1999). Indirect or mediated effects were tested with Stata's *estat teffects* command, and their significance evaluated via z-tests. Because men tend to be more impulsive than women (Waldeck & Miller, 1997), sex was initially considered as a covariate. Similarly, given evidence that impulsivity may vary among ethnic groups (Jackson, Neumann, & Vitacco, 2007; Vitacco, Neumann, & Jackson, 2005), race/ethnicity (coded as Caucasian, Asian American, Hispanic/Latino, and Other) was considered as a covariate. Because the four facets of impulsivity are thought to be related constructs (Whiteside & Lynam, 2001), the model estimated covariances among the four UPPS subscale scores as well as between PRE and NRE.

Results

Preliminary Analyses

Descriptive statistics for variables of interest are presented in Table 1. Survey response rates ranged from 94-98% across the five follow-ups. For baseline variables (PRE, NRE, sensation seeking, negative urgency) there were no missing data. Sixteen participants failed to complete one or more online assessments, and were missing initiation status data. These participants were excluded from subsequent analyses. Seventy-three participants initiated smoking during follow-up (18.3% of the sample). Univariate analyses indicated that initiation did not vary by age or by sex. However, there was a significant effect of ethnicity [Odds Ratio (OR) = 0.78 (95% confidence interval 0.59, 0.96), $z = -2.26$, $p = .039$], indicating that Asian Americans had lower rates of initiation (11.9%) compared with Caucasian (25.2%) and Hispanic or Latino (36.4%) participants. Consequently, ethnicity was included as a covariate in the initiation model. Correlations among predictor variables are shown in Table 2.

Impulsivity and initiation

The hypothesized model of smoking initiation fit the data well [RMSEA = .050 (95% CI . 031, .069), SRMR = .054, TLI = .964]. The model is shown in Figure 1, with standardized coefficients and significant paths indicated. As hypothesized, there was a significant direct effect of sensation seeking on initiation [b = 0.22 (95% CI 0.12, 0.31), $p < .001$]. Contrary to our hypotheses, the direct effect of negative urgency was not significant [b = 0.05 (−0.03, 0.13), $p = .364$). NRE [b = 0.31 (0.21, 0.40), $p < .001$, PRE [b = 0.18 (0.08, 0.28), $p = .002$], NCE [b = −0.13 (−0.23, −0.04), $p = .007$], and ethnicity [b = −0.16 (−0.25, −0.07), $p < .001$] were also significant predictors of initiation, whereas gender, lack of premeditation, and lack of perseverance were not. Consistent with expectations, the indirect effects of sensation seeking via PRE [b = 0.02 (0.01, 0.04), $p = .036$] and negative urgency via NRE [b = 0.05 (0.03, 0.07), $p = .004$] were significant. In other words, the effects of sensation seeking and negative urgency on the likelihood of smoking initiation were mediated by PRE and NRE, respectively. The effects of negative urgency [b = −0.07 (−0.15, 0.01), $p = .074$] and sensation seeking [b = −0.05 (−0.13, 0.03), $p = .104$] on NCE were not significant. Finally, there was significant covariance among the three expectancy subscales, including PRE and NRE [b = 0.22 (0.16, 0.28), $p < .001$] and among the impulsivity variables, including sensation seeking and negative urgency [b = 0.17 (0.07, 0.26), $p = .002$].

Discussion

This study tested elements of the Acquired Preparedness Model (APM), which suggests that impulsive individuals are disproportionately vulnerable to smoking due to a tendency to form more positive expectancies about smoking. More specifically, we tested the hypothesis that impulsivity would prospectively predict the probability of smoking initiation in a college sample, and that this effect would be mediated by smoking expectancies. Consistent with the APM, the structural equation model indicated significant indirect effects of sensation seeking and negative urgency on the likelihood of initiation of smoking via PRE

and NRE, respectively. Contrary to our expectations, the sensation seeking and negative urgency effects were not mediated by NCE.

The findings regarding PRE and NRE are consistent with previous reports that the effects of impulsivity components on alcohol use are mediated by expectancies and suggest a common pathway by which impulsivity may confer risk for use of multiple substances. For example, a recent study of found that both positive and negative urgency predicted alcohol consumption at the end of the first year in college; these effects were mediated by expectancies of positive and negative reinforcement from alcohol (Settles, et al., 2010). Other studies using broader measures of impulsivity have produced similar findings (Anderson, et al., 2003; Barnow et al., 2004; McCarthy, Miller, et al., 2001).

While NCE was inversely associated with the probability of smoking initiation, it was not significantly related to either sensation seeking or negative urgency, and did not mediate their effects on initiation. Although this finding may initially appear inconsistent with the APM, it is not necessarily clear that this is the case. It is plausible that abstract knowledge of the negative consequences of smoking is less critical than the weight that such consequences are given, or the extent to which they are accessible in the moment (McCusker, 2001; Rather & Goldman, 1994). We have previously argued that impulsive individuals may not lack knowledge of the future consequences of smoking, but instead may be disproportionately prone to discounting these consequences in situations in which they believe smoking will produce a desired result (e.g., positive or negative reinforcement) (Doran, et al., 2006). In the context of the APM, this suggests that, rather than failing to learn the negative consequences of smoking, youth high in sensation seeking and negative urgency may instead fail to learn to use this information to inform their decision-making. An alternative explanation is that due to effective youth prevention programs, knowledge of the negative consequences of smoking is widespread (Tilleczek & Hine, 2006). Consequently, dispositional influences on NCE such as impulsivity may be mitigated by repeated presentation of information on smoking effects.

These findings provide additional support for the APM, as well as extending previous research in several ways. First, previous studies have generally relied on broad, general measures of impulsivity or disinhibition; few have tested specific impulsivity components in the context of the APM. Our findings suggest that, among the facets of impulsivity, sensation seeking and negative urgency may be more relevant to early substance use, which is consistent with those studies that have used more specific measures (Settles, et al., 2010; Urban, 2010; Urban, et al., 2008). Additionally, most tests of the APM have focused on alcohol use. To our knowledge only one previous study has tested the APM in terms of smoking; this cross-sectional survey study found that sensation seeking was associated with past 30-day smoking, and that the relationship was mediated by both PRE and NRE (Urban, 2010).

Perhaps most importantly, the APM has typically been framed as explaining how more impulsive individuals tend to develop more positive substance use expectancies as a result of substance use. That is, impulsive individuals are thought to find use more reinforcing, or to have biased recall toward positive effects of use, making them more likely to continue using

(Settles, et al., 2010). Empirical tests of the APM in the substance abuse literature have tended to use samples in which most individuals have already used the substance. In other words, the implicit suggestion is that impulsive, disinhibited individuals develop stronger positive expectancies only after they have used the substance. Notably, however, the model simply posits that impulsive individuals draw different conclusions from a common event, i.e., higher expectancies would be formed following experience with a substance (Smith & Anderson, 2001a). The current findings suggest that more impulsive youth tend to develop stronger expectancies about reinforcement from smoking before they have ever smoked, presumably based on exposure to smoking models in the media and in their lives (Leventhal & Schmitz, 2006). Combined with previous research and consistent with the APM, the current findings suggest that more impulsive never-smokers are prone to the development of disproportionately strong expectancies about reinforcement from smoking (Doran, Schweizer, et al., 2011), leaving them at greater risk for initiation.

The fact that we found independent indirect effects of sensation seeking and negative urgency suggests that there are multiple pathways by which impulsivity may influence smoking and other substance use via expectancy formation, consistent with previous research (Doran, Schweizer, et al., 2011; Settles, et al., 2010). However, the fact that sensation seeking and negative urgency were significantly correlated with NRE and PRE, respectively, indicates some overlap between the pathways. That is, higher levels of either impulsivity factor appear to be associated with stronger expectancies for both types of reinforcement, and thus with the probability of initiation. In the present sample the zero-order correlations between sensation seeking and NRE and between negative urgency and PRE remained significant after controlling for negative urgency and sensation seeking, respectively, indicating that these relationships are not simply a function of the overlap between sensation seeking and negative urgency. This is consistent with the conceptualization of sensation seeking and negative urgency as related dispositions that nevertheless separately influence behavior.

In addition to the effects of impulsivity and expectancies on smoking, it is notable that 18.3% of participants initiated smoking during their first 15 months post-enrollment. Data from the Monitoring the Future study indicate that initiation peaks between ages 13-15 (Johnston, O'Malley, Bachman, & Schulenberg, 2011). However, these data, along with other recent studies (Costa, Jessor, & Turbin, 2007; Myers, Doran, Trinidad, Klonoff, & Wall, 2009; Wetter et al., 2004), suggest that initiation in college is a growing problem. Additionally, prevention and cessation strategies that are successful for adolescents may be less effective or even counterproductive in college students (Wechsler et al., 2003; Wolburg, 2006, 2009). These findings suggest a need for additional research in this area. For example, intermittent smoking during college is associated with increased alcohol use during this period (Harrison, Desai, & McKee, 2008). While heavy alcohol use tends to decrease following college (O'Neill, Parra, & Sher, 2001), it is not clear whether intermittent smoking follows a similar pattern.

Findings from the current study must be interpreted in the context of its limitations. One potential issue is that impulsivity and smoking expectancies were measured simultaneously, prohibiting any causal interpretations of the apparent indirect effect of impulsivity through

expectancies. A second limitation is that assessments of smoking relied on self-report. There is some evidence that research subjects tend to underreport tobacco use (Gorber, Schofield-Hurwitz, Hardt, Levasseur, & Tremblay, 2009). Thus it is possible that some participants failed to report smoking prior to enrollment. Similarly, smoking initiation was defined as any smoking during study participation. While this definition is not uncommon in the literature (Gilman et al., 2009; Sherman, Chassin, Presson, Seo, & Macy, 2009), it is not clear whether more optimal definitions may exist. Finally, the sample was comprised of freshmen at a large, public university. Although the sample was more diverse than many college samples, findings may not be generalizable to non-college samples, or to different age groups. Further, evidence indicates that most adult smokers initiate before age 18 (Breslau & Peterson, 1996; Kandel, Schaffran, Hu, & Thomas, 2011), and that impulsivity is associated with earlier initiation (Masse & Tremblay, 1997). Highly impulsive individuals may therefore have been ineligible for this study because they had already initiated smoking. While this might suggest that the direct effect of impulsivity factors on initiation would be higher in younger samples, it is not clear whether the indirect expectancy effects would differ.

In this study, we found that the effects of sensation seeking and negative urgency on smoking initiation were mediated by expectancies for positive and negative reinforcement from smoking in a college sample. Findings are consistent with the Acquired Preparedness Model, and suggest that more impulsive youth form strong expectancies for reinforcement from smoking without having smoked, rendering them vulnerable to smoking initiation. These findings indicate that impulsive young adults may benefit from smoking cessation and prevention programs that directly target expectancies for reinforcement from smoking.

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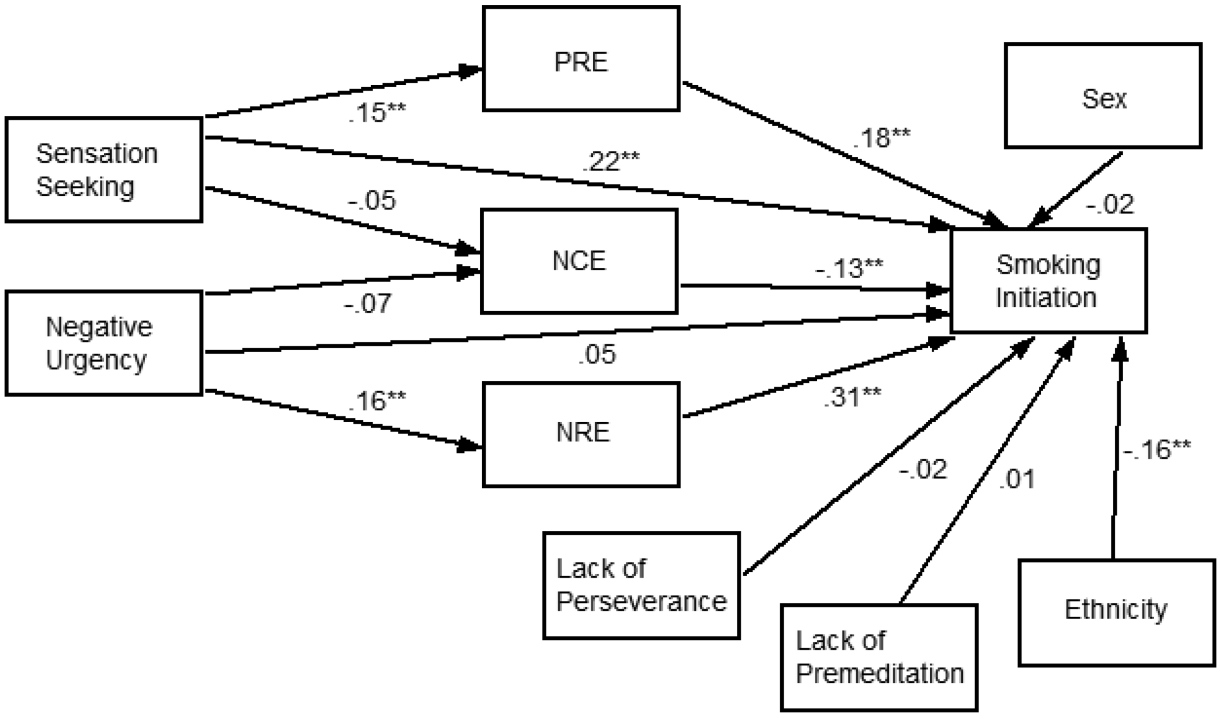

*$p < .05$, ** $p < .01$. PRE = positive reinforcement expectancies; NCE = negative consequences expectancies; NRE = negative reinforcement expectancies. For simplicity, covariances among impulsivity and expectancy factors, as well as error terms, are excluded.

Figure 1.
Path model for smoking initiation displaying standardized coefficients.

Table 1

Descriptive statistics for impulsivity and expectancy variables.

Variable	Non-Initiators n = 327	Initiators n = 73	Total M (SD), range
UPPS			
Sensation seeking**	21.72 (6.67), 2-28	24.13 (5.93), 8-32	22.16 (6.10), 2-32
Negative Urgency*	19.54 (5.71), 0-31	21.40 (6.12), 4-32	19.88 (5.54), 0-32
Lack of Perseverance	10.31 (4.28), 0-30	10.03 (4.81), 0-26	10.26 (4.31), 0-30
Lack of Premeditation	12.72 (4.92), 2-25	12.78 (5.04), 1-30	12.73 (4.91), 1-30
SCQ			
Positive Reinforcement Expectancies*	3.24 (2.13), 0-8.00	3.82 (1.98), 0.21-9.36	3.33 (2.12), 0-9.36
Negative Reinforcement Expectancies**	3.21 (2.23), 0-8.55	5.64 (1.65), 1.09-9.00	3.58 (2.32), 0-9.00
Negative Consequences Expectancies*	7.95 (1.28), 2.12-9.53	7.56 (1.15), 4.00-9.29	7.89 (1.27), 2.12-9.53

* $p < .05$

** $p < .01$ for initiators vs. non-initiators.

Table 2

Correlations among baseline predictor variables.

	Sensation seeking	Urgency	Lack of premeditation	Lack of perseverance	PRE	NRE	NCE
Sensation seeking	--	--	--	--	--	--	--
Urgency	.24**	--	--	--	--	--	--
Lack of premeditation	.19**	.22**	--	--	--	--	--
Lack of perseverance	.06	.34**	.29**	--	--	--	--
PRE	.35**	.17**	.05	.04	--	--	--
NRE	.17*	.38**	.07	.10	.44**	--	--
NCE	.05	.09	.07	.04	−.15**	−.06	--

* $p < .05$

** $p < .01$. PRE = positive reinforcement expectancies; NRE = negative reinforcement expectancies; NCE = negative consequences expectancies.