ORIGINAL INVESTIGATION

Depressive Symptoms Among Heavy Cigarette Smokers: The Influence of Daily Rate, Gender, and Race

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ABSTRACT

Introduction: Cigarette smokers experience higher levels of depressive symptoms and are more likely to be diagnosed with depressive disorders than nonsmokers. To date, the nature of the smoking–depression relationship has not been adequately studied among heavy smokers, a group at elevated risk for poor health outcomes. In this study, we examined depressive symptom expression among heavy smokers while considering the moderating roles of smoking status, gender, and race. We also explored whether amount of tobacco usually consumed had an impact.

Methods: We extracted data from a large, highly nicotine-dependent, nontreatment cigarette smoking study sample ($N = 6,158$). Participants who consented were screened for major exclusions, and they completed questionnaires.

Results: Smokers reported a higher, clinically meaningful level of depressive symptoms relative to nonsmokers (27.3% of smokers vs. 12.5% of nonsmokers) scored above the clinical cutoff on the Center for Epidemiological Studies Depression (CES-D) scale ($p < .001$), which differed among race $\times$ gender subgroups. Further, amount of daily intake was inversely associated with self-report of depressive symptoms. For every 10-cigarette increment, the likelihood of scoring above the CES-D clinical cutoff decreased by 62% ($p < .0001$).

Conclusions: These findings improve our understanding of tobacco's influence on depressive symptom expression among heavy smokers, with implications for tailoring evidence-based tobacco treatments.

INTRODUCTION

Considerable research has documented that relative to non-smokers, cigarette smokers are more likely to be diagnosed with depressive and other psychiatric disorders, are at increased risk for suicide, and report higher levels of depressive and other psychological symptoms (Glassman et al., 1990; Kiviniemi, Orom, & Giovano, 2011; Klungsoyr, Nygard, Sorensen, & Sandanger, 2006; Lasser et al., 2000; Scherrer et al., 2012; Sung, Prochaska, Ong, Shi, & Max, 2011; Trosclair & Dube, 2010). Various explanations have been proposed to account for this relationship. Some evidence indicates that those who experience elevated levels of distress use tobacco as a self-medication or coping strategy (Glassman et al., 1990; Khantzian, 1997; Munafò & Araya, 2010; Pomerleau & Pomerleau, 1991). Other literature suggests that chronic tobacco exposure increases susceptibility to depression and distress, both for those who smoke (Breslau, Novak, & Kessler, 2004; Carmody, 1989; Pomerleau & Pomerleau, 1984) and for those who are exposed to second-hand smoke in the home or workplace (Bandiera et al., 2010).

Research on tobacco use among psychiatric outpatients has similarly demonstrated increased expression of depressive symptoms (Leventhal, Kahler, Ray, & Zimmerman, 2009). Finally, depression and smoking may share underlying liabilities (environmental, genetic, social), increasing the risk for both disorders (Dierker, Avenevoli, Stolar, & Merikangas, 2002; Hughes & Hatsukami, 1986; Kendler et al., 1993; McCaffery, Stanton, Papandonatos, Lloyd-Richardson, & Niaura, 2008). Johnson, Rhee, Chase, and Breslau (2004) concluded that a correlated liabilities model, which argues that smoking and depression are influenced by genetic and/or environmental factors that are correlated across these conditions, offers the best fit for understanding the association between depression and tobacco use.

Presentation with significant depressive symptoms requires attention by health care providers, given the adverse impact on well-being and health outcomes. In addition, treatment for nicotine dependence may be compromised by the presence of depressive symptoms due to the deleterious impact on motivation, self-efficacy, and treatment compliance. Indeed, considerable evidence has documented poorer tobacco

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treatment outcomes for those reporting higher levels of depressive or other psychological symptoms (Berlin & Covey, 2006; Cinciripini et al., 2003; Kinnunen, Doherty, Militello, & Garvey, 1996; McClave et al., 2009; Niaura et al., 2001; Sung et al., 2011). Even when successful in achieving abstinence, relapse risk is elevated for depressed individuals (Perez, Nicolau, Romano, & Laranjeira, 2008).

A corollary issue concerns the roles of race and gender in moderating the smoking–depression relationship. Various lines of evidence converge to suggest the importance of these factors. For example, it has been established that African American (AA) smokers uptake and metabolize nicotine more efficiently than European Americans (EA), and generally consume less tobacco overall (Benowitz et al., 1999; Caraballo et al., 1998; Moolchan, Franken, & Jaszyna-Gasior, 2006; Pérez-Stable, Herrera, Jacob, & Benowitz, 1998). As a result, African American smokers may be more susceptible to a variety of tobacco-related effects, including the exacerbation of depressive symptoms. Women are considered to be at increased risk for being diagnosed with depressive disorders, a liability that may serve to intensify the depression-inducing effects of tobacco use (Husky, Mazure, Paliwal, & McKee, 2008; Kessler, 2006; Massak & Graham, 2008). Others have observed related but more complex relationships (Glassman et al., 1990; Korhonen et al., 2007; Pomerleau et al., 2005).

Another line of research indicates that nicotine may have an antidepressant effect. Available animal research supports this position (Popik et al., 2005; Tizabi et al., 1999; Tizabi, Getachew, Rezvani, Hauser, & Overstreet, 2009; Vazquez-Palacios, Hernandez-Gonzalez, Guevara-Perez, & Bonilla-Jaime, 2010). Limited human research has confirmed these effects as well (Salin-Pascual, Rosas, Jimenez-Genchi, Rivera-Meza, & Delgado-Parra, 1996; Vieyra-Reyes, Venebra-Munoz, Rivas-Santiago, & Garcia-Garcia, 2009). Thus, both chronic and acute effects of smoking/nicotine exposure may play a role in the ultimate expression of depressive symptoms among smokers. Available evidence from community samples of smokers have generally found a positive association between daily smoking rate and both the likelihood of depressive disorders and level of depressive and other psychiatric symptom expression, which seems contrary to the findings indicating an antidepressant effect with increased intake. However, previous work often has included smokers whose usage spanned light to heavy patterns (Epstein, Induni, & Wilson, 2009; Fergusson, Goodwin, & Horwood, 2003; Lawrence, Mitrou, Sawyer, & Zubrick, 2010; Lekka, Lee, Argyriou, Beratis, & Parks, 2007; Leventhal, Zvolensky, & Schmidt, 2011; Payne et al., 1991; Pedersen & Von, 2009; Strong et al., 2010). It is possible that the inclusion of low-rate smokers has masked the effects for heavy smokers, that is, those who possess an elevated level of addiction liability may be more susceptible to mood altering and related effects (Cui, Seneviratne, Gu, & Li, 2012; Johnson et al., 2004; Li, 2006). To date, evidence addressing this issue is generally lacking.

Thus, the manifestation of depressive symptoms among smokers may be more complex than previously considered. While direct pharmacological effects are highly likely, it is conceivable that subpopulation and moderator effects are operative but not adequately studied. This study is unique in its exploration of the cigarette smoking–depression relationship specifically among heavy smokers, while considering the moderational roles of smoking status, race, and gender. We also examined the potential role of the amount of daily tobacco use.

First, we hypothesized that heavy smokers would present with elevated and clinically meaningful levels of depressive symptoms relative to nonsmokers, consistent with previous research. Second, this association should be moderated by both race and gender, that is, female gender and AA race were expected to be associated with increased risk for reporting elevated levels of depressive symptoms. Finally, we examined whether the usual, daily level of tobacco consumption influenced the degree of depressive symptom expression among our heavy user sample. Higher levels of tobacco use were expected to yield a greater antidepressant effect, thus serving to reduce depressive symptom expression. We examined these issues in a community-based nontreatment sample in an effort to reduce the likelihood that quit motivation or efforts would influence findings.

METHODS

Participants

Data were extracted from the records of individuals enrolled in a large genetic study of nicotine dependence conducted by our group during 1999–2012 (procedures associated with the genetic component are not reported here). This study received institutional review board approval from all participating institutions. Selection criteria included minimum age of 18, EA or AA race, negative history for substance use other than nicotine and alcohol over the past 12 months, and no history of diagnosis for any serious mental disorder, for example, schizophrenia, other psychosis, or severe cognitive problems (e.g., dementia, Alzheimer's disease). In addition to the general criteria above, smokers were required to report daily cigarette use for at least the past 5 years, a daily rate of at least 20 cigarettes during the past 12 months, and produce an expired CO level ≥ 8 ppm. Nonsmoker controls also met the general criteria and reported having smoked 1–399 cigarettes in lifetime, had no history of regular use of any other tobacco product, had not used any tobacco treatment medications in the past year, and produced an expired CO level of < 8 ppm.

Measures

Questionnaires administered covered a broad range of topics related to the goals of the main project. For this study, the following measures were selected: (a) demographic characteristics including age, employment status, income, education level, marital status, gender, and race; (b) Center for Epidemiological Studies Depression (CES-D) scale (Radloff, 1977), a 20-item measure that assesses primarily nonvegetative symptoms of depression (sum of items rated from 0 [*rarely or none of the time*] to 3 [*most or all of the time*], $\alpha = 0.95$; sample items: “I felt depressed” and “I talked less than usual”); (c) Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991), a commonly used instrument to measure key aspects of nicotine dependence (total score range = 0–10, $\alpha = 0.75$); (d) average cigarettes smoked per day (CPD) over the past year; (e) maximum lifetime CPD; (f) current desire to quit, rated 0–10; (g) current confidence to quit, rated 0–10; (h) the Minnesota Nicotine Withdrawal Scale (Hughes & Hatsukami, 1986), which includes ratings of the intensity of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 1994), nicotine withdrawal symptoms (sum of eight items rated 0 [*not*

at all] to 4 [severe], $\alpha = 0.95$); (i) current tobacco use by spouse (yes/no), friends (rated 0–5 based on percentage who use), and household members (rated 0–4 based on number of members who use); and (j) current alcohol use (yes/no).

Procedure

Recruiters approached individuals in medical outpatient clinics, community centers, and shopping malls. Most participants resided in central Mississippi, with the remainder from Tennessee, Arkansas, and Texas. Those agreeing to participate were screened for major exclusions, provided informed consent, and completed questionnaires either on paper or a touch-screen laptop running a custom Microsoft Access application requiring approximately 45 min. Individuals were mailed a \$25 check for their participation.

Statistical Analysis

Preliminary examination of demographic data was conducted using univariate analysis. Differences in CES-D score and other continuous measures were tested using Student's *t* test with respect to smoking status or analysis of variance when multiple factors were considered. Due to its skewed distribution and consistent with accepted scoring guidelines, the CES-D was dichotomized with a score of 16 or greater indicating a possible clinical depression (Radloff, 1977). The association between smoking status and CES-D categories was investigated using multiple logistic regression, adjusting for demographic characteristics (age, gender, race, education level, income, employment, and marital status), tobacco use by others, and alcohol consumption in a stepwise manner (Hosmer & Lemeshow, 2000). Other associations between CES-D score and tobacco use measures were explored using Pearson correlation analyses. Separate logistic regressions were performed for race $\times$ gender subgroups to identify differential associations with depressive symptoms for all participants and smokers only. $p < .05$ was considered to be significant. All statistical analyses were conducted using SAS 9.2 software (Cary, NC).

RESULTS

Sample Characteristics

A total of 6,158 participants were included in this study, with 3,219 smokers (52%) and 2,939 nonsmokers (48%). For the entire sample, 55% were female, 66% AA race, mean age was 43.3 ($SD = 13.7$) years, 65% were full-time employed, 36% had post high school education, 56% earned less than \$30,000 annually, 45% were married and 36% single, and 66% reported no current alcohol consumption (of those who did consume alcohol, 79.3% averaged 1–3 drinks per week, 19.5% averaged 4–21 drinks per week, and 1.2% averaged more than 21 drinks per week). AA and EA participants were similar with regard to age and educational achievement. Compared with EAs, AAs were more likely to be full-time employed, but less likely to be married, use alcohol, or report smoking among others (friends, spouse/partner, household members; all p values $< .0001$). Average CES-D score for all participants was 7.8 ($SD = 11.0$) and was significantly higher for EAs (9.7, $SD = 12.1$) than for AAs (6.8, $SD = 10.3$), $p < .0001$.

As shown in Table 1, nonsmokers of both races were more likely to be female, achieve greater than high school education, were less likely to have a spouse/partner who smoked, have other smokers in the home, indicate half or more friends who smoke, or use alcohol. EA nonsmokers were more likely to be married and earn \$30,000 or more per year than EA smokers. AA smokers were slightly older than nonsmokers, while the reverse was true for EA smokers.

Among smokers ($N = 3,219$), mean CPD was 25.8 ($SD = 6.5$), mean FTND was 8.3 ($SD = 1.4$), mean age at smoking onset was 18.8 ($SD = 3.4$), 25% had a partner or spouse who smoked, 28% lived with other smokers, and 20% reported that half or more friends used tobacco (Table 2). AA smokers started smoking later ($p < .0001$) and smoked fewer cigarettes daily ($p < .001$) than EAs but produced higher FTND scores ($p < .0001$). AA smokers were less likely to use alcohol ($p < .0001$) and reported fewer friends and family members who smoked (p values $< .0001$).

Table 1. Comparison of Descriptive Characteristics Across African American (AA) and European American (EA) Smokers and Nonsmokers

Characteristics	AA sample			EA Sample		
	Smokers ($N = 2,130$)	Nonsmokers ($N = 1,939$)	p value	Smokers ($N = 1,089$)	Nonsmokers ($N = 1,000$)	p value
Female	48.9	58.1	$<.001$	55.1	63.8	$<.001$
Post high school education	32.3	36.3	$<.001$	33.2	47.3	.007
Married	42.1	43.4	.398	40.4	57.2	$<.001$
Income \$30K or more	41.6	42.6	.537	36.6	59.9	$<.001$
Full-time employed	69.3	68.9	.761	53.1	58.5	.127
Spouse/partner smoker	20.8	3.6	$<.001$	33.4	5.8	$<.001$
Other smokers in home	21.5	6.2	$<.001$	40.9	9.3	$<.001$
50% or more friends smoke	14.5	3.5	$<.001$	30.5	4.4	$<.001$
Current alcohol use	39.2	21.6	$<.001$	49.0	30.6	$<.001$
Age	43.6 (12.6)	42.3 (14.3)	.002	42.5 (12.8)	45.4 (15.4)	$<.001$
CES-D score	8.5 (11.7)	4.8 (08.0)	$<.001$	12.3 (13.1)	7.0 (10.1)	$<.001$

Note. CES-D = Center for Epidemiological Studies Depression.

Data are reported as percent (%) for categorical variables and M (SD) for continuous variables.

Table 2. Tobacco Use Characteristics Among African American (AA) and European American (EA) Smokers

Characteristics	All smokers (<i>N</i> = 3,214)	AA Smokers (<i>N</i> = 2,128)	EA Smokers (<i>N</i> = 1,086)	<i>p</i> value (AA vs. EA)
Cigarettes/day	25.8 (6.5)	25.5 (6.1)	26.3 (7.2)	.010
FTND score	8.3 (1.4)	8.5 (1.2)	8.0 (1.8)	<.001
Age smoking onset	18.8 (3.4)	19.0 (3.1)	18.4 (4.0)	<.001
Spouse/partner smoker	25.1	20.8	33.4	<.001
Other smokers in home	28.1	21.5	40.9	<.001
50% or more friends smoke	19.9	14.5	30.5	<.001
Current alcohol use	42.5	39.2	49.0	<.001

Note. FTND = Fagerström Test for Nicotine Dependence.

Data are reported as percent (%) for categorical variables and *M* (*SD*) for continuous variables.

Smoking Status and CES-D Score

Smokers presented with higher overall CES-D scores relative to nonsmokers, 9.8 (*SD* = 12.3) versus 5.6 (*SD* = 8.8), $p < .001$. When we examined CES-D scores based on categorical ranges, fewer smokers scored 0 (39.0% vs. 46.1%), whereas more smokers scored ≥ 16 (27.3% vs. 12.5%; $OR = 2.63$, 95% CI: 2.30–3.01; $p < .0001$). Logistic regression adjusting for age, gender, race, education level, income, employment, and marital status attenuated the association only slightly ($OR = 2.41$, 95% CI: 2.09–2.78; $p < .0001$). The final model, which included additional adjustments (smoking by others, alcohol consumption), remained significant ($OR = 1.42$, 95% CI: 1.21–1.67; $p < .0001$).

When considering smokers only, CES-D ≥ 16 was positively associated with age ($OR = 1.27$ for every 10 years increment, 95% CI: 1.17–1.37; $p < .0001$), 50% or more friends using tobacco ($OR = 2.20$, 95% CI: 1.61–3.02; $p < .0001$), household members using tobacco ($OR = 1.70$, 95% CI: 1.33–2.16; $p < .0001$), spouse or partner using tobacco ($OR = 1.65$, 95% CI: 1.29–2.12; $p < .0001$), and use of alcohol ($OR = 3.41$, 95% CI: 2.80–4.14; $p < .0001$; Table 3). Full-time employment ($OR = 0.51$, 95% CI: 0.41–0.64; $p < .0001$), household annual income $> \$30,000$ ($OR = 0.68$, 95% CI: 0.51–0.89; $p < .005$), education beyond high school ($OR = 0.67$, 95% CI: 0.53–0.83; $p < .0005$), and being married ($OR = 0.34$, 95% CI: 0.27–0.44; $p < .0001$) were negatively associated with CES-D ≥ 16 . Importantly, a 10-cigarette increment in CPD was associated with a 62% reduction in possible clinical depression ($OR = 0.38$, 95% CI: 0.33–0.45; $p < .0001$).

Interaction of Smoking Status, Race, and Gender on CES-D Score

Logistic regression was employed to examine the interactive effects of smoking status, race, and gender on CES-D ≥ 16 while controlling for age, employment status, income level, education level, marital status, tobacco use by spouse/household members/friends, and alcohol consumption. The overall three-way interaction was significant ($\chi^2 = 10.41$, $p < .002$), as were all two-way interactions. As our primary interest concerned differences across smoking status, we conducted the relevant contrasts for each race $\times$ gender subgroup. In univariate analyses, smokers consistently produced higher CES-D scores than nonsmokers in each race $\times$ gender subgroup. After adjustment, a significantly higher percentage of smokers relative to nonsmokers produced CES-D ≥ 16 among AA males

($OR = 2.05$, 95% CI: 1.50–2.81; $p < .0001$) and EA women ($OR = 1.56$, 95% CI: 1.14–2.15; $p < .007$). A marginal effect was noted for AA women ($OR = 1.28$, 95% CI: 0.997–1.65; $p < .053$), whereas there was no difference for EA men ($p > .50$). When restricting this analysis to smokers only, a trend for race was noted ($OR = 0.82$, 95% CI: 0.67–1.01; $p < .07$). We removed the FTND from the equation to specifically emphasize the role of tobacco intake (i.e., CPD); this yielded a significantly reduced likelihood of CES-D ≥ 16 in AA relative to EA smokers ($OR = 0.71$, 95% CI: 0.58–0.87; $p < .001$).

Supplemental Analyses

Associations between the CES-D score and additional measures were examined to further characterize how depressive symptom level relates to the heavy smoker's clinical presentation ($N = 3,196$ –3,214). Consistent with the findings for CPD (reported at the beginning of the section, "Smoking status and CES-D Score"), maximum lifetime CPD (42.62, *SD* = 15.35) was negatively associated with CES-D score as well ($r = -.40$, $p < .0001$). Strong, positive correlations were observed between the CES-D score and with Minnesota Nicotine Withdrawal Scale, whether rated based on the past 24 hr ($r = .70$, $p < .0001$) or when trying to quit ($r = .72$, $p < .0001$), possibly as a function of some overlap in symptoms for nicotine withdrawal and depression. Finally, elevated CES-D score was inversely related to both desire to quit ($r = -.46$, $p < .0001$) and confidence to quit ($r = -.55$, $p < .0001$). Follow-up analyses within each of the race $\times$ gender subgroups revealed the same pattern of findings.

DISCUSSION

This study adds to the accumulating evidence confirming an important, complex relationship between cigarette smoking and the expression of depressive symptoms. Our sample of highly nicotine-dependent smokers reported an increased level of depressive symptoms relative to nonsmokers and was more likely to score above the established clinical cutoff for possible depression. The magnitude of score differences (4.4 points) and increased percentage of individuals scoring above the CES-D cutoff of 16 (+14.8%) suggests that the effects are of a moderate degree and clinically meaningful. These effects were observed after controlling for a variety of demographic and tobacco-related factors. Our confidence in these findings

Table 3. Associations Between Smoker Characteristics and Possible Clinical Depression (CES-D ≥16)

Characteristics	OR	CI	p value
Positive associations			
Age (10-year increment)	1.27	1.17–1.37	<.0001
50% or more friends smoke	2.20	1.61–3.02	<.0001
Household use of tobacco	1.70	1.33–2.16	<.0001
Spouse/partner smoker	1.65	1.29–2.12	<.0001
Current alcohol use	3.41	2.80–4.14	<.0001
Negative associations			
Full-time employment	0.51	0.41–0.64	<.0001
Income \$30K or more	0.68	0.51–0.89	.0048
Post high school education	0.67	0.53–0.83	.0004
Married	0.34	0.27–0.44	<.0001
CPD (10-cigarette increment)	0.38	0.33–0.45	<.0001

Note. CES-D = Center for Epidemiological Studies Depression; CPD = cigarettes per day; OR = odds ratio; CI = confidence interval.

is strengthened by analyses yielding expected relationships between the CES-D and various demographic characteristics (Akhtar-Danesh & Landeen, 2007).

An inverse relationship between daily smoking rate and CES-D categories was identified, such that a higher level of tobacco consumption was associated with a lower likelihood of scoring above the clinical cutoff on the CES-D. Thus, whereas chronic tobacco use is generally associated with increased depressive symptoms, a higher daily smoking rate is associated with symptom reduction among heavy smokers. This finding supports our rationale for exploring this issue and suggests that heavy smokers differ qualitatively in their response to smoking relative to light smokers. We did not evaluate this relationship among lighter smokers (not recruited for this study), but as previously mentioned, earlier work including such participants has failed to identify this effect. The mechanism for this population-based finding is currently unclear but may include differential physiological responses (possibly genetically mediated), differences in patterns of tobacco use, or other processes. Thus, in addition to other known short-term effects of smoking (e.g., craving relief, increased energy and arousal, improved concentration, and other cognitive functions), the reduction of depressive symptoms by increasing smoking rate may serve as a potent negative reinforcer of smoking behavior for highly dependent individuals. Given known effects of nicotine on brain dopaminergic and serotonergic mechanisms, these processes seem plausible (Cui et al., 2012; Herman & Sofuoglu, 2010; Picciotto, 2003; Wang & Li, 2010).

We identified race × gender effects, particularly for AA men and EA women smokers, who endorsed significantly more depressive symptoms than nonsmoker controls. As stated earlier, AA smokers may be more susceptible to a variety of tobacco-related effects as a function of enhanced uptake and metabolism of nicotine. Indeed, our final regression analysis demonstrated that despite reporting approximately the same CPD as EA smokers (likely a function of recruitment procedures), AA smokers revealed a lower likelihood to score 16 or higher on the CES-D, perhaps reflecting a greater antidepressant effect. We also know that AAs in general and particularly AA women tend to enjoy stronger social support systems (Payne, Andrew, Butler, Wyatt, Dubbert, & Mosley, 2012), which may serve to buffer some of the depression-inducing effects chronic of tobacco use. The more comprehensive

consideration of moderators in this study suggests the complex nature of factors that influence ultimate clinical symptom presentation. Obviously, this is an area in need of further work.

The presence of elevated CES-D scores has important implications for tobacco treatment services delivered to heavy users. Given the potentially serious negative consequences, routine assessment and monitoring for changes in symptom level, coupled with tailored intervention efforts, is warranted. Treatment options include preferential use of bupropion HCL, use of other antidepressants, and cognitivebehavioral strategies to facilitate coping with such symptoms (Zelman, Brandon, Jorenby, & Baker, 1992). The current work also suggests that certain subgroups may be at increased risk; given gender-based and cultural preferences in managing stress, training in the use of preferred strategies may enhance outcomes.

This study has limitations, which should be considered when interpreting findings. As our smokers were heavy EA and AA users residing in the Southeastern United States, generalizability to other populations or locations should be considered tentatively until additional evidence is available. Also, elevated depressive symptom level is correlated with but does not confirm the presence of a diagnosable disorder. Only a small portion of our sample was of higher socioeconomic status; as such, the relevance of these findings to persons with greater access to informational, social, and clinical services remains to be determined. Data were not available regarding current use of tobacco medications among smokers (screened out for non-smokers), although it seems unlikely that someone consistently using tobacco medications would maintain a daily smoking rate of 20 or more cigarettes. Average cigarette rate per day was assessed for the past year, whereas the CES-D targets symptoms over the past 2 weeks. While potentially somewhat discordant for assessment period, smoking rates tend to be stable among chronic smokers who are not attempting to quit. Finally, as these findings have clinical implications, research employing treatment samples is needed.

In sum, our findings add to the growing literature attesting to the relationship between cigarette smoking and the expression of depressive symptoms. This work has implications for enhancing our understanding of these important clinical issues for heavy users, particularly with regard to how the amount of tobacco consumed may influence the expression of symptoms and the moderating roles of both race and gender. Tailored

strategies developed in light of these considerations may enhance treatment outcomes for heavy smokers, a population possessing elevated health risks and typically achieving poorer abstinence outcomes.

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DECLARATION OF INTERESTS

None declared.

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