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Young Adult Smoking: What factors differentiate ex-smokers, smoking cessation treatment seekers and nontreatment seekers?

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Abstract

The present study investigated demographic and psychosocial correlates of smoking status and predictors of smoking cessation among young adults, ages 18–30 years old. Young adults (n=294) completed a self-report survey regarding their health habits and smokers were offered the opportunity to enroll in a smoking cessation program. Substitute reinforcers were greater among ex-smokers compared to nontreatment seeking smokers, treatment seeking smokers who did participate in a smoking cessation program and treatment seeking smokers who did not subsequently participate in a smoking cessation program. Greater complementary reinforcers and delay discounting rates differentiated nontreatment seeking smokers from ex-smokers and treatment seeking smokers who subsequently attended a smoking cessation program. Nontreatment seekers were less likely to have higher depression symptoms than ex-smokers. Treatment seekers who did not attend a smoking cessation program tended to live in a household with another smoker, to not be college educated, and to be non-white. Young adult smokers who increased their substitute reinforcers across treatment were almost two times more likely to be quit at treatment end. These results highlight variables that may be important to consider in recruitment strategies and treatment components for smoking cessation interventions for young adult smokers.

Keywords

Smoking; Young Adults; Depression; Reinforcers; Delay Discounting

1. Introduction

Over 26% of young adults smoke in the United States, which is the highest smoking prevalence of any adult age group (CDC, 2006). Young adults are less likely to succeed at quitting smoking compared to older adults even though they are more likely to attempt to quit (Curry, Sporer, Pugach, Campbell, & Emery, 2007; Rigotti, Lee, & Wechsler, 2000; Solberg, Asche, Boyle, McCarty, & Thoele, 2007). Investigation of the factors that are associated with smoking

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practices in young adulthood may help inform smoking cessation interventions that specifically target this age group (Lantz, 2003). However, we are only beginning to understand factors that influence young adult smoking and decisions surrounding smoking cessation (Backinger, Fagan, Matthews, & Grana, 2003; Husten, 2007).

One theoretical model that can be used to conceptualize the factors that influence young adult smoking behavior is Behavioral Economic Theory. Behavioral Economic Theory suggests that the choice of one rewarding behavior, such as smoking, depends in part on access to and availability of alternate reinforcers and that the reinforcing value of one behavior, can be enhanced, or reduced, based on the alternatives (Green & Freed, 1993). Substitute alternative reinforcers are used instead of cigarettes (e.g., hobbies, sports) and have been shown to reduce the likelihood of smoking uptake (Audrain-McGovern et al., 2004). Although not yet investigated, greater substitute reinforcers for smoking may also differentiate young adult smokers who are and who are not interested in quitting smoking and those who successfully quit. In contrast, complementary reinforcers are used in conjunction with cigarettes (e.g., alcohol, coffee) and have been shown to increase the odds of progression along the smoking uptake continuum (Audrain-McGovern et al., 2004). Higher levels of complementary reinforcers to smoking may decrease a young adult smoker's interest in quitting, promote ambivalence about quitting or have a negative impact on a quit attempt. Alternative sources of reward have been shown to be important to substance use in young adults (Correia, Simons, Carey, & Borsari, 1998). For example, cocaine abuse tends to be associated with a low frequency of substitute reinforcers and cocaine abstinence tends to be associated with a higher frequency of substitute alternative reinforcers (Van Etten, Higgins, Budney, & Badger, 1998).

The evidence to date suggests that depression may be an important factor in young adult smoking. Young adults with a history of major depression are two to three times more likely to become daily smokers and to become nicotine dependent compared to nondepressed young adults (Breslau, Kilbey, & Andreski, 1993; Breslau, Peterson, Schultz, Chilcoat, & Andreski, 1998). About one-third of young adults in college report smoking to manage depression symptoms (DeBernardo et al., 1999). Depression has been linked to fewer alternative sources of reward and to a higher reward value for smoking compared to other reinforcers (Lewinsohn & Amenson, 1978; MacPhillamy & Lewinsohn, 1974; Perkins, Hickcox, & Grobe, 2000; Spring, Pingitore, & McChargue, 2003). In addition, individuals with a history of depression are less likely to quit smoking in young adulthood compared to those without a history of depression (Rohde, Kahler, Lewinsohn, & Brown, 2004).

Likewise, delay discounting, which is the process whereby the value of a reward is discounted as a function of delay to its delivery (Madden, 2000) and is characterized by the tendency to choose reward immediacy over reward magnitude (Monterosso & Ainslie, 1999) may play a role in young adult smoking behavior. Ex-smokers and nonsmokers tend to discount future reinforcers less than current smokers (Bickel, Odum, & Madden, 1999). Smokers with a lower degree of discounting may be more able to commit and adhere to a smoking cessation plan, quit smoking and successfully become an ex-smoker as the future health and economic benefits of smoking cessation are not undervalued.

The purpose of this study was to evaluate (1) whether substitute reinforcers to smoking, complementary reinforcers to smoking, depression, and delay discounting differentiated four groups of young adults including ex-smokers, smoking cessation treatment seekers who did and who did not participate in a formal smoking cessation program, and current smokers not interested in quitting smoking (nontreatment seekers) and (2) whether these variables predicted smoking status at the end-of-treatment for those smokers who enrolled in and attended a smoking cessation program. We hypothesized that higher levels of substitute reinforcers, and

lower levels of complementary reinforcers and depression symptoms would differentiate ex-smokers and treatment seekers who did participate in smoking cessation treatment from those treatment seekers who did not attend treatment and nontreatment seekers. We expected lower levels of delay discounting would differentiate ex-smokers and treatment seekers from treatment seekers who did not attend treatment and nontreatment seekers. In addition, we expected higher levels of substitute reinforcers and lower levels of complementary reinforcers, delay discounting, and depression to predict smoking cessation at end-of-treatment.

2. Method

2.1. Participants and procedures

A sample of young adults 18–30 years old was recruited from the community via general print advertisements (e.g., local and college newspaper and bulletin ads) for a self-report survey of the health habits of young people. Four-hundred and forty-two individuals responded to the advertisements. About 95% of eligible respondents completed the survey. Forty-two individuals were ineligible due to age (> 30 years old) and 20 young adults declined to complete the survey due to length (i.e., about 20 minutes to complete). Respondents who completed the survey were given a \$10 American Express gift certificate. Young adults who completed the survey included ex-smokers (n=62), current smokers (n=232), and young adults who never smoked regularly (n=128).

Smokers who completed the survey and were interested in quitting smoking (172 of 232 smokers) were referred to a free smoking cessation program for young adult smokers. Current smokers who were interested in quitting were randomized (computer generated without replacement) to one of two behavioral treatment groups, standard cognitive-behavioral smoking cessation counseling (SCC) or SCC plus alternative reinforcers (SCC + AR). The SCC control intervention focused on identifying smoking triggers, strategies to manage triggers, developing a relapse prevention plan and stress management (Fiore et al., 2000; Marlatt & Gordon, 1985). The SCC + AR, a behavioral economic informed intervention included the standard smoking cessation counseling as well as components that focused on helping the young adult smokers identify, access, and engage in alternative substitute reinforcers to smoking regularly (Higgins, Bickel, & Hughes, 1994; Higgins, Budney et al., 1994; Smith & Meyers, 2001; Smith, Meyers, & Miller, 2001; Tucker, 2001; Vuchinich & Tucker, 1996). The SCC+AR intervention was based on the premise that environmental contingencies play a powerful role in promoting smoking cessation and preventing smoking relapse. Both smoking and nonsmoking behaviors were a focal point. As such, alternative reinforcers (not just alternative behaviors) were emphasized in the quitting and maintenance process. The goal was to make a nonsmoking lifestyle more rewarding than a lifestyle involving cigarette smoking. Both the SCC and the SCC+AR treatments involved six in-person, one-on-one smoking cessation counseling session that spanned seven weeks. Session three was the planned target quit date for all participants. Participants completed an end of treatment survey at week 7. Abstinence (7-day point prevalence) was determined by self-report, and confirmed by saliva cotinine (< 15 ng/ml) (Benowitz et al., 2002; Patrick et al., 1994; Velicer, Prochaska, Rossi, & Snow, 1992).

The sample in the present analyses included young adults who were ex-smokers (n=62), current smokers not interested in quitting (nontreatment seekers; n=60), current smokers interested in quitting who did subsequently attended a 6-session smoking cessation program (“smoking cessation treatment seekers +”; n= 81), and current smokers interested in quitting who did not attend at least one session of a smoking cessation program (“smoking cessation treatment seekers –”; n= 91). Young adults who never smoked regularly (72 experimented, but did not ever smoke regularly and 56 never smokers) were not included in these analyses as we wanted to compare those who currently or ever smoked regularly. Cross-sectional comparisons were

made among ex-smokers, nontreatment seekers, and treatment seekers who did and who did not eventually attend smoking cessation treatment (n=294). End of treatment smoking outcomes were considered among those young adults who enrolled in and attended the smoking cessation program (n=81).

2.2. Independent Variables

Gender, race, age, education, and home smoking restrictions were assessed to characterize the sample and to utilize as controlling variables. Home indoor smoking restrictions was measured with one item that asked, "Is smoking allowed in your dorm/apartment/home?" as home environmental restrictions have been shown to predict smoking behavior (Gfroerer, Greenblatt, & Wright, 1997; Wechsler, Kelley, Seibring, Kuo, & Rigotti, 2001). In addition, treatment group and nicotine dependence served as controlling variables in the analysis of smoking cessation outcomes. Nicotine dependence was measured by the Fagerstrom Test for Nicotine dependence (FTND), which is a 6-item self-report measure with satisfactory psychometric properties (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991; Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994).

Alternative reinforcers were measured with a 78 item adapted version of the Pleasant Events Schedule (PES) (MacPhillamy & Lewinsohn, 1976, 1982). The PES was designed to assess reinforcers that occur in an individual's natural environment. The respondents rated items once in terms of frequency (0=none to 3=often) and once in terms of enjoyability (0=none to 3=very) over the past 30 days. The cross product score of frequency and enjoyability provided a measure of reinforcement from the activity. The sum of the cross products provided an alternative reinforcers score. Reinforcers rated as associated with smoking or the urge to smoke (yes/no) were categorized as complementary reinforcers and reinforcers rated as not associated with smoking or the urge to smoke (yes/no) were categorized as substitute reinforcers. Thus, substitute alternative reinforcers and complementary reinforcers were defined by the respondents. Examples of reinforcers included physical activity, listening to music, cooking, spending time with significant others, hobbies, using alcohol and drugs, drinking coffee, driving, working/studying, and watching movies. This measure has been used to assess rewarding activities in substance abusers and substance use has been shown to predict a low frequency of pleasant activities (Correia et al., 1998; Van Etten et al., 1998).

Depression symptoms were measured with the Center for Epidemiologic Studies Depression Scale. This 20-item Likert-style scale has high internal consistency (Cronbach's $\alpha = .85-.90$) and has been shown to correlate with clinical ratings of the severity of depression (Radloff, 1977), self-medication smoking and nicotine dependence (Lerman et al., 1996). Response options range from 0 (none of the time) to 3 (most of the time).

Delay discounting was measured from the pattern of choices across 27 questions on a monetary choice questionnaire (Kirby, Petry, & Bickel, 1999). The 27 choices define 10 ranges of discount rates with delays ranging from 7 days to 186 days. Delay discounting is measured by fitting a hyperbolic function to bivariate data on indifference points between choices of small, medium, and large delayed rewards and the time delay. The resulting estimated parameter (k) is greater for individuals who discount the value of future rewards and thus prefer immediate rewards (Kirby, 1997; Kirby et al., 1999; Madden, Petry, Badger, & Bickel, 1997; Myerson & Green, 1995).

2.3. Outcome Variables

Smoking practices were assessed using a standard series of self-report items about experimentation with cigarettes, regular smoking and current smoking (Grunbaum et al., 2004). Four levels of smoking were defined as above. Current smoking was defined as having

smoked at least five cigarettes a day for the past six months. This criterion was used to discriminate young adults who smoke regularly from those who smoke irregularly (e.g., chippers, social smokers). Smoking cessation at end of treatment was defined as a saliva cotinine confirmed seven day point prevalence.

3. Results

3.1. Characteristics of Study Participants and Bivariate Associations with Smoking Status

The characteristics of the study sample and the bivariate associations with smoking status are shown in Table 1.

3.2. Multivariate Analyses of Smoking Status

In order to evaluate the independent contributions of each variable to smoking status, a multinomial logistic regression model for smoking status (4 groups: ex-smoker, smoking cessation treatment seekers who did (+) and who did not (–) participate in a formal smoking cessation program, and nontreatment seeking current smokers) was conducted with ex-smokers as the comparison group. Those variables with a bivariate association $p < .25$ with smoking status were included in the model (Hosmer & Lemeshow, 2000). Race, education, home smoking restrictions, substitute reinforcers, complementary reinforcers, depression symptoms, and delay discounting were entered into the model. The odds ratios and 95% confidence intervals for all model comparisons appear in Table 2. Race, education, and home smoking restrictions served as controlling variables. To highlight the effects of the continuous predictors on smoking status, the effects are presented for a standard deviation increase.

3.2.1. Ex-smokers as the comparison group—The results revealed that a standard deviation (SD=1.58) increase in delay discounting was associated with 55% (OR=1.55, 95% CI=1.01, 2.36) increase in the odds of being a nontreatment seeking smoker versus an ex-smoker. A standard deviation (SD=66.11) increase in complementary reinforcers also increased the odds nearly threefold (OR=2.80, 95% CI=1.43, 5.52) of being a nontreatment seeking smoker versus an ex-smoker. A standard deviation (SD=71.13) increase in substitute reinforcers was associated with a 76% decrease (OR=.24, 95% CI=.13, .48) in the odds of being a nontreatment seeking smoker versus an ex-smoker. A standard deviation increase in substitute reinforcers was also associated with an 80% (OR=.20, 95% CI=.10, .39) and an 83% (OR=.17, 95% CI=.09, .34) decrease in the odds of being a treatment seeking smoker who participated (+) and who did not participate (–) in smoking cessation treatment compared to being an ex smoker, respectively. Finally, a standard deviation increase in depression symptoms (SD=16.96) was associated with a 47% decrease (OR=.53, 95% CI=.32, .89) in the odds of being a nontreatment seeking smoker versus an ex-smoker.

3.2.2. Treatment seekers who did participate in treatment (+) versus those who did not (–) and nontreatment seekers—A standard deviation increase in delay discounting (SD=1.58) was associated with an 85% (OR=1.85, 95% CI=1.22, 2.79) increase in the odds of being a nontreatment seeker versus a treatment seeking (+) participant. A standard deviation (SD=66.11) increase in complementary reinforcers was associated with a 73% (OR=1.73, 95% CI=1.04, 2.88) increase in the odds of being a nontreatment seeker rather than a treatment seeking (+) participant. Regarding the covariates, compared to white smokers, non-white smokers were over three times (OR=3.36, 95% CI=1.55, 7.26) more likely to be a treatment seeking (–) smoker than a treatment seeking (+) smoker. Having a household member whom smokes was associated with a two fold (OR=2.20, 95% CI=1.08, 4.49) increase in the odds of being a treatment seeking (–) smoker a treatment seeking (+) smoker. Finally, with respect to education, attending/graduated from college was associated with a 93% (OR=.07, 95% CI=.03, .17) decrease in the odds of being a nontreatment seeker than a treatment seeking

(+) smoker, and a 64% (OR=.36, 95%CI=.16, .85) decrease in the odds of being a treatment seeking (-) smoker than a treatment seeking (+) smoker.

3.2.3. Treatment seekers who did not participate in treatment (-) versus nontreatment seekers—These analyses indicated that non-white smokers were over 80% less likely (OR=.19, 95%CI=.08, .46) to be a nontreatment seeking smoker than a treatment seeking (-) smoker compared to white smokers. Living with a household member whom smokes resulted in a 71% (OR=.29, 95%CI=.13, .65) decreased likelihood of being a nontreatment seeking smoker than a treatment-seeking (-) smoker who did not participate in smoking cessation treatment. Participants attending/graduated from college were 82% (OR=.18, 95%CI=.08, .44) less likely to be a nontreatment seeking current smoker than a treatment-seeking (-) smoker who did not participate in smoking cessation treatment.

3.3. Analyses of Smoking Cessation

3.3.1. Bivariate Associations with Smoking Cessation—At the end of treatment, 31 of 81 (38%) treatment seekers who attended the smoking cessation program were quit. Of the 81 (17 non-white, 64 white) young adults who attended the smoking cessation program, 12% of the non-white and 40% of the white smokers were quit at the end of treatment $\chi^2(1) = 4.50$, $p=.034$. In addition, smokers who had a greater increase in their level of substitute reinforcers from baseline to end of treatment were more likely to be quit at study end (32 versus 10). Gender, treatment group, home smoking restrictions, and delay discounting were not significantly related to being quit at treatment end ($p's > .40$). The following bivariate associations with end of treatment abstinence (no versus yes) were not statistically significant at the $p < .05$ level, but met statistical criteria for inclusion in the multivariate model (bivariate association $p < .25$) (Hosmer & Lemeshow, 2000) age (22.5 years old versus 21.7 years old), education (15% noncollege quit versus 37% of college quit), nicotine dependence (3.2 versus 2.6), depression (19.6 versus 15.7) and decreases in the level of complementary reinforcers from baseline to end of treatment (- 31.46 versus - 45.66).

3.3.2. Multivariate Associations with Smoking Cessation—Multivariate logistic regression analysis was conducted to determine the independent associations with smoking cessation at the end of treatment (7 day point prevalence). Variables with a significant bivariate association ($p \leq .25$) with abstinence were entered into the model (Hosmer & Lemeshow, 2000). Treatment group was also entered into the model and forced to remain in the model. Backward elimination was used to retain variables that were significant ($p < .10$) independent predictors of smoking cessation. The only significant predictor was the increase in substitute reinforcers from baseline to the end of treatment. For every standard deviation increase in substitute reinforcers ($SD = 42$), there was about a two-fold increase in the likelihood of being quit at study end (OR = 1.73, C.I. = 1.02, 2.95).

4. Discussion

The findings of the present study indicate that several variables derived from Behavioral Economic Theory, such as substitute reinforcers to smoking, complementary reinforcers to smoking and delay discounting can differentiate among young adult smoking practices. Nontreatment seekers, treatment seeking smokers who did and treatment seeking smokers who did not subsequently participate in a formal smoking cessation program were characterized by a lower level of substitute reinforcers to smoking compared to ex-smokers. Greater complementary reinforcers and higher delay discounting rates differentiated nontreatment seeking smokers from ex-smokers and treatment seeking smokers who subsequently attended a smoking cessation program. Young adult smokers who increased their substitute reinforcers across treatment were almost two times more likely to be quit at treatment end. These variables

may be important to consider in recruitment and treatment approaches for smoking cessation interventions for young adult smokers.

The observation that ex-smokers had greater substitute alternative reinforcers than the three current smoking groups suggests that substitute reinforcers to smoking may play a role in the ability to quit smoking and maintaining smoking abstinence. These cross-sectional findings are consistent with our smoking cessation findings in that increases in substitute reinforcers to smoking during treatment appeared to confer a two-fold advantage in smoking cessation among young adults, at least in the short-term. The frequency of substitute alternative reinforcers has been shown to predict post-treatment cocaine, alcohol, and heroin abstinence (Higgins, Heil, & Lussier, 2004; Smith et al., 2001; Van Etten et al., 1998). The present study now provides preliminary evidence that substitute reinforcers may facilitate smoking abstinence. Thus, helping young adult smokers identify, access and engage in substitute reinforcers for smoking (not just substitute behaviors) prior to and after a quit attempt may promote long-term cessation by replacing smoking associated rewards with other rewarding behaviors making a nonsmoking lifestyle as rewarding or more rewarding than a lifestyle involving cigarette use.

Behavioral Economic Theory is based in part on the premise that access, availability and involvement in alternative substitute reinforcers are critical in the choice and ability to discontinue a rewarding, yet unhealthy behavior such as smoking. If reinforcers are limited, then an individual may be more likely to choose to smoke because it is an easily available method to increase overall reinforcement and a reinforcement deprived environment may increase the rewarding value of smoking (Perkins et al., 2000). Physical activity may be an especially good substitute reinforcer since it shares several of the same functions as smoking (e.g., weight and mood management) and has been shown to decrease smoking abstinence associated withdrawal symptoms, craving and negative affect (Ussher, Taylor, & Faulkner, 2008). About 60% of the smoking cessation program participants defined physical activity as a substitute reinforcer that they chose to engage in (among other reinforcers) over the four weeks after their target quit day. Although we cannot quantify the amount of physical activity engaged in, the choice of physical activity at least twice over the 30-days after the quit day was associated with a significant reduction in cigarettes smoked ($p = .003$), but not significantly related to abstinence at the end of treatment ($p > .10$). Future research may want to delineate whether some substitute reinforcers are more effective at promoting smoking cessation than others and for which smokers.

Greater complementary reinforcers differentiated nontreatment seeking smokers from ex-smokers and treatment seeking smokers who subsequently attended a formal smoking cessation program, but not those treatment seekers who did not participate in a smoking cessation program. Complementary reinforcers to smoking (e.g., coffee, alcohol, smoking peers) may make smoking cigarettes even more enjoyable, hindering interest in quitting. In addition, these reinforcers are common triggers to smoke and contribute to relapse. Consistent with this notion, household smoking doubled the odds of being a treatment seeking smoker who did not attend treatment than a treatment seeking smoker who did attend a smoking cessation treatment program. Thus, the level of complementary reinforcers for smoking among young adult smokers may be a marker for how entrenched smoking is in a young adult smoker's environment and how this may translate to a lack of interest in quitting as well as a tentative commitment to quit smoking. The level of complementary reinforcers or the change from baseline did not appear to be as important to achieving cessation as the level of substitute reinforcers among young adults.

Higher delay discounting differentiated nontreatment seeking smokers from ex-smokers and treatment seeking smokers who participated in a formal quit smoking program, but not those treatment seekers who did not participate in the quit smoking program. Thus, delay discounting

may be a pre-treatment variable that can identify young adult smokers at risk of not participating in a smoking cessation program after enrolling due to tentative interest in quitting. This suggests that recruitment strategies and program components will need to appeal to delay discounting characteristics in young adult smokers not interested in quitting and those ambivalent about quitting within a formal program. Given that the benefits of smoking cessation (delayed in time) will be heavily discounted, maybe incentive-based components (relatively more immediate) for program participation and/or smoking cessation would promote interest in participation, actual participation, and successful abstinence (Petry, 2000). Although delay discounting did not predict abstinence in our small sample of treatment seekers, we observed a slight shift in delay discounting toward greater impulsive decision making (-4.70 at baseline and -4.33 at end of treatment). The small increase in delay discounting occurred in those young adults who were quit and those not quit at the end of treatment. Thus, it may reflect insignificant variation in delay discounting or possibly a marker for relapse or relapse vulnerability.

Depression symptoms played a smaller role in differentiating these smoking groups than anticipated and contrary to our hypothesis, nontreatment seekers were less likely to have higher depression symptoms than ex-smokers. This may suggest that young adult smokers not interested in quitting may derive mood management benefits from nicotine, which serves to maintain their smoking behavior. In order for disinterest in quitting to be transformed to interest and subsequent quitting, the role of smoking in mood modulation among subgroups of young adults will need to be further delineated to determine if intervention components need to replace smoking with skills/behaviors of similar mood management function.

With respect to the demographic variables, ex-smokers and treatment seeking smokers who participated in treatment have either attended college or were currently attending college compared to nontreatment seekers and treatment seeking smokers who did not subsequently participate in treatment. Recent research has shown that non-college educated young adults were less likely to have made a quit attempt than college educated young adults (Green et al., 2007). Nonwhites were more likely to be among the treatment seeking smokers who did not subsequently participate in treatment than ex-smokers, treatment seeking smokers who participated in treatment, and nontreatment seekers. This speaks to the importance of identifying smoking cessation program features that will appeal within and/or across racial groups of young adult smokers to maintain interest in quitting with the assistance of a formal program.

The between-group, cross-sectional comparisons made in the present study do not allow us to make statements regarding the temporal precedence of these variables and smoking behavior, although the smoking cessation findings do suggest an important role for substitute reinforcers in short-term quitting success. Further investigation with larger samples of young adults may determine whether these variables play a role in long-term smoking cessation. In addition, the small sample of smoking cessation program attendees does not permit an in-depth analysis of whether one type of substitute reinforcer is more important to smoking cessation or if the overall level is key to promoting smoking cessation. Of note, only demographic variables discriminated between nontreatment seeking young adult smokers and treatment seeking smokers who did not participate in smoking cessation treatment. Future research with larger numbers of young adults will be needed to determine whether other psychosocial variables differentiate these groups or if the differences are simply demographic. This is important as some comparisons involved small cells sizes and the representativeness of the present sample of young adults is not clear.

In general, these comparisons highlight variables that might be important to address in the recruitment and smoking cessation treatment approaches focused on young adult smokers. Young adults are more likely than older adults to make a quit attempt, less likely to seek

assistance in their smoking cessation attempt and more likely to fail (Curry et al., 2007; Rigotti et al., 2000; Solberg et al., 2007). Smoking cessation among young adults is a cancer control and public health challenge that will need to be met to prevent another generation of smoking attributable morbidity and mortality.

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Table 1
Means, Standard Deviations, and Frequencies for the Study Variables (N=294).

Variable	Level	Ex-Smoker Number (%)	Treatment Seeking (+) Number (%)	Treatment Seeking (-) Number (%)	Non-Treatment Seeking Number (%)	Bivariate Statistic
Gender	Male	27 (44)	35 (43)	50 (56)	34 (57)	$X^2(1) = .03, p = .89$
	Female	35 (56)	46 (57)	40 (44)	26 (43)	
Race	White	54 (87)	64 (79)	37 (41)	45 (75)	$X^2(6) = 60.86, p < .0001$
	Black	3 (5)	11 (14)	48 (53)	10 (17)	
	Asian	5 (8)	6 (7)	5 (6)	5 (8)	
Education	College	29 (47)	68 (84)	48 (53)	20 (67)	$X^2(3) = 40.75, p < .0001$
	Non-college	33 (53)	13 (16)	43 (47)	40 (33)	
Home Smoking	Yes	27 (44)	40 (49)	62 (70)	28 (47)	$X^2(3) = 13.1, p = .004$
	No	34 (56)	41 (51)	27 (30)	32 (53)	
			Mean (SD)	Mean (SD)		
Age		22.4 (2.9)	22.2 (2.7)	21.7 (2.4)	22.5 (3.8)	$F(3, 291) = 1.07, p = .36$
Substitute Reinforcers		150.4 (67.4) ^a	80.8 (39.6) ^b	62.3 (47.1) ^b	73.3 (54.2) ^b	$F(3, 286) = 39.11, p < .0001$
Complementary Reinforcers		46.4 (45.6) ^a	86.0 (42.2) ^b	103.5 (57.4) ^b	112.3 (94.3) ^b	$F(3, 286) = 14.51, p < .0001$
Delay Discounting		- 5.0 (3.6) ^a	- 4.82 (1.7) ^{abc}	- 4.30 (1.8) ^{abc}	- 3.50 (1.9) ^a	$F(3, 286) = 4.95, p = .002$
Depression Symptoms		16.4 (9.2)	18.3 (9.9)	20.4 (11.4)	17.4 (9.8)	$F(3, 290) = 2.11, p = .10$

abc common superscripts indicate no significant mean differences

Table 2

Multinomial logistic regression of young adult smoking status.

Predictor Variable	Compared to being an Ex-smoker					
	Treatment Seeking (+)			Treatment Seeking (-)		
	OR	95% CI [/]		OR	95% CI [/]	
Race	3.40	.98, 11.84		11.41	3.42, 38.13	2.16
Home Smoking	.85	.36, 1.99		1.87	.76, 4.62	.54
Education	9.13	3.45, 24.18		3.33	1.29, 8.62	.54
Depression Symptoms	.81	.50, 1.29		.76	.46, 1.23	.53
Delay Discounting	.84	.55, 1.28		1.14	.75, 1.74	1.55
Complementary Reinforcers	1.62	.81, 3.24		1.96	.99, 3.89	2.80
Substitute Reinforcers	.20	.10, .39		.17	.09, .34	.24
Compared to being a Treatment-Seeking -						
Compared to being a Treatment-Seeking +						
Predictor Variable	Non-Treatment Seeking			Non-Treatment Seeking		
	OR	95% CI [/]		OR	95% CI [/]	
	OR	95% CI [/]		OR	95% CI [/]	
Race	.19	.08, .46		.63	.24, 1.67	3.36
Home Smoking	.29	.13, .65		.63	.28, 1.44	2.20
Education	.18	.08, .44		.07	.03, .17	.36
Depression Symptoms	.70	.46, 1.08		.66	.42, 1.03	.94
Delay Discounting	1.36	.75, 2.46		1.85	1.22, 2.79	1.36
Complementary Reinforcers	1.43	.92, 2.24		1.73	1.04, 2.88	1.21
Substitute Reinforcers	1.42	.75, 2.67		1.21	.62, 2.35	.85

Note. Race (1=Non Caucasian); Home smoking (1=someone in the household smokes); Education (1=attends/attended college)

[/] Confidence intervals that include 1 are not significant, p<.05)