Associations Between Health Literacy and Established Predictors of Smoking Cessation

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Objectives. We examined associations between health literacy and predictors of smoking cessation among 402 low-socioeconomic status (SES), racially/ethnically diverse smokers.

Methods. Data were collected as part of a larger study evaluating smoking health risk messages. We conducted multiple linear regression analyses to examine relations between health literacy and predictors of smoking cessation (i.e., nicotine dependence, smoking outcome expectancies, smoking risk perceptions and knowledge, self-efficacy, intentions to quit or reduce smoking).

Results. Lower health literacy was associated with higher nicotine dependence, more positive and less negative smoking outcome expectancies, less knowledge about smoking health risks, and lower risk perceptions. Associations remained significant ($P < .05$) after controlling for demographics and SES-related factors.

Conclusions. These results provide the first evidence that low health literacy may serve as a critical and independent risk factor for poor cessation outcomes among low-socioeconomic status, racially/ethnically diverse smokers. Research is needed to investigate potential mechanisms underlying this relationship. (*Am J Public Health.* 2013;103:e43–e49. doi:10.2105/AJPH.2012.301062)

Cigarette smoking is the leading preventable cause of morbidity and mortality in the United States.[1] Approximately one third of all US cancer-related deaths and 87% of lung cancer cases result from smoking,[2] and smoking contributes to 80% to 90% of lung cancer deaths each year.[3] Although smoking prevalence has declined in recent years, nearly 21% of US adults continue to smoke.[4] Distinct populations such as those with low education, income, and occupational status and racial/ethnic minorities have disproportionately high smoking rates.[5–8] Individuals from these populations are also less likely to successfully quit smoking because they have limited access to effective smoking cessation resources and are less likely to use such resources.[9–11] Thus, smoking has a striking impact on socioeconomic status (SES) and racial/ethnic disparities in cancer morbidity and mortality.[10–13]

Numerous key predictors of smoking cessation and maintenance have been identified in previous research. One of the most robust predictors is nicotine dependence (i.e., average number of cigarettes smoked per day, time to first cigarette on waking).[14–16] Smokers with higher levels of dependence are less likely to quit smoking and less likely to maintain abstinence.[14–16] Smoking outcome expectancies, or the beliefs that smokers have about the consequences of smoking, also predict cessation.[17] Smoking expectancies can be positive (e.g., smoking facilitates social interactions, smoking reduces boredom or negative affect) or negative (e.g., smoking is harmful to health, others might disapprove of smoking). Stronger negative outcome expectancies are associated with greater intentions to quit and better cessation outcomes.[18] Smoking health risk knowledge and risk perceptions are also associated with smoking cessation such that lower perceived vulnerability and fewer perceived smoking risks are negatively associated with abstinence.[19,20] Moreover, quitting self-efficacy (i.e., the confidence in one's ability to quit smoking)[21,22] and intention to quit smoking predict successful cessation outcomes.[15,23,24]

Poor health literacy is one factor that may be negatively associated with cessation outcomes, particularly for low-SES racial/ethnic minority populations. However, very little research has examined health literacy as an independent predictor of smoking initiation or poor cessation outcomes. Health literacy is the ability to obtain, understand, and use health information to make important decisions regarding health and medical care.[25] Nearly half of US adults have poor health literacy.[26] Racial/ethnic minorities and those with lower educational attainment, income, and employment status are more likely to have difficulty with health literacy.[27–31] Specifically, two thirds of African American adults and three fourths of Latino adults have limited health literacy, compared with 32% of non-Latino Whites.[32] Poor health literacy is associated with higher incidence of chronic illness (e.g., diabetes, hypertension) and more limited access to prevention and treatment programs.[33] Those with poor health literacy tend to engage in harmful health behaviors (e.g., poor medication adherence, less preventive care utilization, less cancer screening) and are more likely to report poor health status.[34–36] They also have low levels of illness-related knowledge.[31,35,37,38] Furthermore, individuals with low health literacy are less likely to be screened for cancer and are more frequently diagnosed with advanced-stage cancers.[35,39] Low health literacy is also associated with higher overall mortality rates.[40–42]

Whereas associations between low health literacy, negative health behaviors, and poor health outcomes have been well documented,[35] few studies have examined potential associations between health literacy and smoking. Sudore et al.[30] reported that elderly participants with lower health literacy were more likely to endorse current smoking status. However, Baker et al.[40] found no such association in a different sample of elderly persons. Another study found no relationship

between health literacy and smoking status in a sample of low-income pregnant women; however, poor health literacy was found to be associated with lower smoking risk knowledge and fewer negative smoking-related attitudes.[43] A more recent study found that health literacy was not significantly associated with cessation outcomes after completion of an inpatient smoking cessation program.[44] Notably, this study had a very small sample size, and most participants had adequate health literacy. Thus, there is a critical need to better understand how health literacy may be linked with smoking prevalence and cessation, particularly in large samples of low-SES, racial/ethnic minority smokers, because health literacy may be an essential, but often overlooked, factor in understanding tobacco-related health disparities.

We investigated associations between health literacy and established predictors of cessation (i.e., nicotine dependence, smoking outcome expectancies, smoking health risk knowledge and risk perceptions, self-efficacy to quit smoking, and intentions to quit or reduce smoking). The data were collected as part of a larger, single-visit laboratory study (Project INFORM) that evaluated responses to different types of smoking health risk messages among smokers with different levels of health literacy. On the basis of the existing literature, we hypothesized that smokers with lower (vs higher) health literacy would be more nicotine dependent, have more positive and fewer negative smoking outcome expectancies, have lower perceptions of smoking-related risk, be less knowledgeable about the health consequences of smoking, and have lower self-efficacy to quit smoking, and weaker intentions to change their smoking behavior.

METHODS

Participants (n = 402) were recruited in Houston, Texas, between September 2009 and September 2010, via media (i.e., public service announcements, paid advertisements) and community outreach (i.e., distribution of flyers, personnel visits to health care settings and health fairs). Eligible individuals were current daily smokers (smoked ≥ 5 cigarettes per day during the past year), aged between 18 and 70 years, and able to speak, read, and write English.

Exclusion criteria were current use of nicotine replacement therapy or bupropion, current enrollment in a smoking cessation treatment program, self-reported intention to quit smoking within 30 days of study enrollment, and expired carbon monoxide of less than 10 parts per million.

Procedures

Interested individuals were contacted by phone. After receiving a detailed description of the study, potential participants provided verbal informed consent and were screened for eligibility. We scheduled eligible participants for in-person laboratory visits, during which the study was further described, written informed consent was obtained, and eligibility was finalized. As part of the larger study, participants completed baseline questionnaire measures, were randomly assigned to review 1 of 4 different sets of smoking health risk messages, and completed postmessage measures.

Analyses for this article used the baseline questionnaire measures. These questionnaires assessed demographics, smoking characteristics (e.g., history, prior quit attempts) and nicotine dependence, smoking-related outcome expectancies, smoking risk knowledge and risk perceptions, self-efficacy, and intentions to reduce or quit smoking completely. Research staff administered the Rapid Estimate of Adult Literacy in Medicine (REALM)[45] to measure health literacy. All questionnaires were administered in private interview rooms via the Questionnaire Design System. This system uses a computer-administered self-interview format that includes audio and visual scripts. Questionnaire items were presented on the computer screen in written form and were accompanied by audio scripts that read each item aloud to participants. Participants received $35 as compensation for their time.

Measures

Demographic characteristics. Demographic characteristics assessed included age, race/ethnicity, gender, educational attainment, total annual household income, and relationship status. Responses for the variables were categorized as follows: race/ethnicity (non-Latino White, African American, and other), education (< high school degree vs ≥ high school degree or general equivalency diploma), and relationship status (married or living with a partner vs not married or living with a partner).

Health literacy. Health literacy was measured with the REALM, a rapid screening instrument that assesses the ability to decode 66 common medical words and lay terms for body parts.[45] Words are ordered according to difficulty. Participants are instructed to read through the list of words and pronounce as many as possible. The REALM takes 2 to 3 minutes to administer and score. Scoring is based on standard dictionary pronunciation rules. The sum of words read correctly is translated into 1 of 4 grade-level estimates (0–18, < fourth grade; 19–44, fourth–sixth grade; 45–60, seventh–eighth grade; ≥ 61, ≥ ninth grade). The REALM has excellent test–retest reliability and is highly correlated with comprehensive literacy diagnostic instruments.[45,46] For the purposes of this article, we dichotomized health literacy on the basis of a median split at the ninth-grade level. Previous studies have also dichotomized the REALM at this level.[30,47]

Nicotine dependence. We measured nicotine dependence with 2 items from the Fagerström Test for Nicotine Dependence (FTND)[48]: self-reported average number of cigarettes smoked per day and time to first cigarette on waking. These 2 items constitute the Heaviness of Smoking Index (HSI).[16] The HSI is a good indicator of nicotine dependence,[16] has fair internal consistency,[49] and is predictive of smoking relapse.[40]

Smoking outcome expectancies. We assessed smoking outcome expectancies with the Smoking Consequences Questionnaire–Adult (SCQ-A),[17] a 55-item self-report measure of expectations about the positive and negative consequences of smoking. Items are rated on a 10-point Likert scale (0 = "completely unlikely," 9 = "completely likely"). The SCQ-A includes 10 subscales: Negative Affect Reduction, Stimulation/State Enhancement, Health Risks, Taste/Sensorimotor Manipulation, Social Facilitation, Weight Control, Craving/Addiction, Negative Physical Feelings, Boredom Reduction, and Negative Social Impression. The subscales have good internal consistency and construct validity.[17] Positive expectancies are positively correlated with nicotine dependence (i.e., FTND scores).[50]

Risk perceptions. Smoking risk perceptions were assessed in terms of absolute risk and risk compared with other smokers. Participants responded to the following 4 questions: (1) "If you don't quit smoking for good, what are your chances of ever developing a smoking-related health problem?" (2) "If you quit smoking for good, what are your chances of ever developing a smoking-related health problem?" (3) "Compared to other smokers, what are your chances of ever developing a smoking-related health problem if you continue smoking?" and (4) "Compared with other smokers, what are your chances of ever developing a smoking-related health problem if you quit smoking for good?" Perceptions were rated on a 7-point, verbally anchored Likert scale ranging from "extremely unlikely" to "extremely likely." Participants also rated their perceived personal risk of developing at least 1 health consequence of smoking if they were to permanently quit smoking and if they were to continue smoking. This rating scale ranged from 0% to 100%. We developed these items for this study on the basis of recommendations by Brewer et al.[51] and Weinstein.[52]

Risk knowledge. We measured risk knowledge with a 20-item multiple-choice measure of smoking health consequences developed for this study.

Self-efficacy to quit smoking. We measured self-efficacy to quit smoking by asking participants how confident they were that they could quit smoking if they wanted to. Participants responded on a 5-point Likert scale (1 = "definitely no," 5 = "definitely yes").

Intentions to change smoking behavior. We assessed how confident participants were that they could cut back, limit their smoking to certain situations, or quit completely within the next 2 months. Participants responded on a 9-point Likert scale ranging from 1 ("extremely unlikely") to 9 ("extremely likely").

Statistical Analyses

Analyses were conducted in 2 steps. First, we assessed demographic differences between health literacy groups (i.e., lower vs higher) using χ^2 analysis and *t*-tests for categorical and continuous variables, respectively. Next, we conducted multiple linear regression analyses to test for associations between health literacy and the following dependent variables: (1) nicotine dependence (as measured by the HSI), (2) smoking outcome expectancies (positive and negative subscales of the SCQ-A), and (3) smoking-related beliefs (i.e., smoking risk perceptions, smoking risk knowledge, self-efficacy to quit, intentions to change smoking behavior).

Analyses were adjusted to control for key demographic and socioeconomic variables (i.e., age, gender, race/ethnicity, education, income, relationship status). Covariates were entered at step 1, and health literacy (dichotomized as lower vs higher) was entered at step 2. We examined data for adherence to assumptions of normality and homoscedasticity and removed outliers greater than 3.3 standard deviations from their predicted means.[53] Analyses were conducted using IBM SPSS version 19 (IBM, Armonk, NY).

RESULTS

Participants were 66% men and predominantly African American (70%), with a mean age of 43.2 years (SD = 10.8). Approximately 27% had less than a high school diploma or general equivalency diploma, and most (70%) reported a total annual household income of less than $10 000. Participants smoked an average of 17.9 cigarettes per day, and nearly half (47%) reported smoking their first cigarette of the day within 5 minutes of waking. Smokers with lower (vs higher) health literacy were more likely to be male and African American and have lower income and education (Table 1).

Health literacy was negatively associated with nicotine dependence, such that individuals with lower (vs higher) health literacy reported significantly higher levels of dependence (Table 2). Health literacy was associated with smoking outcome expectancies, such that individuals with lower (vs higher) health literacy perceived significantly fewer negative and significantly more positive consequences of smoking (Table 2). Namely, lower health literacy was associated with lower scores on the Health Risks subscale and higher scores on the Stimulation/State Enhancement and Social Facilitation subscales. We detected nonsignificant trends toward significance such that those with lower health literacy had higher scores on the Weight Control subscale ($P = .07$) and lower scores on the Craving/Addiction subscale ($P = .07$).

Health literacy was significantly associated with smoking risk knowledge and risk perceptions, such that participants with lower (vs higher) health literacy reported less knowledge about the health risks of smoking and lower perceptions regarding the health risks of smoking. Contrary to hypotheses, health literacy was not associated with self-efficacy to quit smoking or intentions to limit, reduce, or completely quit smoking within the next 2 months (Table 2).

DISCUSSION

This study is the first to our knowledge to investigate associations between health literacy and established predictors of smoking cessation in a sample of low-SES, racially/ethnically diverse smokers. Poor health literacy was associated with being male, being African American, and having lower education and income. As hypothesized, compared with smokers with higher health literacy, those with lower health literacy were more nicotine dependent, more likely to endorse positive consequences and less likely to endorse negative consequences of smoking, and less knowledgeable about smoking-related health risks and perceived themselves as less vulnerable to the health consequences of smoking. Associations remained significant after controlling for demographics and SES-related characteristics known to be associated with smoking prevalence and cessation. Thus, health literacy appears to be independently associated with certain known predictors of cessation. Individuals with lower health literacy might be less successful at quitting smoking and maintaining abstinence.

Results indicated that individuals with lower health literacy had higher levels of nicotine dependence than those with higher health literacy. Notably, nicotine dependence is the most robust known predictor of smoking cessation because it is associated with heavier smoking and lower quit rates.[14–16] Results also indicated that individuals with lower health literacy were more likely to endorse the positive than the negative consequences of smoking. Studies have found that smoking expectancies are highly associated with nicotine

TABLE 1—Participant Characteristics: Houston, TX

Variable	Total Sample (n = 402), Mean ±SD or No. (%)	Lower HL (n = 174), Mean ±SD or No. (%)	Higher HL (n = 228), Mean ±SD or No. (%)	χ^2 or t^a
Age (range = 18–69), y	43.20 ±10.78	43.21 ±10.75	43.18 ±10.82	0.026
Gender				10.56***
Female	137 (34)	44 (32.1)	93 (67.9)	
Male	265 (66)	130 (49.1)	135 (50.9)	
Race				14.91***
Non-Latino White	94 (23.4)	27 (28.7)	67 (71.3)	
African American	283 (70.4)	140 (49.5)	143 (50.5)	
Other	25 (6.2)	7 (28.0)	18 (72.0)	
Total annual household income, $				4.99*
< 10 000	276 (70.2)	128 (46.4)	148 (53.6)	
≥ 10 000	117 (29.8)	40 (34.2)	77 (65.8)	
Educational level				7.09**
< high school degree	107 (26.6)	58 (54.2)	49 (45.8)	
≥ high school degree	295 (73.4)	116 (39.3)	179 (60.7)	
Relationship status				0.072
Married or living with partner	74 (18.4)	31 (41.9)	43 (58.1)	
Not married or living with partner	328 (81.6)	143 (43.6)	185 (56.4)	
REALM score	56.13 ±12.92	46.15 (14.40)	63.74 (1.59)	-18.31***
Heaviness of Smoking Index	3.25 ±1.35	3.45 (1.38)	3.09 (1.30)	2.66**
SCQ subscales (positive outcome expectancies)				
Negative Affect Reduction	6.45 ±2.19	6.42 ±2.06	6.46 ±2.17	-0.16
Stimulation/State Enhancement	4.21 ±2.53	4.49 ±2.54	4.01 ±2.50	1.89*
Taste/Sensorimotor Manipulation	5.10 ±2.16	5.27 ±2.02	4.98 ±2.27	1.33
Social Facilitation	4.61 ±2.42	4.95 ±2.30	4.36 ±2.48	2.44*
Weight Control	3.72 ±2.68	3.91 ±2.65	3.57 ±2.71	1.26
Boredom Reduction	5.60 ±2.48	5.64 ±2.36	5.56 ±2.57	0.31
SCQ subscales (negative outcome expectancies)				
Health Risks	7.80 ±1.65	7.28 ±1.98	8.20 ±1.20	-5.70***
Craving/Addiction	6.63 ±1.87	6.33 ±1.92	6.86 ±1.81	-2.83**
Negative Physical Feeling	3.38 ±2.39	3.33 ±2.32	3.51 ±2.44	-1.22
Negative Social Impression	4.57 ±2.52	4.26 ±2.53	4.81 ±2.50	-2.18*
Smoking risk knowledge	52.08 ±5.46	51.73 ±5.81	54.15 ±4.29	-4.68***
Smoking risk perceptions				
Item 1: If you don't quit smoking for good, what are your chances of ever developing a smoking-related health problem?	6.06 ±1.44	5.75 ±1.77	6.19 ±1.30	-2.88**
Item 2: If you quit smoking for good, what are your chances of ever developing a smoking-related health problem?	4.11 ±1.89	4.06 ±2.10	4.39 ±1.84	-1.67
Item 3: Compared with other smokers, what are your chances of ever developing a smoking-related health problem if you continue smoking?	5.60 ±1.43	5.33 ±1.61	5.83 ±1.29	-3.47***
Item 4: Compared with other smokers, what are your chances of ever developing a smoking-related health problem if you quit smoking for good?	4.04 ±1.78	3.99 ±1.95	4.11 ±1.74	-0.63
Item 5: What is your perceived risk of developing at least 1 health consequence of smoking if you quit smoking for good?	54.70 ±25.00	55.60 ±25.40	52.30 ±24.50	1.31
Item 6: What is your perceived risk of developing at least 1 health consequence of smoking if you continue smoking?	70.60 ±25.00	66.20 ±26.30	76.20 ±23.00	-4.07***

Continued

TABLE 1—*Continued*

Self-efficacy to quit smoking	2.86 ±1.16	6.11 ±2.16	5.46 ±2.23	2.97**
Intention to cut down smoking	5.91 ±2.26	5.45 ±2.18	5.69 ±2.41	–1.04
Intention to limit smoking	5.99 ±2.21	5.46 ±2.14	5.71 ±2.40	–1.09
Intention to quit smoking	5.09 ±2.81	4.82 ±2.94	4.60 ±2.81	0.781

Note. HL = health literacy; REALM = Rapid Estimate of Adult Literacy in Medicine; SCQ = Smoking Consequences Questionnaire.
[a]We used the χ^2 test for categorical variables and the *t*-test for continuous variables.
*$P < .05$; **$P < .01$; ***$P < .001$.

dependence, intentions to reduce or quit smoking completely, and actual cessation, such that the endorsement of more positive than negative expectancies predicts higher nicotine dependence, lower intentions to reduce or quit smoking, and poorer cessation outcomes.[18,50] In this study, those with lower health literacy were significantly more likely to report smoking for stimulation or state enhancement and to improve social facilitation. Conversely, they reported fewer smoking-related health risks. Results revealed nonsignificant trends suggesting that smokers with lower health literacy were more likely than those with higher health literacy to report smoking to manage their weight but were less likely to believe that smoking would result in continued craving for and use of cigarettes.

Findings also indicated that those with lower health literacy reported less knowledge of smoking health risks and perceived themselves as less vulnerable to the health consequences of smoking. These results are congruent with research linking lower perceived vulnerability to smoking health risks and fewer perceived health risks to poor cessation outcomes.[19,20] Little research has investigated the relationship between health literacy and smoking; however, 1 previous study examined relations between health literacy and smoking

TABLE 2—Adjusted Multiple Regression Coefficients for Relationships Among Health Literacy and Smoking-Related Characteristics: Houston, TX

Variable	B (SE)	ΔR^2	*t*
Heaviness of Smoking Index	–0.42 (0.14)	0.022	–3.04**
SCQ subscales (positive outcome expectancies)			
Negative Affect Reduction	–0.11 (0.22)	0.001	–0.49
Stimulation/State Enhancement	–0.51 (0.27)	0.009	–1.92*
Taste/Sensorimotor Manipulation	–0.22 (0.23)	0.002	–0.94
Social Facilitation	–0.49 (0.26)	0.009	–1.94*
Weight Control	–0.51 (0.29)	0.008	–1.80[a]
Boredom Reduction	–0.13 (0.26)	0.001	-0.48
SCQ subscales (negative outcome expectancies)			
Health Risks	0.64 (0.12)	0.069	5.28***
Craving/Addiction	0.39 (0.19)	0.008	1.81[a]
Negative Physical Feeling	0.24 (0.25)	0.002	0.97
Negative Social Impression	0.27 (0.27)	0.007	1.54
Smoking Risk Knowledge (total score)	2.49 (0.54)	0.053	4.62***
Smoking risk perceptions:			
Item 1: If you don't quit smoking for good, what are your chances of ever developing a smoking-related health problem?	0.29 (0.13)	0.013	2.22*
Item 2: If you quit smoking for good, what are your chances of ever developing a smoking-related health problem?	0.20 (0.21)	0.002	0.97
Item 3: Compared with other smokers, what are your chances of ever developing a smoking-related health problem if you continue smoking?	0.54 (0.15)	0.030	3.56***
Item 4: Compared with other smokers, what are your chances of ever developing a smoking-related health problem if you quit smoking for good?	0.01 (0.19)	0.000	0.04
Item 5: What is your perceived risk of developing at least 1 health consequence of smoking if you quit smoking for good?	–0.39 (0.27)	0.005	–1.43
Item 6: What is your perceived risk of developing at least 1 health consequence of smoking if you continue smoking?	0.93 (0.26)	0.031	3.55***
Self-efficacy to quit smoking	–0.05 (0.13)	0.000	-0.38
Intention to cut down smoking	0.25 (0.25)	0.003	0.99
Intention to limit smoking	0.25 (0.25)	0.003	1.01
Intention to quit smoking	0.00 (0.30)	0.000	–0.01

Note. SCQ = Smoking Consequences Questionnaire. Analyses controlled for the following variables: age, gender, race/ethnicity, relationship status, income, education.
[a]*P* = nonsignificant trend (*P* = .07).
*$P < .05$; **$P < .01$; ***$P < .001$.

risk knowledge and attitudes among low-income pregnant smokers.[43] Results indicated that poor health literacy was associated with lower smoking risk knowledge and less negative smoking-related attitudes.

We expected that those with lower health literacy would report lower self-efficacy to quit smoking and fewer intentions to change their smoking behavior. Contrary to hypotheses, we found no group differences in self-efficacy or intentions to reduce or quit smoking completely, perhaps because 1 of the eligibility criteria for this study was that smokers not intend to quit within 30 days of study enrollment. Future research is needed to examine associations between health literacy, self-efficacy, and smoking intentions in treatment-seeking samples.

Our results indicate that men, African Americans, and those with lower education and lower income are more likely to have low health literacy. These findings are congruent with results from the 2003 National Assessment of Adult Literacy, which reported that poor health literacy was associated with male gender, racial/ethnic minority status, older age, and SES-related factors such as lower education and lower annual income.[26,32] Numerous other studies have also reported this relationship.[27,29–31] It is particularly notable that in the present study, we found that health literacy was associated with key predictors of cessation even after controlling for relevant demographic and SES-related factors (i.e., age, gender, race/ethnicity, education, income, relationship status). This provides further evidence that low health literacy may be an important and independent risk factor for poor cessation outcomes. Findings support the consideration of health literacy as an additional SES-related variable that may be important in explaining health disparities.[29,35,54]

Current methods of teaching individuals about the health risks of smoking may fail to reach individuals with poor health literacy. Thus, these findings highlight the importance of increasing awareness about the impact of low health literacy on poor health behaviors (i.e., smoking) and outcomes and improving providers' training in communicating clearly about the health risks of smoking (e.g., using simple language, one-on-one teaching, the teach-back method). Previous research has suggested that efforts be made to improve visual educational materials to include more pictures and simpler language to ensure that all patients understand, regardless of health literacy level.[31] Future studies should investigate the possible mechanisms underlying relations among health literacy, race/ethnicity, SES, smoking-related characteristics, and cessation outcomes. Developing a better understanding of these relations will be critical in informing efforts to improve providers' clear communication about the health risks of smoking. Results would be useful in informing and developing prevention and cessation strategies tailored to those with lower health literacy, thereby reducing tobacco-related health disparities for the underserved.

Limitations

Limitations include that our analyses were cross-sectional. Thus, results do not imply causality but rather demonstrate an independent association between health literacy and key predictors of smoking cessation outcomes. Longitudinal studies are needed to clarify the temporal relationship of health literacy to predictors of cessation. Also, because our sample consisted of non–treatment-seeking adult daily smokers, future research should investigate relations between health literacy and smoking in treatment-seeking smokers.

Moreover, participants were recruited only from Houston, Texas, which might limit the generalizability of these findings. Studies should attempt to replicate and extend this research in other settings. Regarding participant recruitment, because we did not use random population sampling, we were unable to calculate participant response rate. This study is also limited in its reliance on self-report measures, which can be biased and unreliable.

Conclusions

This study is the first to our knowledge to investigate associations between health literacy and established predictors of smoking cessation in a sample of low-SES, racially/ethnically diverse smokers. Even after controlling for demographics and SES-related characteristics, lower health literacy was associated with higher nicotine dependence, more positive and less negative smoking expectancies, less knowledge of smoking health risks, and lower smoking risk perceptions. These findings provide the first evidence that health literacy may serve as a unique risk factor for poor cessation outcomes, over and above well-established predictors of cessation. That is, among low-SES, racially/ethnically diverse smokers, those with lower health literacy might be at an even more elevated risk for poor cessation outcomes. ■

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Contributors

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Human Participant Protection

Procedures were approved by the institutional review board at The University of Texas MD Anderson Cancer Center.

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