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Impulsivity-like traits and smoking behavior in college students

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Abstract

Recent research has deconstructed the concept of impulsivity by identifying five different traits that influence engagement in impulsive behaviors: positive urgency (tendency to act rashly in response to a positive mood), negative urgency (tendency to act rashly in response to a negative mood), sensation seeking, lack of planning, and lack of perseverance. The traits are only moderately related to each other. The aim of this study was to apply this advance to the study of smoking. We tested a two-stage hypothesis: Higher sensation seeking was hypothesized to differentiate current smokers from non-smokers, and negative and positive urgencies were expected to predict concurrent level of nicotine dependence among smokers. As anticipated, greater sensation seeking was associated with a higher odds of being a current smoker (odds ratio=1.51). Greater positive urgency, but not other impulsivity-related traits, was associated with significantly higher levels of nicotine dependence, explaining 29% of the variance in level of nicotine dependence.

Keywords

Impulsivity; Smoking; Nicotine dependence; Smoking status

1. Impulsivity-like traits and smoking behavior

Recent research suggests that personality traits associated with impulsivity (e.g., sensation seeking, risk taking, and delay discounting), influence tobacco use and perhaps level of nicotine dependence (Bickel, Odum, & Madden, 1999; Doran, Cook, McChargue, & Spring, 2009; Mitchell, 2004; Perkins et al., 2008). Various self-report and behavioral measures of impulsivity-related traits are associated with aspects of smoking behavior, including current smoking status (Bickel, et al, 1999; Kassel, Shiffman, Gnys, & Paty, 1994; Lejuez et al.,

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Contributors

Dr. Spillane designed the study, conducted the analyses, and wrote the first draft of the manuscript under the supervision of Drs. Smith and Kahler. Although Dr. Spillane wrote the first draft of the manuscript, all authors contributed to and have approved the final manuscript.

Conflict of Interest

All other authors declare that they have no conflicts of interest.

2003; Mitchell, 1999), smoking initiation (Lipkus, Barefoot, Williams, & Siegler, 1994), and smoking cessation outcomes (Doran, Spring, McChargue, Pergadia, & Richmond, 2004; Kahler, Spillane, Metrik, Leventhal, & Monti, 2009; MacKillop & Kahler, 2009). However, the term impulsivity has been used broadly by many researchers to mean different things (Smith et al., 2007; Whiteside & Lynam, 2001), and more research is still needed to define the dimensions of impulsivity-like traits that are most relevant to smoking and smoking dependence.

In recent years, personality researchers have made considerable progress in parsing “impulsivity” into its component constructs (Cyders & Smith, 2007; Evenden, 1999; Petry, 2001; Whiteside & Lynam, 2001). At present, five different personality dispositions to engage in rash or impulsive action have been identified and have been found to be modestly related to each other (Cyders & Smith, 2007; Cyders et al., 2007; Smith et al., 2007; Whiteside & Lynam, 2001). The five traits are negative urgency (the tendency to act rashly in response to negative mood), positive urgency (the tendency to act rashly when experiencing intensely positive mood), sensation seeking (the tendency to seek out novel and thrilling experiences), lack of perseverance (the inability to remain focused on a task), and lack of planning (the tendency to act without thinking).

The five specific traits are distinct from each other and predict different components of risky behaviors (Cyders & Smith, 2007, 2008c; Smith et al., 2007; Whiteside & Lynam, 2001, 2003). Sensation seeking has consistently been shown to relate to the frequency of engaging in risky behaviors, such as alcohol consumption, gambling, and risky sex, in both cross-sectional and longitudinal research (Cyders & Smith, 2008b; Cyders, Flory, Rainer, & Smith, 2009; Smith et al., 2007; Zapolski, Cyders, & Smith, 2009). In contrast, positive and negative urgency consistently relate, both cross-sectionally and longitudinally, to problem levels of involvement in such behaviors, including problem drinking, pathological gambling, the use of illegal drugs, and binge eating (Anestis, Selby, & Joiner, 2007; Cyders & Smith, 2008b; Cyders et al., 2007, 2009; Zapolski et al., 2009). The purpose of the current study is to study the five impulsivity-like traits in relation to smoker status and level of nicotine dependence in college students.

1.1. Impulsivity and smoking

Of the impulsivity-like traits, sensation seeking has perhaps received the most attention in regards to smoking. Sensation seeking has been found to differentiate smokers from non-smokers, with smokers having higher sensation seeking scores than non-smokers (Carton, Jouvent, & Widlocher, 1994; Lejuez et al., 2003; Mitchell, 1999; Kahler, Daughters, et al., 2009); however, it does not appear to predict smoking dependence (Harmen, Bischof, Brooks, Hohagen, & Rumpf, 2006; Kahler, Daughters, et al., 2009; Kahler, Spillane, et al., 2009). Higher sensation seeking has been found to predict reduced odds of abstinence from smoking during smoking cessation (Kahler, Spillane, et al., 2009). In addition to the research on sensation seeking, researchers have used a behavioral measure of risk taking, which correlates with sensation seeking and lack of planning (Lejuez et al., 2002), and differentiates smokers and non-smokers (Lejuez et al., 2003).

There are a number of possible mechanisms that may explain the relationship between sensation seeking/risk taking and smoking initiation. One of these mechanisms suggests that the novelty of smoking and the positive reinforcement one receives from smoking may attract someone who is high in sensation seeking to smoke (Clayton, Segress, & Caudill, 2007). However, as an individual continues to smoke, the novelty of the smoking experience wears off and therefore, the individual may lose interest in smoking, and seek out other novel and/or thrilling experiences to engage in. Thus, one would expect sensation seeking to have relatively little association with smoking dependence.

Whereas sensation seeking is likely to predict the likelihood of initiating smoking and choosing to smoke, we hypothesize that impulsivity-like traits related to urgency traits will be the stronger predictors of level of nicotine dependence. There are both empirical and theoretical reasons for this prediction. Smoking is likely to be particularly reinforcing during intense mood states, whether as part of a celebratory marking of positive events or as a means of reducing negative affect. A high-urgency individual who experiences reinforcement for smoking is more likely in the future to respond to an intense mood state with additional smoking because such individuals are more prone than others to act on their immediate needs, rather than their long-term interests (Cyders & Smith, 2008c). The repeated choice to smoke when emotional then facilitates the development of dependence (Baker, Brandon, & Chassin, 2004). Indeed, a significant portion of smoking lapses occur during positive affective states (Brandon, Tiffany, Obremski, & Baker, 1990; Shiffman, Paty, Gnys, Kassel, & Hickcox, 1996) and positive affect predicts urges to smoke during the course of ongoing smoking (Zinser, Baker, Sherman, & Cannon, 1992). In laboratory settings, positive affect imagery has been found to elicit stronger urges to smoke than neutral imagery (Tiffany & Drobes, 1990). These findings appear to suggest a role for positive urgency in predicting the level of nicotine dependence.

However, studies also suggest that positive reinforcement is not the major motivational pathway to nicotine dependence. Although positive affect imagery elicits smoking urges, it is less effective than negative affect imagery (Tiffany & Drobes, 1990). Research also suggests that among those who try cigarettes, those who progress to regular smoking status and nicotine dependence are more likely to report higher levels of negative mood states such as stress and negative affect (Chassin, Presson, & Sherman, 1984; Stein, Newcomb, & Bentler, 1996). Moreover, Nichter and Carkoglu (2007) found that smoking to alleviate distress was a common motivation for college student smokers, therefore suggesting a possible role for negative urgency.

The urgency traits predict problem involvement in several other addictive behaviors, as noted above (Cyders & Smith, 2008c; Cyders et al., 2009; Settles, Cyders, & Smith, in press; Zapolski et al., 2009). Although there have been few studies relating the five impulsivity-related traits to smoking, Billieux, Van der Linden, and Ceschi (2007) did find that among four of the traits (the study did not include positive urgency), only negative urgency predicted cigarette craving cross-sectionally. Similarly, Doran and colleagues (2009) also studied four of the five traits (the study did not include positive urgency), and found that, in smokers, negative affect craving was significantly associated with negative urgency and lack of perseverance. They found that this relationship became stronger when smokers were exposed to a smoking cue. These findings suggest that smokers higher in the negative urgency and lack of perseverance components of impulsivity have a greater negative affect craving response to smoking cues than those lower in negative urgency and lack of perseverance. The role of negative and positive urgency in differentiating smokers from non-smokers and differentiating levels of dependence among smokers has not yet been reported.

1.2. Hypotheses for the current study

In the present study, we tested a two-stage hypothesis of smoking behavior and impulsivity. First, we hypothesized that, in replication of prior research, sensation seeking would differentiate smokers from non-smokers. Second, we anticipated that positive and negative urgency would be associated with higher levels of dependence among those who smoke. These hypotheses were tested in a sample of college students. A large percentage of those who smoke, approximately 23%, are aged 18–24 (Centers for Disease Control, 2009). During the college years many students who have never previously smoked experiment with smoking and become social smokers (Wetter et al., 2004), with research suggesting that

25% of all smokers begin smoking in college (Everett et al., 1999). Constructs related to impulsivity may be especially relevant to smoking among college students as a willingness to take risks and seek new experiences and a tendency to be driven by immediate affective consequences of behavior may be especially strong in young adults and be especially important to the early course of individual's smoking careers.

2. Method

2.1. Participants

A total of 359 undergraduate college students participated in the study, including 210 women who ranged in age from 18 to 25 ($M=18.8$ years; $SD=1.08$) and 148 men who ranged in age from 18 to 36 ($M=19.2$ years; $SD=1.8$). The majority of the sample's (69.6%) self-reported household income was over \$50,000.

We defined individuals as a current smoker if, on the Fagerström Nicotine Dependence Questionnaire (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991), they reported that they smoked at least once a month. We defined individuals as negative for smoker status if they reported that they had never tried a single cigarette. Individuals classified into neither group were those that reported that they had smoked once or twice, just to try it, but not in the past month were excluded from the analyses because of their ambiguous status. We excluded past smokers because they did not currently smoke and therefore, did not complete the FTND. In all, 87 participants reported that they had never smoked a cigarette, 139 participants reported current smoker status (68% reported smoking 10 cigarettes or less; 12% reported smoking 11–20; 0% reported smoking 21–30; and 1% reported smoking 31 or more cigarettes per day), and the remaining 113 reported that they had smoked once or twice, but not in the past month or were past smokers and were excluded from these analyses.

2.2. Procedure

Participants were undergraduate students recruited from the General Psychology subject pool. Informed consent was obtained for every participant. Questionnaires were administered in a group format with approximately 25 people in each group, and were completed confidentially. Following completion of the measures, participants were debriefed, thanked, and received course credit for their participation.

2.3. Measures

2.3.1. Smoker status and level of nicotine dependence—Fagerström Nicotine Dependence (FTND; Heatherton et al., 1991). The FTND measures symptoms of nicotine dependence on a six-item scale. Scores can range from 0 to 10, with higher scores indicating greater levels of dependence. Internal consistency estimate for this sample is .75. Scores on the FTND ranged from 0 to 8 with a mean of 1.61 ($SD=1.80$). As mentioned above, to determine smoker status, we used item number 1 on the FTND.

2.3.2. Impulsivity

UPPS-P Impulsive Behavior Scale (UPPS-P: Lynam, Smith, White-side, & Cyders, 2006): The UPPS-P is a 59-item, four-point Likert type scale used to assess five different dispositions to impulsive action. The five different components are those described above: negative urgency (12 items), positive urgency (14 items), lack of planning (11 items), lack of perseverance (10 items), and sensation seeking (12 items). Measurement of each of the traits converges across assessment method (Cyders & Smith, 2007; Smith et al., 2007), and there is good discriminant validity between the traits. Internal consistency estimates in this

sample were: negative urgency (.84), positive urgency (.95), lack of planning (.78), lack of perseverance (.84), and sensation seeking (.83).

3. Results

3.1. Sample impulsivity-like trait characteristics

As shown in Table 1, the pattern of intercorrelations among the traits was very similar to those reported previously (cf. Cyders & Smith, 2007). Positive and negative urgency were highly correlated ($r=.53, p<.001$), which is expected given that they are a facets of a general urgency trait. However, each of these traits was only modestly correlated with the other three traits. Lack of planning and lack of perseverance, the two facets of the deficits-in-conscientiousness factor, were also highly correlated ($r=.48, p<.001$), and they were only moderately correlated with the other three traits. Finally, sensation seeking was only moderately correlated with the other four.

3.2. Concurrent prediction of smoker status

Table 2 lists the means, standard deviations, and effect sizes of the five impulsivity-like constructs by smoker status. In each case, smokers had significantly higher scores on the impulsivity-like traits. We next conducted a series of bivariate, binary logistic regression analyses. In each case, we controlled for age and gender and entered one of the impulsivity traits into the regression equation as the independent variable and smoker status (no or yes) as the dependent variable. When entered separately in this way, all five traits predicted smoker status. When all five trait measures were entered into a logistic regression equation simultaneously, controlling for age and gender only one had significant incremental validity over the others: sensation seeking (see Table 3). Sensation seeking had an odds ratio 1.51 (95% CI: 1.09–2.08), meaning that for each one point increase in sensation seeking; one was one and a half times more likely to be a smoker. This finding supported our first hypothesis.

3.3. Concurrent prediction of level of nicotine dependence

Out of the total sample, 139 participants smoked at least monthly and therefore smoked enough to have scores on the FTND measure. Scores on the FTND ranged from 0 to 9 ($M=1.61$; $SD=1.80$). To correct for positively skewed scores on the FTND, the square root transformation was applied to the data. We again proceeded by first conducting regression analyses for each trait separately, and then conducting a single analysis with all five traits entered simultaneously (we used linear regression in this case). When each personality trait was entered separately into the multiple regression, only one trait related to level of nicotine dependence: positive urgency ($\beta=.28, p<.01$), accounting for 28% of the variance in level of nicotine dependence. Consistent with this result, when all five trait scores were entered simultaneously and controlling for age and gender (see Table 4), only positive urgency had incremental validity over the other four traits. Interestingly, its predictive power was not diminished when the other four traits were considered in the equation ($\beta=.29, p<.01$).

4. Discussion

In this study, we examined the ability of five traits related to impulsive behavior to predict concurrently smoker status and level of nicotine dependence. As anticipated, different traits predicted smoker status and level of nicotine dependence. Consistent with previous research, sensation seeking predicted smoker status. Trying a novel behavior is not the same as becoming dependent. Eventually that behavior is not new anymore and therefore, the individual high in sensation seeking may move on to another novel experience to satisfy their need for stimulation.

The urgency traits are personality traits which involve acting out in response to intense emotion and should be more relevant for predicting level of nicotine dependence. Indeed, we found that those higher in positive urgency had higher scores on level of dependence as measured by the FTND. Those individuals who report that they act out when in an extreme positive mood are those that are more likely to have higher dependence scores. Somewhat surprising was the finding that negative urgency did not predict level of dependence. However, this group of smokers had low to moderate levels of nicotine dependence and perhaps early on in the development of dependence positive urgency may be particularly more important. Negative urgency may play a particular role in other areas of smoking behavior such as relapse, where individuals high in negative urgency may be especially likely to relapse in response to the negative affect associated with quitting smoking. In addition, the other impulsivity-related traits of lack of planning and lack of perseverance may also play a unique role in other aspects of smoking, perhaps as predictors of cessation.

A potential limitation to this study was that we did not include a measure of depression. This study did not assess or seek to differentiate impulsivity-related constructs from negative affect-related constructs such as depressive symptoms or neuroticism. Others have done so with relation to problem drinking and found that negative affect did not predict problem drinking above and beyond negative urgency, but negative urgency does predict problem drinking above and beyond negative affect (Fried, Fisher, Coombs, & Smith, 2009 July). However, this study focused on alcohol use and perhaps we would find a different relationship for different various aspects of smoking behavior. Future research may well want to include measures of depression to examine negative urgency's distinctness from depression in predicting smoking behavior. Thus, we view comparisons with depression as a different question, or perhaps a future direction, for risk research.

The differences found in the prediction of smoker status versus dependence speak to the need to clarify the relationship between specific traits related to impulsivity on the one hand and smoking behavior on the other hand. The different roles of sensation seeking and positive urgency are similar to the different roles observed by those traits in relation to other addictive behaviors. Similar to what has been observed with respect to drinking and gambling, sensation seeking was related to engaging in smoking behavior, whereas positive urgency was related to problem-level involvement with tobacco (Cyders & Smith, 2008a, b; Cyders et al., 2007; Smith et al., 2007). If, as is suggested in this report, different traits relate to different aspects of the risk process, it is crucial for both researchers and clinicians to understand the complexity of personality's role in relation to smoking. Doing so can only help with our ability to not only be able to distinguish among likely non-smokers, potential smokers, and those at greatest risk to become nicotine dependent, but also has the potential to inform treatment plans and decisions. For example, individuals high in positive urgency may require a treatment that teaches adaptive techniques for savoring successes and positive mood. A treatment that helps these individuals identify alternative, safer means of celebrating or enhancing a positive mood might prove efficacious. Perhaps tailoring the treatment to address certain risk factors may help the individual succeed.

The current report is cross-sectional in nature, and so is not a test of a risk model. The primary contribution of this report is to help clarify the nature of the possible personality contribution to the risk process, now that basic science has identified five distinct traits impulsivity-like traits that relate to various aspects of risky behavior. Because this study did not prospectively predict traits related to smoker status and dependent status, it speaks to the value of longitudinal work designed to evaluate whether the traits identified here contribute to the progression of risk.

In addition to possible longitudinal investigations of these processes, future research might examine the interaction between personality traits and psychosocial learning. Alone, personality traits are perhaps more distal in their prediction of risky behaviors. By themselves, they lack specificity. The presence of a personality trait, such as positive urgency, may tell you that the individual is at risk for engaging in problematic levels of risky behaviors; however, the presence of a particular trait, in this instance positive urgency, suggests that one is at risk for many risky behaviors. Smith and Anderson (2001) have proposed the acquired preparedness (AP) model of risk, one component of which involves the interaction of personality traits and psychosocial learning (with psychosocial learning measured as response outcome expectancies) to predict engagement in problematic levels of risky behaviors. Response outcome expectancies (Rotter, 1975; Tolman, 1932) are learned beliefs concerning the likelihood of positive or negative consequences of a potential action. That is, expectancies represent summaries of one's learning history of expected reinforcement and punishment from a given behavior (Goldman, Brown, Christiansen, & Smith, 1991). One tends to choose behaviors for which one expects reward and avoid behaviors for which one expects punishment. The AP model has proven fruitful in relation to alcohol use, eating disorders, and pathological gambling (Barnow et al., 2004; Combs, Smith, Flory, Simmons, & Hill, in press; Settles et al., in press; McCarthy, Kroll, & Smith, 2001). Future research might apply the AP model to smoking.

Additional limitations of the current sample also need to be taken into consideration. First, the sample consisted of light to moderate smokers; the current results should be replicated on a sample with higher levels of nicotine dependence. Perhaps the light to moderate smoker status may have underestimated the role of negative urgency. It may well be that negative urgency plays more of a role in the persistence of smoking, and/or in cessation because of its relationship with negative affect craving (Doran et al., 2009). Therefore, in a group of smokers who are at the initial stage of developing nicotine dependence, positive urgency is a more powerful predictor; however, once nicotine dependence is established, negative urgency may play a role in the maintenance of smoking and perhaps even predicts cessation failure among those who try to quit. Although we do not have the data in this sample to test this possibility, future research should address these considerations.

Second, these data were based on self-report questionnaires. Although there is good evidence for the validity of the measures employed, the present findings could be supplemented with interview assessments of positive and negative urgency such as the ones developed by Smith and colleagues (2007). In addition, it may be helpful to include behavioral measures of impulsivity, such as the Balloon Analogue Risk Task (BART; Lejuez et al., 2002) or delay discounting to see how they relate to positive and negative urgency in the context of smoking behavior and nicotine dependence.

A final limitation of the study was the failure to collect ethnicity/race data. However, there is little reason to anticipate that race/ethnicity would affect the risk process. McCarthy, Miller, Smith, and Smith (2001) tested the invariance of impulsivity measures in the prediction of problem drinking behavior across Caucasian and African American samples, and the relationships were similar. Similarly, Spillane and Smith (2009 July) tested the invariance of impulsivity measures in the prediction of problem drinking across an Indigenous and Caucasian samples, and the relationships were the same. Therefore, it is unlikely that ethnicity could account for the influence of the traits on smoking behavior.

Impulsivity broadly conceived has been shown to be a risk factor for various risky behaviors, including alcohol consumption, bingeing and purging, gambling, and smoking. Recent advances in deconstructing the concept of impulsivity into distinct traits, and the initial success in applying those advances to smoking behavior reported here, suggest the

possibility that personality's role in risk for smoking may well be further clarified in the near future. We suggest that as researchers investigate impulsivity-related constructs in relation to smoking, they define clearly which impulsivity-related constructs they believe are important.

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Table 1

Correlations among the different types of impulsivity-like constructs.

Subscale	1	2	3	4	5
Participants (<i>n</i> =359)					
Positive urgency	–	.54**	.21**	.24**	.23**
Negative urgency	–	–	.14**	.24**	.36**
Sensation seeking	–	–	–	.13*	–.23**
Lack of planning	–	–	–	–	.48**
Lack of perseverance	–	–	–	–	–

*

p<.05;

**

p<.01.

Table 2

Means, standard deviations, and effect sizes for the five impulsivity-like traits by smoker status.

	Smoker status			
	Non-smoker <i>M</i> (SD) (<i>n</i>=87)	Current smoker <i>M</i> (SD) (139)	<i>t</i>	<i>p</i>
Positive urgency	26.51 (8.59)	30.39 (8.84)	-3.25	.001
Negative urgency	27.21 (5.56)	29.91 (6.43)	-3.22	.001
Sensation seeking	34.08 (5.97)	36.86 (6.46)	-3.24	.001
Lack of planning	21.22 (4.80)	23.46 (4.79)	-3.41	.001
Lack of perseverance	18.78 (4.46)	20.25 (4.61)	-2.36	.019
				.32

Table 3

Multiple logistic regression with all impulsivity-like traits entered together predicting smoker status controlling for age and gender.

	B	SE	Odds ratio	95% CI
Step 1				
Age	.17	.12	1.19	.95–1.49
Gender	.15	.27	1.16	.68–1.97
Step 2				
Positive urgency	.02	.02	1.18	.82–1.69
Negative urgency	.03	.03	1.23	.86–1.75
Sensation seeking	.07	.03	1.51 ^a	1.09–2.08
Lack of planning	.06	.04	1.36	.94–1.97
Lack of perseverance	.03	.05	1.15	.77–1.70

^a
 $p < .05$.

Table 4

Multiple regression analyses with all impulsivity-like trait entered together predicting nicotine dependence controlling for age and gender.

	<i>B</i>	<i>SE</i>	β
Step 1			
Age	-.01	.04	-.03
Gender	-.14	.11	-.11
Step 2			
Positive urgency	.03	.01	.29 ^a
Negative urgency	-.00	.01	-.03
Sensation seeking	-.01	.01	-.06
Lack of planning	-.01	.02	-.06
Lack of perseverance	.01	.02	.05

^a $p < .01$.