BRIEF REPORT

Self-Efficacy to Quit in HIV-Infected Smokers

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ABSTRACT

Introduction: Tobacco use is epidemic among persons living with HIV (PLWH), and several studies have shown self-efficacy (SE) to be a predictor of successful cessation. This study examined sociobehavioral correlates of SE and its predictive value for successful cessation in a group of PLWH smokers.

Methods: The study was conducted on combined patient data from 2 separate randomized controlled trials of tobacco treatment for PLWH smokers. Both trials utilized the same SE scale at the same timepoints, and both had the same smoking cessation endpoint (biochemically confirmed, 7-day, point prevalence abstinence at 3 months). Univariate and multivariate techniques were used to analyze the merged dataset.

Results: Baseline SE data were available for 272 subjects. The Self-Efficacy/Temptations Scale—Long Form demonstrated good internal reliability with overall and subscale Cronbach's alpha of .77–.92. Younger age, HIV risk other than injection drug use, recent alcohol use, and higher scores for anxiety, depression, loneliness, and nicotine dependence were all significantly correlated with lower baseline SE. Posttreatment SE was significantly predictive of successful cessation, whereas baseline SE was not. Subjects randomized to the treatment interventions were significantly more likely to quit ($AOR = 2.99 [1.26–7.01]$, $p = .01$), and logistic regression suggested a possible mediating effect of posttreatment SE.

Conclusions: SE is tightly correlated with a number of modifiable affective and behavioral factors in PLWH smokers, and measures aimed at increasing the SE to abstain in such individuals may enhance the effect of targeted tobacco treatment strategies.

INTRODUCTION

Persons living with HIV (PLWH) smoke at approximately triple the rate of the general adult population¹ and experience a greater risk of smoking-related disease.² In the era of highly active antiretroviral therapy, tobacco use has emerged as a leading cause of morbidity and mortality among PLWH, and one recent study estimated that 61.5% of mortality in this population is directly attributable to smoking.³ Most PLWH smokers have comorbidities, especially psychiatric illness and other substance use, that present obstacles to successful cessation.⁴ Established tobacco treatment strategies, such as motivational interviewing, have proven ineffective for PLWH smokers,⁵ and the U.S. Public Health Service has prioritized the development of more effective tobacco treatments targeting PLWH smokers.⁶

Self-efficacy (SE) is a behavioral concept referring to an individual's confidence in his/her own ability to perform a

behavior. In the realm of tobacco treatment, SE is the self-estimation of one's ability to refrain from smoking in various situations. Several validated SE scales have demonstrated their predictive values for achieving and maintaining smoking abstinence.⁷ Although there may be some correlation between motivation to quit and SE, they are distinct concepts. For example, an individual may be very motivated to quit but have little confidence in his/her own ability to accomplish the goal. Decreases in SE may play a key role in lapses during quit attempts.⁸ As such, increasing SE is a major goal of most cognitive-behavioral tobacco treatments.⁹

Several tobacco treatment trials for PLWH found SE to be a predictor of successful cessation.^{10–13} No prior work has presented a detailed picture of SE in PLWH smokers, and such information may prove useful in developing more effective tobacco treatments for this population. Herein, we describe sociodemographic and psychobehavioral correlates of SE in a

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group of PLWH smokers, and we explore its role as a putative mediator of the effect of intensive behavioral therapy on quitting.

METHODS

Montefiore's Center for Positive Living provides care to over 2,800 PLWH in the Bronx, NY. Between 2009 and 2013, we conducted two randomized controlled trials of our "Positively Smoke Free" intensive behavioral cessation interventions, one live and one Web-based (without any person-to-person interaction), versus standard care. All subjects were offered nicotine patches. The inclusion criteria for the studies, published elsewhere,^{11,14} were similar: documented HIV infection, receipt of care at the Center for Positive Living, current cigarette smoking, motivation to quit, and absence of contraindication to nicotine patches. In the second study, there were additional computer/Internet access and literacy requirements. Program content was summarized in detail in these prior publications, but, in short, both programs consisted of eight educational/motivational sessions, guided by social cognitive theory, delivered over 7 weeks. The program content was thoroughly tailored to address the specific needs and concerns of smokers living with HIV. In both studies, subjects provided sociodemographic information and completed behavioral scales relevant to tobacco use at three timepoints: enrollment, Day 42 (toward the end of the intervention for those allocated to the behavioral intervention), and 3 months after quit day. The primary endpoint was exhaled carbon monoxide (ECO)-verified, 7-day point prevalence abstinence at 3 months. An ECO level < 10 parts per million was considered to be consistent with abstinence. SE was assessed with the Self-Efficacy/Temptations Scale—Long Form,⁹ which asks users how tempted they would be to smoke in 20 different situations with 1 = *not at all tempted* and 5 = *extremely tempted* (lower scores indicated higher SE). The measure includes three subscales: positive-affect/social situation (e.g., "When I am happy and celebrating..."), negative-affect situation (e.g., "When things are just not going the way I want and I am frustrated..."), and habit/craving situation (e.g., "When I first get up in the morning..."). Mean scores were calculated for overall SE and for each subscale. The internal reliability of the scale has been confirmed in general population, adult smokers with Cronbach's alpha from .80 to .95.¹⁵

For this study, we merged the patient samples from the two trials. For the 11 subjects who participated in both trials, data from the first study were retained and from the second study were excluded. In order to assess similarities and differences between the two study cohorts, we compared baseline characteristics between the two control groups and between the two intervention groups. In the later study, among both controls and intervention subjects, there was a higher proportion of Latinos (because a separate Latino-specific cessation trial competed for enrollment with the earlier trial), and educational attainment was higher. In the intervention groups, subjects were younger in the later study. The latter two observations were likely attributable to the requirement for home Internet access in the later study. We also compared overall SE and all of the SE subscales at baseline. The only significant difference between the two studies was lower negative-affect situation SE in the later study. There were no significant differences between the groups in proportions achieving the abstinence outcome.

Means and standard deviations were calculated for continuous variables. Cronbach's alpha was calculated for overall SE and the subscales. Comparisons of proportions were performed using chi-square analysis. Comparisons of means were performed using Student's *t* test or Mann-Whitney *U* test. Bivariate correlations were measured using Spearman's rank-order correlation. Multiple linear regression and logistic regression were performed using a backward stepwise methodology serially removing covariates without significant effect on the model and retaining in the final model only those covariates that were associated with the dependent variable at an alpha < .10 when adjusted for the other covariates. Statistical analyses were completed using SPSS V18.0.

All aspects of this research were approved by the Montefiore Medical Center Institutional Review Board.

RESULTS

The final sample size was 272. Enrollment SE data were available for all subjects, Visit 2 SE data for 87.5%, and 3-month abstinence data for 96.3%. Baseline sociodemographic and behavioral data are presented in Table 1. The intervention and standard care conditions were well balanced for all baseline measures.

Study subjects completed 99.6% of SE scale items at enrollment. The Self-Efficacy/Temptations Scale demonstrated good internal consistency reliability in our sample with Cronbach's alpha = .92 for overall SE, and .77, .90, and .78 for the positive-affect/social situations, negative-affect, and habit/craving subscales, respectively.

Baseline SE scores are presented in Table 1. Analyses were performed to evaluate associations between SE and other baseline characteristics. The correlations of SE with a number of continuous variables assessed at baseline are presented in Table 2. Younger age, higher levels of nicotine dependence, loneliness, depression, anxiety, cigarette consumption, and ECO were all correlated with lower SE. There were no significant differences in SE by gender, ethnicity, race, educational level, or motivation to quit. HIV acquisition via injection drug use (IDU) was associated with higher overall (3.16 vs. 3.44, $p = .01$), negative-affect (3.70 vs. 4.13, $p = .02$), and habit/craving (3.01 vs. 3.39, $p = .05$) SE. Complete abstinence from alcohol in the past 30 days was associated with greater positive-affect/social situation SE (3.20 vs. 3.58, $p = .005$). In the multiple regression analysis using baseline overall SE as the outcome variable, the covariates retained in the final model were HIV acquisition via IDU ($\beta = -.135$, $p = .02$), abstinence from alcohol for the past 30 days ($\beta = -.099$, $p = .08$), nicotine dependence ($\beta = .346$, $p < .001$), loneliness score ($\beta = .150$, $p = .03$), depression score ($\beta = -.142$, $p = .06$), and anxiety score (.229, $p = .003$).

We also evaluated baseline factors for association with 3-month abstinence. Subjects who successfully quit were, on average, 3 years older than nonquitters (49.5 vs. 46.5, $p = .08$). There was a trend toward lower loneliness scores in quitters versus nonquitters (21.3 vs. 23.9, $p = .09$). The proportion of subjects in the intervention conditions who achieved the abstinence endpoint exceeded that of the control condition (15.0% vs. 7.2%; odds ratio [OR] = 2.28 [1.03–5.08], $p = .04$). There were no significant differences in baseline SE between quitters and nonquitters, although there was a trend toward higher

Table 1. Baseline Characteristics of the Combined Study Cohort

Characteristic	Control condition (N = 139 ^a)	Intervention condition (N = 133 ^a)	p value
Age	46.7 ± 8.5	47.0 ± 9.2	.73
Gender			
Male	77 (55.8%)	67 (50.8%)	.62
Female	60 (43.5%)	63 (47.7%)	
Transgender	1 (0.7%)	2 (1.5%)	
Ethnicity			
Latino	47 (35.3%)	44 (35.2%)	.98
Non-Latino	86 (64.7%)	81 (64.8%)	
Race			
Black	93 (80.2%)	89 (80.9%)	.65
White	20 (17.2%)	16 (14.5%)	
American Indian or Alaskan native	3 (2.6%)	5 (4.5%)	
HIV risk behaviour			
Heterosexual contact	73 (53.3%)	64 (48.5%)	.46
Same sex contact	26 (19.0%)	34 (25.8%)	
Injection drug use	11 (8.0%)	15 (11.4%)	
Transfusion	5 (3.6%)	3 (2.3%)	
Other/unknown	22 (16.1%)	16 (12.1%)	
Most recent CD4+ count (cells/μl)	539 ± 313	541 ± 328	.97
Daily cigarette consumption	10.9 ± 7.4	11.9 ± 9.1	.34
Nicotine dependence score ^b	5.1 ± 2.2	4.8 ± 2.1	.39
Motivation to quit ^c	6.6 ± 1.5	6.8 ± 1.4	.26
Self-efficacy total ^d	3.7 ± 0.7	3.7 ± 0.8	.75
Positive-affect/social situations	3.4 ± 0.9	3.4 ± 1.0	.99
Negative-affect situations	4.1 ± 0.9	4.0 ± 1.0	.57
Habit/craving situations	3.4 ± 0.7	3.3 ± 0.8	.74

^aResponse totals do not equal the cohort size for all items because of incomplete reporting.

^bAs measured using the Modified Fagerstrom Tolerance Questionnaire.¹⁶

^cAs measured using the Abrams and Biener Readiness to Quit Ladder.¹⁷

^dAs measured using the Self-Efficacy/Temptations Scale.⁹

Table 2. Correlation of Self-Efficacy With Continuous Variables Assessed at Baseline

Variable	Overall SE		Positive-affect SE		Negative-affect SE		Habit/craving SE	
	Rho	p value	Rho	p value	Rho	p value	Rho	p value
Age	−0.102	.09	−0.054	.37	−0.177	.003	−0.017	.78
Nicotine dependence	0.412	<.001	0.300	<.001	0.237	<.001	0.263	<.001
Loneliness	0.289	<.001	0.260	<.001	0.227	<.001	0.284	<.001
Depression	0.208	.001	0.172	.004	0.195	.001	0.198	.001
Anxiety	0.277	<.001	0.216	<.001	0.251	<.001	0.243	<.001
Cigarettes/day	0.313	<.001	0.233	<.001	0.245	<.001	0.339	<.001
Exhaled CO level	0.135	.03	0.100	.10	0.053	.38	0.145	.02

Note. SE = self-efficacy; Rho = Spearman's rank-order correlation coefficient, CO = carbon monoxide.

positive-affect/social situations SE in quitters (3.15 vs. 3.45, $p = .09$). None of the other baseline sociodemographic or behavioral parameters were associated with abstinence.

A backward, stepwise multivariate logistic regression model evaluated the associations of those variables demonstrating either trends or significant associations with 3-month abstinence. The covariates retained in the final model were assignment to the intervention condition ($AOR = 2.99$ [1.26–7.01], $p = .01$) and loneliness ($AOR = 0.96$ [0.91–1.01], $p = .09$).

Additional analyses were performed to evaluate the association between SE at Visit 2 (toward the end of the intervention

for those assigned to the interventions) and the abstinence outcome. Abstinent subjects exhibited higher overall SE (2.87 vs. 3.39, $p = .04$), positive-affect/social situation SE (2.61 vs. 3.15, $p = .004$), and habit/craving situation SE (2.42 vs. 3.00, $p = .002$) at Visit 2. All SE scales and subscales showed larger increases in SE from baseline to Visit 2 in the intervention versus control conditions, but these between-group differences did not achieve statistical significance. When overall posttreatment SE was entered into a logistic regression model with study condition, the association of assignment to the intervention condition with 3-month abstinence was attenuated ($AOR = 2.30$ [0.98–5.4], $p = .06$).

DISCUSSION

Tobacco use in PLWH represents a daunting public health challenge, and efforts to develop treatment strategies based on established methods such as motivational interviewing and intensive personal counseling have yielded disappointing results.^{5,18} A clearer understanding of the behavioral bases of tobacco use and cessation may help guide the development of future interventions for this highly vulnerable group.

SE to refrain from smoking has been associated with successful quitting in four separate studies of tobacco treatment in PLWH.^{10–13} Although the scales used to quantitate SE, the timing of the measurement (i.e., before, during, or after treatment), the abstinence endpoints, and the effect sizes have varied across studies, the evidence base does confirm the importance of SE as a predictor of successful quitting.⁷

The Self-Efficacy/Temptations Scale is one of the more common SE measures, but it has not been previously validated in PLWH smokers. In our cohort, the internal consistency reliability was good and was comparable to that observed in general population smokers. The inverse relationships between both anxiety and depression and SE have been described in other populations.^{19,20} Consistent with our findings, a recent study of coping mechanisms in older PLWH demonstrated opposite directionality of correlation between anxiety, depression, and loneliness versus SE in their relationships to coping behaviors.²¹ The inverse associations between higher cigarette consumption (reflected in higher ECO levels), and higher nicotine dependence and SE are not surprising and have been observed in prior studies.²² The association of older age with SE was limited to negative-affect situations and may be worthy of further study. The high levels of positive-affect/social situation SE among those abstaining from alcohol is likely related to dual use of these substances during celebrations and in venues where alcohol is served. The great majority (>80%) of subjects who had acquired their infection via IDU were no longer engaging in illicit substance use at the time of enrollment. Their experiences overcoming prior addictions may have increased their SE to quit smoking. These findings, taken as a whole, suggest that interventions aimed at increasing SE should focus on mitigating temptations to smoke in the context of affective disorders, loneliness, alcohol use, and high physiologic cravings for nicotine.

The meta-analysis of Gwaltney et al.⁷ showed that SE was a more reliable predictor of abstinence when measured after a quit attempt rather than at baseline. Our Visit 2 timepoint occurred after all intervention subjects' suggested quit dates, after all control subjects received brief advice to quit, and after all subjects were offered nicotine patches. The significant association of Visit 2 SE, but not baseline SE, is consistent with these published observations. The cessation outcomes reported for the combined cohort strengthen prior observations regarding the efficacy of the Positively Smoke Free interventions for PLWH smokers.^{11,14} The logistic regression results suggest that the success attributed to the interventions may have been partially mediated by increased SE.

The study has certain limitations requiring mention. Patients were recruited from a single center in the Bronx, and most belonged to ethnic/racial minority groups. Our findings may not be generalizable to geographically or demographically different populations. Additionally, the study design did not include formal analyses to test the mediating effect of SE on

intervention efficacy. Although the logistic regression analyses suggest a mediating influence of SE, these findings are inconclusive and future studies should formulate a priori hypotheses and test them with formal path analyses.

The current study demonstrates that SE was significantly associated with nicotine dependence, anxiety, depression, loneliness, history of IDU, and current alcohol use in a group of urban PLWH smokers. Posttreatment SE was a significant predictor of successful quitting, whereas baseline SE was not. Our findings suggest that increasing SE to quit and to remain abstinent should be a goal of tobacco treatment for PLWH. Sensitivity to the affective and behavioral correlates of SE in PLWH smokers, and strategies aimed at teaching patients how to anticipate and avoid high-risk situations, how to respond to urges without smoking, and how to sustain long-term abstinence despite frequent temptations may be key elements to the success of cessation programs targeting this very vulnerable population.

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DECLARATION OF INTERESTS

None declared.

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