Original Investigation

The early health consequences of smoking: Relationship with psychosocial factors among treatment-seeking Black smokers

Monica S. Webb & Michael P. Carey

Abstract

Introduction: Blacks suffer disproportionately from the long-term health effects of smoking. Little is known about the prevalence of the early health consequences of smoking in this population or whether psychosocial factors influence the frequency of symptoms. This study investigated the prevalence and psychosocial correlates of smoking-related physical symptoms in Black smokers.

Methods: Adult smokers ($N = 117$, 58% female, $M_{\text{age}} = 43.0$ years) who smoked at least 5 cigarettes/day completed self-administered assessments of cigarettes smoked per day, smoking duration, alcohol use, perceived stress, depressive symptoms, and smoking-related symptoms.

Results: The most frequently occurring physical symptoms were shortness of breath (66%), coughing (50%), and headaches (49%). Multivariate analyses showed that smoking history, alcohol use, perceived stress, and depressive symptoms were independently related to smoking-related symptoms, even after controlling for sociodemographic variables and medical diagnoses.

Discussion: The early health consequences of smoking appear to be common among Black smokers and can serve as a cue to action for cessation efforts. Alcohol use, stress, and depression appear to negatively influence the early health consequences of smoking and should be assessed routinely in treatment-seeking Black smokers.

Introduction

Blacks suffer disproportionately from smoking-related diseases, including cancer, stroke, and heart disease (U.S. Department of Health and Human Services [USDHHS], 1998). Although the

greater incidence and prevalence of smoking-related diseases in this population are well documented, few data are available concerning the short-term health consequences of smoking among Blacks. Research with non-Black samples suggests numerous early health consequences of smoking, for example, respiratory tract symptoms, persistent coughing, shortness of breath, wheezing, reduced respiratory functioning, bronchial irritation (Amigo, Oayrzun, Bustos, & Rona, 2006; Arday et al., 1995; Jindal & Gupta, 2004), and retinal deficiencies (Wills et al., 2008). Whether Black smokers, who tend to smoke at lower intensity levels, experience such consequences remains understudied.

Public health efforts to reduce long-term disease should begin with attention to the early health consequences of smoking because these are often precursors to more serious pathology. In addition, early symptoms may serve as “cues to action” (Abraham & Sheeran, 2005), motivating smoking cessation. Early physical symptoms associated with smoking occur in people with limited smoking histories and worsen over time (USDHHS, 1990, 1994). Arday et al. (1995) found that smoking-related symptoms, including coughing, wheezing, and shortness of breath without exercising, were greater in adolescents with a 4-year history of regular smoking than in never-smokers. Generally, the negative health consequences of smoking exhibit a dose–response relationship (Arday et al., 1995; Newcomb & Bentler, 1987).

Psychosocial factors may worsen smoking-related symptoms

Two prominent psychosocial factors have been associated with both smoking and long-term health outcomes: stress and depression (cf., Kassel, Stroud, & Paronis, 2003).

Stress. Smokers experience greater stress levels than do non-smokers (Parrott, 1999), a relationship also found among Black smokers (Romano, Bloom, & Syme, 1991; Webb & Carey, 2008).

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The elevated stress levels among urban Blacks (Ewart & Suchday, 2002) who are exposed to multiple sources of daily stress (Geronimus, 1992) also may affect the experience of smoking-related physical symptoms. Stress is an important consideration, given its relationship with disease onset and course (Harris, 2001) and cardiovascular health (Black & Garbutt, 2002).

Depression. Substantial evidence supports the association between smoking and depression. The likelihood of depression among smokers is threefold that among nonsmokers (Murphy et al., 2003). In addition, a history of depression is related to increased withdrawal symptoms (Breslau, Kilbey, & Andreski, 1992) and a reduced likelihood of cessation (Anda et al. 1990; Hall, Muñoz, Reus, & Sees, 1993). However, the relationship between depression and smoking abstinence is still under debate, with a recent meta-analysis demonstrating no relationship (Hitsman, Borrelli, McChargue, Spring, & Niaura, 2003) and research among Blacks showing a negative association (Catley et al., 2005). Among Black women, depression is associated with both smoking and high blood pressure (Artinian, Washington, Flack, Hockman, & Jen, 2006).

Alcohol use and smoking

Alcohol use also has been implicated as a correlate of smoking (e.g., Dierker et al., 2006) and as a risk factor for negative health consequences, such as cancer and cardiac disease (Schlecht et al., 1999). Alcohol use also is positively associated with smoking among Black women (Webb & Carey, 2008). Previous research has not examined the influence of alcohol use on short-term, smoking-related symptoms among Blacks.

Theoretical model

The biopsychosocial model provides a framework for examining relationships among physical symptoms and psychosocial and behavioral factors. Little is known about the interactions of these dimensions in the health status of Black smokers. Fernander, Shavers, and Hammons (2007) described a multi-causal, biopsychosocial model of tobacco use, illustrating the influences of psychosocial factors on health outcomes among smokers. This interactive model illustrates the possible mediating roles of lifestyle factors (e.g., psychological stress, alcohol use, medical diagnoses, and environmental exposure) in the association between smoking and health outcomes. Fernander et al. suggested that these factors may have systematic differences across racial and ethnic groups and, thus, contribute to tobacco-related health disparities. The model was used as a heuristic guide for the present study, which examined relationships between smoking-related physical symptoms and perceived stress, depressive symptoms, alcohol use, and smoking history (i.e., cigarettes smoked daily, smoking duration).

The present study

Much research has focused on the late health effects of smoking. However, the early effects also are important health outcomes. The present study provided a unique opportunity to estimate the short-term consequences of smoking among Black adults seeking help quitting. It also allowed investigation of how psychosocial factors influence the experience of smoking-related symptoms. Using the biopsychosocial perspective, we hypothesized that smoking-related physical symptoms would be positively associated with perceived stress, depressive symptoms,

and alcohol use. We also expected that smoking-related symptoms would be positively associated with smoking history. Exploratory analyses also examined the associations between categories of symptoms (e.g., respiratory) and perceived stress and depressive symptoms.

Increasing knowledge about the early health consequences of smoking has implications for the provision of intervention services. For example, smoking cessation programs can educate clients about these early physical effects to increase risk perceptions and encourage smoking cessation (Arday et al., 1995; Glynn, 1989). This approach may be especially important among Black smokers, for whom perceptions of personal health risk may be low (Prokhorov et al., 2003; Vander Martin, Cummings, & Coates, 1990; Webb, Francis, Hines, & Quarles, 2007). Menthol smokers, in particular, may have lowered risk perceptions due to the concealing of medical symptoms (Garten & Falkner, 2003).

Methods

Participants and data collection

Participants were part of a larger clinical trial that is testing the efficacy of a cognitive-behavioral smoking cessation intervention (plus nicotine patch therapy) among Black smokers. Black smokers were recruited via newspaper ads, flyers, community health clinics, and word of mouth. Data for the present study were from the baseline assessment of 117 smokers who attended the orientation session for the clinical trial. Participants were eligible if they (a) self-identified as Black, (b) currently smoked at least 5 cigarettes/day, (c) were aged 18–65 years, (d) were able to read fifth-grade English, (e) could attend clinic cessation sessions (bus tokens were provided), (f) had a minimum breath carbon monoxide level of 8 ppm, and (g) were interested in quitting smoking. Participants currently receiving cessation treatment, those who were pregnant or breastfeeding, or those diagnosed with an acute cardiac or respiratory condition were excluded. All participants provided written informed consent. The study was approved by the institutional review board at Syracuse University. Participants completed the self-administered assessments used in the present study during the orientation session.

Measures

Demographics. A brief survey assessed race, ethnicity, gender, age, marital status, education, and yearly household income. Household income was measured on a 10-point scale, ranging from 1 (less than US\$10,000) to 10 (more than \$90,000). Participants' highest level of education was measured on an 8-point scale, ranging from elementary school to postgraduate degree.

Smoking history. The smoking history instrument assessed smoking intensity in cigarettes per day, smoking duration, and nicotine dependence. Dependence was measured with the Fagerström Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerström, 1991).

Medical diagnosis. Participants reported whether they had been diagnosed with a medical problem. They responded to the following question (coded 1 for yes or 0 for no): "Have you been told that you have a medical problem?" If yes, participants reported the name of the problem (not used in data analyses).

Smoking-related physical symptoms. A modified version of the Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1982) assessed smoking-related symptoms. The PILL is a reliable and valid measure of 54 common physical symptoms and sensations. The 22 symptoms selected from the measure were those related to smoking behavior. Subscales were formed to assess categories of symptoms including respiratory (sneezing spells, running nose, congested nose, bleeding nose, asthma or wheezing, coughing, out of breath, choking sensations, lump in throat, eyes water, and sore throat), gastrointestinal (upset stomach, heart burn, constipation, diarrhea, and nausea), cardiovascular (chest pains, racing heart), and vestibular balance, sleep, and tension (insomnia, headaches, dizziness, and feel faint). Participants indicated how often they experienced each symptom, using the following frequency metric: 0 (have never or almost never experienced), 1 (less than three or four times per year), 2 (every month or so), 3 (every week or so), or 4 (more than once every week). The total score, indicating the degree of smoking-related symptoms, and the subscale total scores were used in the analysis. The internal consistency of the measure in the present study was .87 (full scale), .79 (respiratory), .74 (gastrointestinal), .67 (cardiovascular), and .67 (vestibular balance, sleep, and tension).

Depressive symptoms. The Center for Epidemiological Studies Depression Scale (Radloff, 1977) assessed the frequency of depressive symptoms. This 20-item instrument has established reliability and validity (Radloff, 1977) and has been used in research with Blacks (e.g., Foley, Reed, Mutran, & DeVellis, 2002; Williams & Adams-Campbell, 2000). Depressive symptoms were rated on a 4-point scale: 0 (rarely or none of the time), 1 (some or a little of the time), 2 (occasionally or a moderate amount of time), and 3 (most or all the time). The total score represented the degree of symptoms. This measure demonstrated good internal consistency ($\alpha = .82$) in the present sample.

Perceived stress. The 10-item version of the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983; Cohen, Kessler, & Gordon, 1995) assessed the extent to which participants perceived events or circumstances in their lives as stressful within the past 2 weeks. Response options were rated on a 5-point scale: 0 (never), 1 (almost never), 2 (sometimes), 3 (fairly often), and 4 (very often). Scores on the scale ranged from 0 to 40. Higher scores indicated higher levels of perceived stress. This widely used measure has been shown to be reliable and valid, and it demonstrated good internal consistency ($\alpha = .77$) in the present sample.

Alcohol use frequency. One alcoholic beverage was considered to be a 12-ounce beer or wine cooler, 6 ounces of malt liquor, 5 ounces of wine, or 1.5 ounces of hard liquor. Participants reported the frequency of consuming at least one alcoholic beverage during the past week with one item: "During the past week, on how many days did you drink any alcoholic beverages?"

Data analyses

Summary statistics were computed (i.e., means and percentages). Bivariate relationships were examined between smoking-related physical symptoms and the set of demographic, smoking history, medical history, alcohol use, and psychosocial variables.

Hierarchical multiple regression was used to test for independent associations between smoking-related symptoms (full scale and each subscale) and smoking history, alcohol use, perceived stress, and depressive symptoms. Demographics and medical history were entered in the first block, smoking history and alcohol use frequency were entered in the second block, and depressive symptoms and perceived stress were entered in the third block. We were interested in the change in *R*-squared after controlling for demographics and medical history. We also assessed multivariate multicollinearity by examining the tolerance statistic for each predictor variable. Tolerance estimates indicated that multicollinearity was not problematic. Alpha was set at .05 for all analyses.

Results

As depicted in Table 1, the sample was mostly women (58%), with an average age of 43 years, and most participants were single (65%). Nearly all (86%) completed at least high school. Three-quarters of the sample had an income of less than \$30,000; modal household annual income was \$10,000–\$20,000. On average, participants smoked 13 cigarettes/day for 22 years, and they were moderately nicotine dependent. Approximately one-half of participants had been diagnosed with a medical problem. Levels of perceived stress and depression were moderate ($M = 18$ and 24.7 , respectively). Alcohol use frequency during the previous week was relatively infrequent ($M = 0.78$, $SD = 1.07$).

The bivariate correlations of demographic, medical history, smoking history, alcohol use, and psychosocial variables with smoking-related symptoms are shown in Table 1. None of the demographic variables were correlated with smoking-related symptoms; however, physical symptoms were associated with (a) having a medical diagnosis, (b) smoking more cigarettes per day, (c) nicotine dependence, (d) greater depressive symptoms, (e) greater perceived stress, and (f) more frequent drinking.

Table 2 shows the prevalence of specific smoking-related symptoms in the sample and their correlations with depressive symptoms and perceived stress. Overall, 87% of the sample reported having at least one physical smoking-related symptom monthly. The most frequently reported symptom was breathlessness (66%), followed by coughing (50%), headaches (49%), watering eyes (45%), and congested nose (41%). The least reported symptoms were bleeding nose and lump in throat. Depressive symptoms were positively correlated with several individual symptoms, such as dizziness ($r = .39$), running nose ($r = .36$), racing heart ($r = .33$), and feeling faint ($r = .32$). Perceived stress was positively correlated with symptoms such as chest pains ($r = .35$), racing heart ($r = .30$), dizziness ($r = .27$), and headaches ($r = .20$).

Multivariate correlates of smoking-related symptoms

Table 3 depicts the hierarchical regression model for smoking-related symptoms. The model explained 42% of the variance in physical symptoms ($p < .001$). The first step of the model, which accounted for 14% of the variance in physical symptoms ($R^2 = .14$, $F(5, 111) = 3.58$, $p = .005$), included demographics and history of medical diagnosis. Two factors explained significant variance: age ($p = .02$) and having a medical diagnosis ($p < .001$).

Table 1. Sample characteristics and bivariate correlations with smoking-related symptoms ($N = 117$)

Characteristic	<i>M</i>	<i>SD</i>	Possible range	Observed range	Correlation with smoking-related symptoms
Demographics					
Age	43.0	10.3	18–65	18–65	–.08
Smoking history					
Rate (cigarettes/day)	13.0	8.2	1–	1–40	.19*
Duration (years smoked)	22.0	11.2	0–	0–50	.09
Nicotine dependence	4.5	2.0	0–11	0–8	.24*
Psychosocial characteristics					
Depressive symptoms	24.7	9.7	0–60	5–53	.46**
Perceived stress	18.0	6.6	0–40	3–33	.22**
Alcohol use frequency (days per week)	0.78	1.07	0–7	0–5	.22**
	Number of subjects	Percent			Correlation with smoking-related symptoms
Demographics					
Gender (percent female)	68	58			–.02
Marital status (percent single)	75	65			.02
Education (percent high school)	100	86			.08
Annual household income ($n = 107$)					–.10
<\$10,000	43	41			
\$10,000–\$20,000	23	21			
\$20,001–\$30,000	15	14			
\$30,001–\$40,000	11	10			
>\$40,001	15	14			
Medical background					
Medical illness diagnosed (percent yes)	57	49			.33**

Note. * $p < .05$ (two tailed); ** $p < .01$ level (two tailed).

Level of education, household income, and gender were not associated with smoking-related symptoms.

We hypothesized that after controlling for demographics and medical diagnosis history, smoking history, alcohol use frequency, and psychosocial factors would be independently related to smoking-related symptoms. As shown in Table 3, smoking history and alcohol use accounted for unique variance in smoking-related symptoms ($R^2 \Delta = .19$, $F(3, 108) = 10.00$, $p < .001$). Smoking a greater number of cigarettes per day and more years of smoking were associated with greater symptoms. Alcohol use frequency also demonstrated a positive association with symptoms. As expected, psychosocial factors explained significant variance in symptoms beyond that explained by demographics, medical diagnosis, smoking history, and alcohol use ($R^2 \Delta = .10$, $F(2, 106) = 8.92$, $p < .001$). Specifically, there were positive relationships between smoking-related symptoms and (a) perceived stress and (b) depression.

Bivariate and multivariate analyses explored the relationships between psychosocial factors and the categories of smoking-related symptoms. As shown in Table 4, perceived stress was positively correlated with gastrointestinal symptoms and cardiovascular symptoms. Stress was unrelated to respiratory symptoms and vestibular balance, sleep, and tension symptoms. Depressive symptoms were positively correlated with all four subscales of the PILL. Exploratory multivariate analyses investigated the independent relationships between psychosocial factors and categories of smoking-related symptoms (i.e.,

respiratory, gastrointestinal, cardiovascular, and vestibular balance, sleep, and tension subscales). Of interest was the change in R -squared after controlling for demographics, medical history, smoking history, and alcohol use. Neither perceived stress nor depressive symptoms were associated with respiratory complaints. The combination of perceived stress and depressive symptoms, however, accounted for significant variance in gastrointestinal ($R^2 = .06$, $F(2, 106) = 3.95$, $p = .02$), cardiovascular ($R^2 = .09$, $F(2, 106) = 7.01$, $p = .001$), and vestibular balance, sleep, and tension symptoms ($R^2 = .05$, $F(2, 106) = 3.92$, $p = .02$). Perceived stress was independently associated with cardiovascular symptoms, whereas depressive symptoms were associated with vestibular balance, sleep, and tension symptoms.

Discussion

The present study is the first to our knowledge to examine the prevalence and psychosocial correlates of smoking-related physical symptoms among Black smokers. Several findings emerged. First, as expected, we found ample evidence of early health consequences of smoking. Upper and lower respiratory symptoms were the most frequently reported. Shortness of breath was the most prevalent symptom, followed by coughing, headaches, and watering eyes. This finding is consistent with previous research, which found high rates of similar symptoms in primarily White smokers (Arday et al., 1995; Prokhorov et al., 2003).

Table 2. Prevalence of smoking-related symptoms and correlations with depressive symptoms and perceived stress (*N* = 117)

Symptom	Frequency		Depressive symptoms	Perceived stress
	Number of subjects	Percent	<i>r</i>	<i>r</i>
Breathlessness	78	66%	.31**	.13
Coughing	59	50%	.11	-.04
Headaches	57	49%	.24**	.20*
Eyes water	52	45%	.23*	.11
Congested nose	48	41%	.27**	.09
Running nose	44	38%	.36**	.21*
Insomnia	44	38%	.11	-.10
Heart burn	40	34%	.16	.15
Dizziness	39	33%	.39**	.27**
Sneezing spells	34	29%	.11	.05
Racing heart	34	29%	.33**	.30**
Upset stomach	34	29%	.30**	.18
Chest pains	33	29%	.30**	.35**
Constipation	32	27%	.19	.09
Diarrhea	28	24%	.19	.19
Asthma or wheezing	25	21%	.04	.01
Choking sensations	23	20%	.20*	.11
Nausea	2	18%	.23*	.17
Feel faint	20	17%	.32**	.17
Sore throat	20	17%	.16	.03
Lump in throat	9	8%	.29**	.16
Bleeding nose	4	7%	.24*	.20*

Note. All symptoms were reported at least monthly.

p* < .05; *p* < .01.

Examining the early health consequences of smoking among Blacks is important because this population suffers disproportionately from smoking-related morbidity and mortality (USDHHS, 1998). Compared with other racial and ethnic groups, Black smokers tend to be less successful at achieving cessation

Table 3. Final hierarchical regression model for predicting smoking-related symptoms

Block	Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i> value
1	Age	.33	.14	2.40	.02*
	Education	1.21	.70	1.72	.09
	Household income	-.04	.51	-.09	.93
	Gender	-.12	1.90	-.07	.95
	Medical diagnosis	7.43	1.75	4.24	<.001*
2	Cigarettes smoked per day	.29	.12	2.44	.02*
	Years of daily smoking	.31	.13	2.49	.01*
3	Alcohol use frequency	2.54	.91	2.79	.006*
	Perceived stress	.37	.17	2.14	.04*
	Depressive symptoms	.43	.12	3.49	.001*

Note. Model $R^2 = .42$.

**p* < .001.

Table 4. Bivariate and hierarchical regression coefficients for associations between symptom categories and psychosocial factors

Symptom category	Perceived stress		Depressive symptoms	
	<i>r</i>	<i>B</i> (<i>SE</i>)	<i>r</i>	<i>B</i> (<i>SE</i>)
Respiratory symptoms	.15	-.02 (.07)	.34**	.14 (.07)
Gastrointestinal symptoms	.21*	.07 (.06)	.30**	.07 (.04)
Cardiovascular symptoms	.37**	.09 (.03)*	.37**	.02 (.02)
Vestibular balance, sleep, and tension symptoms	.16	-.01 (.06)	.37**	.10 (.04)*

Note. The *r* values are for bivariate correlations; all models examined the independent effects of perceived stress and depressive symptoms after accounting for age, education, income, gender, medical diagnosis, daily cigarettes, smoking duration, and alcohol use frequency.

p* < .05; *p* < .01.

(Novotny, Warner, Kendrick, & Remington, 1988), and they report less concern about the negative health effects of smoking (Vander Martin et al., 1990). Attenuated concerns may reflect masked symptoms due to use of menthol cigarettes (Garten & Falkner, 2003) or other health priorities or concerns. Research among White smokers suggests that smokers who believe their symptoms are smoking related are more motivated to quit than are those who do not (Coleman, Barrett, Wynn, & Wilson, 2003). Thus, interventions designed for Black smokers might emphasize early physical symptoms to increase readiness to quit smoking (Prokhorov et al., 2003).

Second, we observed significant associations between smoking-related physical symptoms and smoking history. As expected, the frequency of symptoms was associated with smoking a greater number of cigarettes per day and a longer smoking history. Previous research also has found dose-response relationships (Arday et al., 1995; Newcomb & Bentler, 1987), suggesting that the early negative effects are most evident among people who have more intense smoking patterns.

Third, the results supported a priori hypotheses that smoking-related symptoms would be related to greater perceived stress, more depressive symptoms, and more frequent alcohol use. As predicted, perceived stress was associated with smoking-related symptoms. The model described by Fernander et al. (2007) was used as a heuristic guide for the present study. The model suggests that smoking-related health outcomes are related to multilevel factors, including psychological distress. Moreover, the interactions between race and these factors may contribute to health disparities. Minority health theories suggest that Blacks have a greater stress burden, placing them at greater risk of poorer health outcomes compared with their nonmarginalized counterparts (e.g., Allison, 1998; Meyer, 2003). Black smokers are known to experience elevated levels of daily stress (Ewart & Suchday, 2002; Romano et al., 1991), which appear to affect the frequency of smoking-related symptoms.

Depressive symptoms also were associated with physical symptoms in this sample of smokers. Arday et al. (1995)

suggested that smoking-related symptoms may indicate concurrent mental health concerns. Symptoms of depression were a stronger predictor of physical symptoms than was perceived stress. Although a larger body of literature supports the negative health impact of perceived stress, major depression can be a debilitating condition, and even minor depression is associated with poorer physical health (McCollum, Ellis, Regensteiner, Zhang, & Sullivan, 2007). Depression also has a robust association with smoking in the general population (Murphy et al., 2003), and it is related to lower likelihood of smoking cessation (e.g., Hall et al., 1993). Thus, depressive symptoms can be an important factor in the manifestation of physical symptoms in Black smokers.

Fourth, alcohol use frequency was positively associated with smoking-related symptoms. It is interesting that this association emerged, even though most participants were light drinkers. The finding that symptoms were more prevalent among the regular drinkers suggests that frequent alcohol use may be a risk factor for physical symptoms among Black smokers. Research has not examined the influence of comorbid drinking and smoking on physical health symptoms in this population. However, heavy smoking is related to greater smoking-related symptoms among alcoholics (York & Hirsch, 1995) and to smoking-related diseases such as cancer (Schlecht et al., 1999). Longitudinal evidence indicates that the frequency of alcohol use is predictive of health deterioration (Steinhausen, Eschmann, Heimgartner, & Winkler Metzke, 2008).

Perceived stress and depression are related to physical health effects (e.g., insomnia and gastrointestinal distress), irrespective of smoking status. Edwards, Hersherberger, Russell, and Markert (2001) also found that physical symptoms measured by the PILL were associated with mental health and stress. Given that the overall PILL measure was significantly correlated with perceived stress and depressive symptoms, we anticipated that relationships also would exist with individual symptoms. Indeed, this was the case. However, a notable number of specific symptoms were unrelated to these psychosocial factors. Thus, we also explored relationships between psychosocial factors and categories of smoking-related symptoms. The combination of perceived stress and depressive symptoms was associated with gastrointestinal, cardiovascular, and vestibular balance, sleep, and tension symptoms. However, independent relationships were found only between perceived stress and cardiovascular symptoms and between depressive symptoms and vestibular balance, sleep, and tension symptoms. This finding suggests that the model using the full PILL measure best captured the association between psychosocial factors and smoking-related symptoms.

Because many adults will be diagnosed with a smoking-related chronic illness, evidence of early health problems is a public health concern. Previous research has found an independent association between tobacco smoking and health decline (Kertesz et al., 2007). Moreover, smoking is an important predictor of illness and death among people with "harder" drug dependencies (e.g., Hurt et al., 1996), and almost one-quarter of our participants reported being in recovery from other drug addictions.

These findings should be interpreted in light of study strengths and weaknesses. Strengths of the present study are the

sampling of Black smokers, a group that has been underinvestigated. This gap in the literature is unfortunate because Blacks suffer disproportionately from smoking-related diseases. A second strength is use of a biopsychosocial framework to examine relationships between psychosocial (e.g., depression and stress) and biological (e.g., physical symptoms) factors in the context of smoking. Limitations of the study include use of a convenience sample of smokers enrolled in a smoking cessation trial. Thus, these findings may not generalize to smokers not seeking help quitting. Nonetheless, research with smokers who are motivated to quit is important because these are the people who are most amenable to change. Also, the study was cross-sectional in design, which precludes causal inferences. Longitudinal assessment of symptoms would allow discernment of the temporal ordering of these relationships. In addition, anxiety, coping, and emotional support are relevant factors that the present study did not assess. These measures should be included in future studies. Finally, the limitations of self-report data (e.g., social desirability, memory constraints) must be recognized.

Notwithstanding the limitations of this study, its findings can inform treatment plans for Black smokers interested in quitting. Treatments based on the biopsychosocial model aim not only to reduce symptoms but also to improve functioning across these domains (Aitken, 1987). Stress, depression, and alcohol use are modifiable factors that can be managed through established cognitive-behavioral intervention techniques. Future research should test whether attending to these psychosocial factors in Black smokers reduces the prevalence of smoking-related physical symptoms.

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Declaration of Interests

None declared.

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