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Relative Effects of Social Self-Control, Sensation Seeking, and Impulsivity on Future Cigarette Use in a Sample of High-Risk Adolescents

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Abstract

We used confirmatory factor analysis to compare convergence/divergence across self-report measures of social self-control, sensation seeking, and impulsivity in a sample of high-risk adolescents. In addition, we tested baseline social self-control as a predictor of cigarette use one year later, controlling for baseline cigarette use, impulsivity/sensation seeking, and demographic. variables. Data were collected in 2004–2005 from 821 adolescents (*M* age = 16.3; SD = 1.36) enrolled in 14 continuation high schools in Southern California. Of the baseline sample, 566 students participated in a follow-up survey one year later. Results indicated that social self-control represents a unique dimension of self-control and is a salient predictor of future cigarette use.

Keywords

Social self-control; adolescents; cigarette use

Introduction

Although data show that cigarette use has continued to decline among U.S. adolescents attending regular high schools (Johnston, O'Malley, Bachman, and Schulenburg, 2011), it is unclear whether the changes are similar among adolescents who drop out or do not attend regular high schools. Students who drop out of regular high schools or attend alternative high schools are at higher risk for substance use, including cigarette use (Glynn, Anderson, & Schwarz, 1991; Grunbaum, Lowry, & Kahn, 2001; Sussman, Dent, & Stacy, 2002). Understanding behavioral risk and protective factors among these high-risk youths is crucial to developing targeted prevention programs. High-risk youths are prone to manifesting disinhibited behavior (Sussman & Ames, 2008; Jessor & Jessor, 1977), which has been

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linked with substance use (Schepis & Rao, 2005; Tarter et al., 2003). In the present study, we examined the construct of social self-control in relation to cigarette use among continuation (alternative) high school (CHS) students. Students in California are likely to attend CHSs because of their inability to continue in mainstream high schools for various reasons such as problem behavior (e.g., substance use, delinquency), unplanned pregnancy, or employment (Sussman et al., 2002). Previous research indicates that the prevalence of past-30-day cigarette, alcohol, and marijuana use among CHS students are almost twice as high compared to the regular high school students (Sussman et al., 2002). The type of high-risk youths that can be accessed in CHS setting cannot be accessed easily anywhere else.

Social Self-Control and Adolescent Substance Use

The social dimension of poor self-control or behavioral disinhibition has been understudied. An individual's lack of social self-control is reflected in the improper and uncontrolled way he or she behaves in social situations. The Social Self-Control Scale (SSCS) consists of 10 Likert-type items that purport to measure adolescents' self-control in general social situations. The scale originated from a previous program development work related to adolescent substance abuse prevention (Sussman, McCuller, & Dent, 2003). The 10 items are expected to tap tendencies that favor immediate gratification of urges at the cost of possible social alienation such as speaking one's mind without thinking or getting into arguments frequently (e.g., “I enjoy arguing with people”; “If I think something someone says is stupid I tell them so”; Sussman et al., 2003). Social self-control is likely to influence the quality of adolescents' social interactions. In general, having higher self-control is likely to help adolescents learn and perform prosocial behaviors, whereas lack of self-control may expose them to higher levels of social conflicts and encourage them to affiliate with deviant peers (Wills, Sandy, & Yaeger, 2000; Wills & Filer, 1996).

Sussman et al. (2003) examined the cross-sectional association of social self-control with adolescent substance use, controlling for 12 personality disorder indices (assessed from subscales of the Personality Diagnostic Questionnaire (PDQ; e.g., Hyler, 1996): paranoid, schizoid, schizotypal, histrionic, narcissistic, borderline, antisocial, avoidant, dependent, obsessive–compulsive, and negativistic), and four demographic variables (White ethnicity, Latin ethnicity, socioeconomic status, and male gender) in a CHS sample of adolescents. The study found that lower social self-control, male gender, and antisocial personality were significantly associated with substance use, including past-30-day cigarette smoking (Sussman et al., 2003). This study suggested that social self-control may be a unique predictor of substance use among CHS youth and may represent a construct that is more than an expression of problem personality (Sussman et al., 2003).

Another study (Pokhrel, Sussman, Rohrbach, & Sun, 2007) found a longitudinal relationship between social self-control and adolescent substance use. A causal relationship between social self-control and adolescent substance use is plausible. Wills and colleagues (Wills, Sandy, Yaeger, Cleary, & Shinar, 2001; Wills, Resko, Ainette, & Mendoza, 2004) have found that adolescents who show poorer self-control tend to experience higher levels of negative life events and may associate with deviant, possibly substance-using peers because

adolescents who become alienated or deviant in reaction to negative life events are likely to identify with each other.

Currently, it is not well understood how social self-control relates to other indicators of generalized self-control. In particular, it is not clear whether lack of social self-control is distinct from other self-control related constructs such as impulsivity and sensation seeking. For example, lack of social self-control may merely represent an individuals' general inability to delay gratification. Further, it is not known how well does social self-control explain the variance in future substance use among adolescents relative to impulsivity or sensation seeking. So far only one study (Pokhrel et al., 2010), which was cross-sectional and included the subsamples of U.S. and Russian youths, has tested the effects of social self-control on adolescent cigarette and other substance use relative to sensation seeking. The study (Pokhrel et al., 2010) found both social self-control and sensation seeking to be uniquely correlated with cigarette use in the U.S. subsample.

Sensation Seeking, Impulsivity, and Adolescent Substance Use

Research suggests that there are several impulsivity-like constructs (Whiteside & Lynam, 2001; Dawe, Gullo, & Loxton, 2004; Reynolds, Ortengren, Richards, & De Wit, 2006). For example, using factor analytic technique on multiple measures of impulsivity, Whiteside & Lynam (2001) derived a four-factor scale of impulsivity representing urgency, (lack of) premeditation, (lack of) perseverance, and sensation seeking. Although a consensus regarding the specific number of impulsivity factors seems to be lacking, the proposition that sensation seeking and impulsivity are related, but distinct constructs has been generally accepted (e.g., Steinberg et al., 2008; Schepis et al., 2008; Magid, MacLean, & Colder, 2007). Impulsivity may be defined as the inability to inhibit behavior (e.g., Milich & Kramer, 1982); tendency to act before thinking or act without plan or foresight (e.g., Eysenck & Eysenck, 1977; Schalling, 1978); inability to control temptations or urges (e.g., Gordon, 1979); and the tendency to act in situations where inhibition of such actions would provide benefit (Martin et al., 1994). Sensation seeking has been defined as the tendency to seek varied, novel, and stimulating experiences or to take risks to undergo such experiences (Zuckerman, 1979).

Both impulsivity and sensation seeking have been linked with higher levels of adolescent cigarette use (e.g., Brook, Whitman, & Gordon, 1981; Burt, Dinh, Peterson, & Sarason, 2000; Fields, Collins, Leraas, & Reynolds, 2009). The association between higher impulsivity, sensation seeking, and higher cigarette and other substance use may be understood in terms of some of the recently advanced dual-process theories of risky behavioral choices (e.g., Bechara, 2005; Steinberg et al., 2008); according to which, a risky behavior such as substance use is determined based on the interaction between the prefrontal cortical system in the brain, which is responsible for impulse control, and the limbic system, which is responsible for reward seeking behavior. Poor decision-making is likely to occur when the higher order cognitive system fails to avert a risky behavioral choice by exerting control over the drive for immediate gratification (Bechara, 2005). Higher impulsivity is likely to indicate deficiencies in executive functions (Fuster, 2008), whereas higher sensation seeking is likely to represent a higher reward-seeking tendency (Bardo et al., 1996).

Adolescents higher in sensation seeking are more likely to use cigarettes for motives such as socio-emotional enhancement or physiological stimulation (Zuckerman, Ball, & Black, 1990). Impulsive adolescents are more likely to smoke cigarettes because of their limited ability to appraise risks and benefits or due to poor decision making skills and greater delay discounting tendencies (Reynolds et al., 2006).

The Present Study

In this study, we test the hypotheses that (1) social self-control represents a unique construct compared to the constructs of impulsivity and sensation seeking; and that (2) social self-control is a unique predictor of future cigarette use among high-risk adolescents. The first hypothesis is tested using confirmatory factor analysis (CFA). We use chi-square difference testing of nested models to test whether the items hypothesized to measure social self-control converge on the same latent factor and discriminate from the items purported to measure impulsivity and sensation seeking. That is, a single factor model representing all social self-control and sensation seeking or impulsivity items is compared for better fit against a two-factor model representing separate factors for social self-control and sensation seeking or impulsivity. The second hypothesis is tested using multi-level multiple logistic regression. We test the effects of baseline social self-control on cigarette use (past 30-day use) one year later, adjusting for baseline cigarette use, sensation seeking/impulsivity, and demographic variables (age, gender, ethnicity, parental education).

Method

This study is based on the participants of a trial of Project Toward No Drug Abuse (TND), a nationally recognized evidence-based substance use prevention program that targets high school-aged youth (Sussman, Dent, & Stacy, 2002). The trial is described in detail elsewhere (Valente, Ritt-Olson, Stacy, Unger, Okamoto, & Sussman, 2007). Briefly, the primary aim of the study was to examine whether tailoring Project TND based on students' social network information enhanced the preventive effect of the program on substance use among CHS students. The trial involved three arms: TND plus Network, TND only, and standard care control. The present sample represented students from all three arms.

Subjects and Procedures

Data were collected at three time points: at baseline (pretest), post-test (immediately following the program implementation), and at one-year follow-up (i.e., approximately a year following the post-test). Initially, 25 CHS districts in Southern California were invited to participate in the study, of which 10 school districts refused to participate citing administrative concerns and 7 were excluded for reasons such as small classroom size. Of the eight districts that agreed to participate in the study, one was selected for the pilot study. Across the 14 schools from the seven districts that participated in the study, the participation rate was 65.6%. The baseline data were collected from 894 students. Trained data-collectors administered the self-report questionnaires in the classroom at baseline. The survey questionnaire was designed so as not to take more than one class period (about 45 min) to complete. The study followed the informed consent protocol approved by the university's Institution Review Board (IRB). To participate in the study, minor subjects were required to

have parental consent. Student assent was required for all students, including minors. Students were explained that they could choose to discontinue participation at any time.

Of the 894 students who completed the baseline survey, 821 provided complete data on the variables included in the present study at baseline and 566 participated in the follow-up survey one year later and provided complete data. That is, about 69% of the baseline subjects were retained at follow-up, which is a reasonable attrition rate for CHS students (Sussman et al., 2002). Descriptive statistics pertaining to the study variables at baseline are presented in Table 1 for the longitudinal sample ($N = 566$).

Attrition Analyses

Single sample *t*-tests and chi-square tests for specified proportions were conducted for all variables examined in the present study comparing the total longitudinal sample with the total baseline sample on the baseline data. No statistically significant differences were detected between the samples on age [$t(566) = -0.96$, $p = .34$], gender [χ^2 (1, $N = 566$) = 0.04, $p = .84$], ethnicity [χ^2 (1, $N = 566$) = 0.36, $p = .55$], parental education [χ^2 (1, $N = 566$) = 1.66, $p = .89$], cigarette use [χ^2 (1, $N = 552$), social self-control [$t(566) = -0.38$, $p = .70$], sensation seeking [$t(566) = -0.89$, $p = .38$], and impulsivity [$t(566) = -0.42$, $p = .67$]. Hence, it may be concluded that the total sample size at follow-up was comparable to a random sub-sample of the baseline subjects.

Measures

Demographics—Demographics were assessed using an ethnic indicator (e.g., six response options, including an open-ended “Other” option), gender, and parental education indicators. The highest educational level reached across father/step-father or mother/step-mother was measured using a six-point scale, ranging from not completed elementary school to completed graduate school (see Table 1; Hollingshead & Redlich, 1958).

Social Self-Control—Social self-control was assessed using the 10 items from Sussman et al. (2003). Example items include: “I enjoy arguing with people.” Responses were measured on a four-point scale: (1) always to (4) never. Final set of items used to create the social self-control index was determined based on CFA results (see below).

Sensation Seeking and Impulsivity—Sensation seeking and impulsivity were assessed using the Zuckerman–Kuhlman Personality Questionnaire (Zuckerman, Kuhlman, Thornquist, & Kiers, 1991). The 8 impulsivity items and the 11 sensation-seeking items were distinguished based on past research (e.g., Ames, Zogg, & Stacy, 2002). Examples of the impulsivity items include: “I tend to begin a new job without much advance planning on how I will do it,” and “I often do things on impulse”. The sensation-seeking items involved general novelty-seeking/ risk-taking tendencies. Examples of the sensation-seeking items include: “I like to have new and exciting experiences and sensations even if they are a little frightening,” and “I like doing things just for the thrill of it.” For both sets of items, participants were asked to respond true (1) or false (2) to statements that they might use to describe themselves. Final sets of items used to create impulsivity and sensation-seeking indices were based on CFA results.

Cigarette Use—Cigarette use was assessed based on self-report of past 30-day cigarette use frequency. Participants were asked how many times they have used cigarette in the last month. The response choices ranged between “1” or “never used” to “11” or “91–100+ times” in intervals of 10 (e.g., “1–10 times”, “11–20 times”). The reliability and predictive validity of this type of items have been previously established (Graham et al., 1984). For analysis purposes, the cigarette use variable was dichotomized as use or nonuse since both baseline and follow-up cigarette use prevalence were skewed toward nonuse.

Analysis

Confirmatory Factor Analysis—CFA was conducted using Mplus Version 5.1 (Muthen & Muthen, 2008) on baseline data ($N = 821$). We carried out chi-square difference testing of nested model comparisons. First, we compared the one factor model of Zuckerman's impulsive sensation seeking scale against the two factor models of impulsivity and sensation seeking. In the two-factor model, the 8 items considered to measure impulsivity and the 11 items considered to measure sensation seeking were specified to load on separate “impulsivity” and “sensation-seeking” factors. Second, we compared the one factor model of sensation seeking and social self-control items (i.e., one factor representing all sensation seeking and social self-control items) against the two-factor model where the social self-control and sensation seeking items were specified to load on their respective factors. Third, we compared the one-factor model of impulsivity and social self-control items against the two-factor model where the items of social self-control and impulsivity were specified to load on their respective factors.

All items involved in the CFA were treated as categorical indicators as the sensation seeking and impulsivity items were measured on a dichotomous scale. Hence, the CFA models were estimated using the weighted least squares means and variance (WLSMV) adjusted estimator which allows for the modeling of ordered categorical variables. The content validity of social self-control, impulsivity, and sensation-seeking items were determined based on their standardized loadings on the hypothesized factors. Items showing standardized factor loadings of greater than 0.40 were considered salient (Brown, 2006). Thus, indices for social self-control, impulsivity, and sensation seeking used in the analysis (including the descriptive statistics) were created by summing up the items that showed standardized factor loadings of over 0.40 (Brown, 2006). Scale reliability was determined based on the internal consistency of corresponding items. Because of the categorical (ordinal) nature of the items, internal consistency was determined using ordinal reliability coefficient (Gadermann, Guhn, & Zumbo, 2012), which is based on polychoric correlation matrix (Zumbo, Gadermann, & Zeisser, 2007), rather than Cronbach's alpha, which is based on Pearson correlation matrix. Ordinal reliability coeffcients were computed using methods described and utilized in previous studies (Gugui, Coryn, Clark, & Kuehn, 2009; Gadermann et al., 2012).

Regression Analysis—PROC GLIMMIX (SAS, Version 9.1) was used to examine the effects of baseline social self-control, impulsivity, and sensation seeking on follow-up cigarette use. Since our subjects were nested within schools, this multilevel analytical approach was taken in order to account for the potentially high intraclass correlations

(Littell, Stroup, & Freund, 2002). Five regression models were run with past-30-day cigarette use as the criterion variable; first without adjusting for baseline cigarette use and then adjusting for baseline cigarette use. Model 1, 2, and 3 tested the effects of baseline social self-control, sensation seeking, and impulsivity separately on follow-up cigarette use, controlling for demographic variables. Model 4 tested for the independent effect of baseline social self-control on cigarette use one year later, after including sensation seeking in the model along with demographic variables. Model 5 tested for the independent effect of baseline social self-control on cigarette use one year later, after including impulsivity in the model along with demographic variables. Since the current sample participated in an intervention study, all regression models controlled for potential program effect. In addition, all continuous independent variables were standardized before regression in order to make the interpretations of results easier.

Results

Descriptive statistics of social self-control, sensation seeking, impulsivity, and cigarette use are presented in Table 1. Table 2 shows the zero-order correlations between key study variables. As expected social self-control, impulsivity, and sensation seeking showed relatively higher correlations as did baseline and follow-up cigarette use and Latino ethnicity and lower parental education. At baseline, the correlation between sensation seeking and cigarette use was stronger than the correlations of social self-control and impulsivity with cigarette use.

The two-factor model of impulsive sensation seeking scale with correlated latent constructs for impulsivity and sensation seeking showed a significantly better fit to the data than the one factor model ($\Delta \chi^2 = 54$; $\Delta df = 1$; $p < .001$). When the items with standardized factor loadings less than 0.40 were excluded from the two-factor model, the resulting goodness-of-fit statistics were as follows: $\chi^2 = 189.3$, $df = 76$; CFI = 0.96; and RMSEA = 0.04 (90% CI = 0.035, 0.050).

The CFA on the 10 social self-control items showed a poor fit: $\chi^2 = 386.4$, $df = 27$; CFI = 0.82; and RMSEA = 0.13. Subsequently, items with standardized factor loadings less than 0.40 were excluded from the model. The two dropped items included the following: “My feelings get hurt easily” and “I express all my feelings.” The resulting model showed a good fit to the data: $\chi^2 = 191.5$, $df = 17$; CFI = 0.96; and RMSEA = 0.08. The standardized factor loadings for the remaining eight-item model are shown in Table 3. Nested model comparison for social self-control and sensation seeking suggested that the two-factor model of social self-control and sensation seeking fitted significantly better to the data than the single-factor model ($\Delta \chi^2 = 82.3$; $\Delta df = 1$; $p < .0001$). The two-factor model of social self-control and sensation seeking showed a reasonable fit to the data: $\chi^2 = 296.8$, $df = 118$; CFI = 0.96; and RMSEA = 0.043 (90% CI = 0.037, 0.049). Similarly, nested model comparison for social self-control and impulsivity suggested that the two-factor model of social self-control and sensation seeking fitted significantly better to the data than the single-factor model ($\Delta \chi^2 = 45.0$; $\Delta df = 1$; $p < .0001$). The two-factor model of social self-control and impulsivity showed a good fit to the data: $\chi^2 = 288.4$, $df = 64$; CFI = 0.94; and RMSEA = 0.065 (90% CI = 0.058, 0.073). Table 3 shows the standardized factor loadings of social self-control,

impulsivity, and sensation seeking items on their respective factors. The three-factor model of social self-control, impulsivity, and sensation seeking showed a good fit to the data, χ^2 = 490.2, *df* = 206; CFI = 0.95; and RMSEA = 0.041 (90% CI = 0.036, 0.046). The coefficients for correlations between social self-control and impulsivity, between social self-control and sensation seeking, and between sensation seeking and impulsivity were −0.56, −0.43, and 0.70, respectively.

Tables 4 and 5 show the results of the regression analyses. Higher social self-control at baseline was a significant predictor of lower cigarette use one year later, even after adjusting for sensation seeking or impulsivity and baseline cigarette use. After adjusting for the effects of sensation seeking/impulsivity, baseline cigarette use, and demographic variables (age, gender, ethnicity, and parental education), youths with one standard deviation higher social self-control at baseline were about 0.80 times less likely to have smoked cigarette in the past 30 days one year later (see Table 5). Without controlling for baseline cigarette use, baseline sensation seeking was a significant predictor of follow-up cigarette use, before or after controlling for baseline social self-control (see Table 4). Without controlling for baseline cigarette use, the association between baseline impulsivity and follow-up cigarette use was marginal; however, this effect was nonsignificant after including social self-control in the model (see Table 4). After controlling for baseline cigarette use, neither sensation seeking nor impulsivity significantly predicted future cigarette use with or without controlling for baseline social self-control (see Table 5).

Discussion

This study used CFA to distinguish the social self-control constructs from the constructs of sensation seeking and impulsivity. In addition, we examined whether baseline social self-control explained a significant variance in future cigarette use after accounting for the effects of sensation-seeking/impulsivity, baseline cigarette use, and four demographic variables: age, gender, parents' education, and ethnicity. Our results suggested that social self-control is a unique construct that is correlated negatively with sensation seeking and impulsivity but does not overlap with either construct. Eight out of the 10 social self-control items indicated a single-factor social self-control construct with factor loadings of adequate strength. The two items that showed poor factor loadings which were subsequently dropped from the analysis were related to poor emotional regulation.

One way to conceptualize social self-control is as self-control practiced in interpersonal interaction, especially communication. Thus, future research may need to examine social self-control in relation to some of the variables that been studied in communication research such as argumentativeness and talkativeness. For example, individuals lacking social self-control may be prone to compulsive communication (McCroskey & Richmond, 1993), verbal aggression (Infante & Wigley, 1986), and proactive argumentativeness (Infante & Rancer, 1982): attributes which are likely to make them less prosocial. This type of integration is important because a relationship between communication skills and self-control may have important implications for prevention programming. That is, developing prosocial communication skills early on in childhood or adolescence may protect individuals from cigarette and other substance use later.

In the present study, we found social self-control at baseline to be more strongly correlated with later cigarette use compared with concurrent use. On the other hand, both sensation seeking and impulsivity were found to be more strongly correlated with concurrent cigarette use. In fact, sensation seeking significantly predicted future cigarette use when baseline cigarette use was not included in the model. There was, however, no independent effect of sensation seeking or impulsivity on future cigarette use after controlling for baseline cigarette use.

Longitudinal studies have not always found a strong effect of sensation seeking on later cigarette use among adolescents, after accounting for baseline level of cigarette use (e.g., Crawford, Pentz, Chou, Li, & Dwyer, 2003; Teichman, Barnea, & Ravav, 1989). It is possible that developmentally sensation seeking or impulsivity is associated with initiation or maintenance of adolescent cigarette use rather than increase in substance use over time, beyond the past level of use (Teichman et al., 1989). On the other hand, our results suggest that poor social self-control may result in higher cigarette use over time. Future studies need to examine the mediators of the effects of social self-control on adolescent substance use. The proposition that adolescents lacking social self-control are more likely to affiliate with deviant peer and therefore, are more likely to smoke cigarettes is plausible and needs to be tested.

Based on our findings, it appears that prevention programming may benefit from considering social self-control as an intervention component. Traditionally, social skills training in adolescent substance use has focused more on enhancing assertiveness than affect orientation or emotional regulation (Pentz, 1983; Botvin & Wills, 1985). Providing high-risk adolescents social self-control skills training earlier in the developmental process may protect them from future cigarette use. Clearly, further research is required to identify the type of intervention modality through which social self-control training could be best delivered to high-risk youths.

Limitations

There are several limitations of this study, including the lack of overt behavioral measures of self-control variables. Although we tested all the relevant variables for indications of a bias due to attrition, we did not test several others that were not measured in the study. For example, indicators of SES other than parental education, such as parental income and number of persons living in a house, were not measured in the study. In addition, our data may not generalize to all Los Angeles area CHS. Although students were randomly selected at the classroom level, some selection bias might have been introduced to the data at the level of school, which was based on convenience sampling. Nevertheless, the findings clearly support the distinctiveness of the social self-control scale and its prospective effects on drug use, even after adjusting for previous use and other potential confounders.

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Glossary

High risk youth	In the present context, high risk youth refers to adolescents who are at high risk for engaging in deviant behaviors such as substance use and misuse.
Impulsivity	Inability to inhibit behavior or tendency to act before thinking.
Sensation seeking	Tendency to seek novel or thrilling experiences.
Social self-control	Self-control in social situations or interpersonal interactions

Biographies

Pallav Pokhrel, PhD, MPH, is an assistant professor at the Cancer Prevention and Control Program, University of Hawaii Cancer Center. He received his PhD in Preventive Medicine (Health Behavior Research) from Keck School of Medicine, University of Southern California. His research focuses on understanding the risk and protective factors of tobacco and other substance use in the domains of culture and self-regulation. His research seeks to determine the aspects of self-regulation that can be modified to result in behavior change and utilize the knowledge to develop prevention and treatment strategies that are culturally relevant.

Steve Sussman, PhD, FAAHB, FAPA, received his doctorate in social-clinical psychology from the University of Illinois at Chicago in 1984. He is a professor of preventive medicine and psychology at the University of Southern California. He studies etiology, prevention, and cessation within the addictions arena, broadly defined. He has over 420 publications. His programs include Project Towards No Tobacco Use, Project Towards No Drug Abuse, and Project EX, which are considered model programs at numerous agencies (i.e., CDC, NIDA, NCI, OJJDP, SAMSHA, CSAP, Colorado and Maryland Blueprints, Health Canada, U.S. DOE). He received the honors of Research Laureate for the American Academy of Health Behavior, and Fellow of the American Psychological Association (Division 50, Addictions). He is the current Editor of *Evaluation & the Health Professions* (SAGE Publications).

Alan Stacy (PhD, University of California, Riverside, 1986) is Professor at the School of Community and Global Health, Claremont Graduate University. Most of his current work applies findings from basic research on cognitive neuroscience and memory to health behavior theory and intervention, including research on alcohol, tobacco, methamphetamine, and other drug use, HIV risk behavior, and dietary habits. He also applies the approach to the study of media effects and collaborates on neural imaging studies on health habits.

Table 1

Analysis sample descriptive statistics (*N* = 566)

	M (%)	SD	Range
Age	16.26	1.36	12–19
Female	40%		
Ethnicity			1–6
African-American	5.9%		
Asian	1.7%		
Hispanic/Latin	70.2%		
American Indian	1.1%		
Non-Hispanic White	12.6%		
Other	8.6%		
Parental education			1–6
Below elementary school	10.4%		
Below high school	42.4%		
Completed high school	15.6%		
Some college	16.9%		
Completed college	10.3%		
Completed graduate school	4.4%		
Baseline past-30-day cigarette use	40.6%		0–1
Follow-up past-30-day cigarette use	37.7%		0–1
Social self-control	22.58	4.74	8–32
Sensation seeking	14.52	2.35	9–18
Impulsivity	7.18	1.45	5–10

Table 2

Correlations between study variables (*N* = 566)

	Social self-control	Impulsivity	Sensation seeking	Parental Education	Age	Female	Latino	Baseline Cigarette use
Impulsivity	−0.35 **							
Sensation seeking	−0.25 **	0.45 **						
Parental education	−0.13 **	0.008	0.052					
Age	0.16 **	−0.036	0.016	0.007				
Female	−0.08 *	0.024	−0.016	−0.037	−0.049			
Latino	0.13 **	−0.039	−0.03	−0.42 **	0.005	0.014		
Baseline cigarette use	−0.10 **	0.10 **	0.21 **	0.13 **	0.017	−0.0003	−0.11 **	
Follow-up cigarette use	−0.15 **	0.065 **	0.13 **	0.16 **	0.019	−0.019	−0.14 **	0.38 **

Note.

* $p \leq .05$;

** $p \leq .01$.

Table 3

Final set of social self-control, sensation seeking, and impulsivity items and their standardized factor loadings (*N* = 821)

Scale Items	Standardized factor loadings
Social self-control (reliability coefficient = 0.84)	
I enjoy arguing with people	0.62
If I think something someone says is stupid, I tell them so	0.54
If I am angry, I act like it	0.63
My mouth gets me in trouble a lot	0.76
I do things just to get attention	0.68
Sometimes I provoke people just for the fun of it	0.79
I hate being wrong	0.52
I say things I regret later	0.56
Impulsivity (reliability coefficient = 0.70)	
I usually think about what I am going to do before doing it	0.48
I often do things on impulse	0.61
I tend to change interests frequently	0.46
I often get so carried away by new and exciting things and ideas that I never think of possible complications	0.68
I am an impulsive person	0.76
Sensation seeking (reliability coefficient = 0.84)	
I like to have new and exciting experiences and sensations even if they are a little frightening	0.69
I would like to take off on a trip with no preplanned or definite routes or timetable	0.45
I enjoy getting into new situations where you can't predict how things will turn out	0.61
I like doing things just for the thrill of it	0.79
I sometimes like to do things that are a little frightening	0.72
I will try anything once	0.54
I sometimes do “crazy” things just for fun	0.73
I prefer friends who are excitingly unpredictable	0.59
I like “wild” uninhibited parties	0.64

Table 4

One-year prediction of cigarette use from baseline social self-control, impulsivity, and sensation seeking without controlling for baseline cigarette use (*N* = 566)

	Past 30-day cigarette use	
	Odds ratio	**95% confidence interval**
Model 1		
Social self-control	0.78**	0.65, 0.93
Model 2		
Sensation seeking	1.32**	1.10, 1.60
Model 3		
Impulsivity	1.15†	0.97, 1.37
Model 4		
Social self-control	0.82*	0.68, 0.99
Sensation seeking	1.25*	1.03, 1.52
Model 5		
Social self-control	0.81*	0.67, 0.98
Impulsivity	1.07	0.88, 1.30

Note. All models controlled for age, gender, ethnicity, parental education, and treatment condition.

† $p < .1$,

* $p < .05$,

** $p < .01$ (two-tailed).

Table 5

One-year prediction of cigarette use from baseline social self-control, impulsivity, and sensation seeking after controlling for baseline cigarette use (*N* = 566)

	Past 30-day cigarette use	
	Odds ratio	**95% confidence interval**
Model 1		
Social self-control	0.80 *	0.66, 0.97
Model 2		
Sensation seeking	1.14	0.94, 1.38
Model 3		
Impulsivity	1.07	0.89, 1.28
Model 4		
Social self-control	0.81 *	0.66, 0.99
Sensation seeking	1.08	0.88, 1.31
Model 5		
Social self-control	0.80 *	0.65, 0.97
Impulsivity	0.99	0.81, 1.19

Note. All models controlled for baseline cigarette use, age, gender, ethnicity, parental education, and treatment condition.

* $p < .05$ (two-tailed).