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Patterns of depressive symptomatology in women smokers, ex-smokers, and never-smokers

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Abstract

To investigate the possibility that specific symptom patterns contribute differentially to excess depression among smokers, we analyzed Center for Epidemiological Studies—Depression (CES-D) and subscale scores in 931 women current smokers (CS), ex-smokers (ES), and never-smokers (NS). After adjusting for differences in age, education, and marital status, significant group differences were found for the CES-D overall and for Depressed Affect, Anhedonia, and Somatic Features, but not Interpersonal Distress. Both CS and ES scored significantly higher than NS on most measures, whereas differences between CS and ES failed to reach significance. CS were significantly more likely than NS to be taking antidepressants. Alcohol intake also showed significant group differences, with CS > ES > NS, suggesting that the link between current smoking and alcohol intake is mediated by factors other than depression, since CS and ES were comparably depressed. We conclude that studying specific symptom patterns may elucidate the smoking–depression link. Our observation that ES and CS exhibit similar levels of depressive symptomatology further suggests that interventions for depressed smokers need to take into account the likely persistence of depression following cessation. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Anhedonia; Current smokers; Depressed affect; Depression; Ex-smokers; Interpersonal distress; Never-smokers; Somatic features

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1. Introduction

A relationship between smoking and depression has been repeatedly demonstrated in numerous clinic studies and population-based surveys, whether measured using standard diagnostic criteria of past or current major depressive disorder, assessments of subsyndromal depressed mood, or by scales intended for use in community samples (e.g., [Anda et al., 1990](#); [Breslau, Kilbey, & Andreski, 1991, 1992](#); [Glassman et al., 1988, 1990](#); [Hall, Munoz, & Reus, 1991](#); [Hughes, Hatsukami, Mitchell, & Dahlgren, 1986](#); [Kendler et al., 1993](#); [Lee & Markides, 1991](#)). Because of the higher prevalence of depression in women ([Johnson, Weissman, & Klerman, 1992](#); [Weissman, Bruce, Leaf, Florio, & Holzer, 1991](#)), the association of smoking and depression is of critical importance as a women's public health problem, and indeed may contribute to the increasing proportion of women among smokers as the number of discretionary or casual smokers decreases ([Glassman, 1993](#)).

The current study was designed to enhance our understanding of the relation between smoking and depression in women in a national sample of current smokers (CS), ex-smokers (ES), and never-smokers (NS) assembled by random-digit dialing. Hypothesizing that specific patterns of depressive symptomatology might contribute disproportionately to the relation between smoking and depression, we compared not only overall scores on depression, as measured by the Center for Epidemiological Studies—Depression (CES-D) questionnaire ([Radloff, 1977](#)), but also subscales measuring depressed affect, lack of positive affect/anhedonia, somatic features/psychomotor retardation, and feelings of distress based on interpersonal encounters. An additional index of depression, antidepressant use, was also queried, as was alcohol use, a behavior reported to be associated with both smoking and depression (e.g., [Dixit & Crum, 2000](#); [Pomerleau, Aubin, & Pomerleau, 1997](#)). Because health concerns may be associated with depression ([Radloff, 1977](#)), and because somatic symptomatology has been reported to be elevated in women experiencing a chronic health problem ([Knight, Williams, McGee, & Olaman, 1997](#)), we also included a measure of general health status to determine whether health problems might account for depressive symptomatology in smokers.

Differences in patterns between CS and ES were of particular interest because of their potential for shedding light on those aspects of depression that may contribute to difficulties in quitting. An effort was made to ensure that the smoking patterns of ES at the time when they smoked were comparable to those of the CS in order to minimize the likelihood that group differences simply reflected differences in amount smoked or degree of dependence.

2. Methods

2.1. Participants

Participants were 365 CS, 211 ES, and 355 NS women who participated in a national random-digit dialing survey focused primarily on attitudes and behaviors relating to smoking

and weight but also including the CES-D scale (Radloff, 1977). Participants were required to meet the following criteria: age 18–45, not currently pregnant or having given birth within the past 6 weeks, and not currently using any nicotine replacement product. To be eligible to participate as a smoker, respondents were required to have smoked at least 4 days/week for at least a year, with cigarette smoking their primary form of tobacco use. To be eligible to participate as an ES, respondents were required to have been abstinent from smoking for at least 6 months and to have met at one time the same criteria specified for smokers—that is, to have smoked at least 4 days/week for at least a year, with cigarette smoking their primary form of tobacco use. NS were required to have smoked fewer than 100 cigarettes in their lifetime. (Because the study was designed to conduct comparisons based on smoking status, CS and ES were oversampled and do not represent population distributions; furthermore, “weekend smokers” and recent ES are not included.) An additional 14 respondents (6 CS, 4 ES, and 4 NS—approximately 1.5% of the total sample) declined to answer one or more CES-D items; these individuals were excluded from the current analyses because CES-D scores could not be computed for them.

2.2. Procedure

The protocol was approved by the Institutional Review Boards of both the University of Michigan Medical School and the Institute for Social Research (ISR). Data were gathered by trained interviewers at ISR via a computer-assisted telephone interview.

Standard demographic data, including age, race, marital status, education, and household income, were collected. Both CS and ES were asked to indicate smoking rate at the period during which they smoked the most.

As noted above, the primary measure of depression was the CES-D scale (Radloff, 1977), a scale that was developed for assessing depression in community samples and has undergone extensive psychometric testing (Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). The instrument queries feelings during the past week, rated on a scale of 0 (*hardly ever or never*) to 3 (*almost all of the time or always*). In addition, four subscales derived by Radloff (1977) based on factor analysis were computed:

- I. Depressed Affect (five items): had blues, felt depressed, felt lonely, had crying spells, felt sad
- II. Negative Affect/Anhedonia (four items, reverse-scored): felt as good as others, felt hopeful about the future, was happy, enjoyed life
- III. Somatic Features and Psychomotor Retardation (five items): bothered by things, decreased appetite, everything was an effort, restless sleep, could not get going
- IV. Interpersonal Distress (two items): people disliked me, people were unfriendly

Also included in our analyses were endorsement of being a current user of antidepressant medications, weekly alcohol intake, and single-item assessment of general health status, rated as poor, fair, good, or excellent.

2.3. Data analysis

Baseline differences among groups in age and weight were assessed using ANOVA; for variables with an overall significant *F*, differences among groups were tested using the Tukey method to adjust for multiple comparisons. The extent to which differences in race, educational status, and marital status were predicted by smoking status was tested using logistic regression. Differences between smoking rates for CS and ES were analyzed using Student's *t* test for independent samples. Baseline variables that showed significant group differences were included as covariates in subsequent analyses of depression, depression subscales, self-rated health status, and weekly alcohol intake (using the general linear models procedure, with post hoc testing using the Tukey method) and antidepressant use (using logistic regression).

3. Results

Participant characteristics for the three groups are shown in Table 1. Significant differences among all groups were detected for educational status (highest in NS, lowest in CS) and marital status (highest in ES, lowest in CS). ES were significantly older than both CS and NS and were marginally more likely than NS to be of European American descent. Although CS weighed less and ES weighed more than NS—a pattern consistent with other findings in the literature (Klesges, Ward, et al., 1998)—the differences failed to reach significance in this relatively young sample (Klesges, Zbikowski, et al., 1998).

Table 1
Baseline and demographic characteristics

| | CS (<i>n</i> = 371) | ES (<i>n</i> = 215) | NS (<i>n</i> = 359) | Significance (<i>P</i> value) |
|---|----------------------|----------------------|----------------------|--|
| Age (years) | 33.6 ± 7.6 | 36.6 ± 6.6 | 32.8 ± 7.9 | <i>F</i> = 17.17, <i>P</i> < .001 CS vs. ES: <i>P</i> < .001 ^a ES vs. NS: <i>P</i> < .001 ^a |
| Weight (pounds) | 146.0 ± 35.0 | 151.3 ± 32.9 | 149.7 ± 34.4 | NS |
| Race (percent European American) | 72.9 | 79.0 | 72.2 | ES vs. NS: <i>P</i> < .10 ^b |
| Educational status (percent with post-high school education) | 44.4 | 60.2 | 72.1 | CS vs. ES: <i>P</i> < .001 ^c CS vs. NS: <i>P</i> < .001 ^c ES vs. NS: <i>P</i> < .01 ^c |
| Marital status (percent married) | 49.3 | 70.6 | 62.3 | CS vs. ES: <i>P</i> < .001 ^c CS vs. NS: <i>P</i> < .001 ^c ES vs. NS: <i>P</i> < .05 ^c |

^a Adjusted means differed significantly using the Tukey method to adjust for multiple comparisons.

^b Proportions differed marginally using logistic regression.

^c Proportions differed significantly using logistic regression.

Smoking rate among CS was 15.4 ± 10.0 cigarettes/day. Self-reported smoking rate at the period when “smoked the most” was 23.5 ± 13.6 cigarettes/day for CS and 17.6 ± 12.0 cigarettes/day for ES. Comparisons using Student’s *t* test showed that ES, when they smoked the most, smoked significantly more cigarettes per day than CS smoked at the time of the interview ($t = -2.26$, $P < .05$) but significantly fewer cigarettes per day than did CS at the time when they smoked the most ($t = 5.37$, $P < .001$).

As shown in Table 2, after adjusting for baseline differences in age, educational status, and marital status, significant differences among groups emerged for the overall CES-D and all subscales except Interpersonal Distress, with CS scoring significantly higher and ES significantly or marginally higher than NS. NS were less likely to be taking antidepressants than CS or ES, though the differences were only significant for CS after adjusting for baseline covariates. Significant differences among all groups emerged for alcohol intake, with CS

Table 2
Differences between CS, ES, and NS on measures of depression

| | CS ($n = 365$) | ES ($n = 211$) | NS ($n = 355$) | Significance (<i>P</i> value) after adjustment for cofactors |
|---|------------------|------------------|------------------|---|
| CES-D score (adjusted means \pm S.D., range 0–60) | 13.63 \pm 9.14 | 13.16 \pm 9.40 | 10.73 \pm 9.75 | $F = 9.18$, $P < .001$ CS vs. NS: $P < .001^a$ ES vs. NS: $P < .01^a$ |
| I. Depressed Affect (adjusted means \pm S.D., range 0–15) | 2.78 \pm 3.01 | 2.80 \pm 3.09 | 1.97 \pm 3.21 | $F = 7.71$, $P < .001$ CS vs. NS: $P < .01^a$ ES vs. NS: $P < .01^a$ |
| II. Anhedonia (adjusted means \pm S.D., range 0–12) | 3.24 \pm 2.66 | 3.17 \pm 2.74 | 2.66 \pm 2.84 | $F = 4.50$, $P < .05$ CS vs. NS: $P < .05^a$ ES vs. NS: $P < .10^b$ |
| III. Somatic Features (adjusted means \pm S.D., range 0–15) | 4.58 \pm 2.93 | 4.20 \pm 3.01 | 3.58 \pm 3.02 | $F = 9.73$, $P < .001$ CS vs. NS: $P < .001^a$ ES vs. NS: $P < .05^a$ |
| IV. Interpersonal Distress (adjusted means \pm S.D., range 0–6) | 0.82 \pm 1.05 | 0.79 \pm 1.08 | 0.70 \pm 1.12 | NS |
| Percent on antidepressant medications | 10.4 | 10.4 | 6.2 | CS vs. NS: $P < .05^c$ |
| Alcohol intake (adjusted means \pm S.D., drinks per week) | 3.68 \pm 5.08 | 2.26 \pm 5.22 | 1.13 \pm 5.41 | $F = 20.92$, $P < .001$ CS vs. ES: $P < .01^a$ CS vs. NS: $P < .001^a$ ES vs. NS: $P < .05^a$ |
| Self-rated health status [adjusted means \pm S.D., range: 1 (<i>poor</i>)–4 (<i>excellent</i>)] | 2.89 \pm 0.72 | 3.00 \pm 0.74 | 3.15 \pm 0.76 | $F = 11.18$, $P < .001$ CS vs. NS: $P < .001^a$ ES vs. NS: $P < .05^a$ |

^a Means (adjusted for age, education, and marital status) differed significantly using the Tukey method to adjust for multiple comparisons.

^b Means (adjusted for age, education, and marital status) differed marginally using the Tukey method to adjust for multiple comparisons.

^c Proportions differed significantly using logistic regression.

having the highest and NS the lowest weekly intake. NS rated their health status as being significantly better than did either CS or ES.

4. Discussion

After adjusting for baseline differences in age, educational status, and marital status, significant differences among groups were found for the CES-D overall and the Depressed Affect, Anhedonia, and Somatic Features subscales, but not on the Interpersonal Distress subscale. For measures of depression showing overall significance, post hoc tests to identify specific group differences revealed—as expected—that CS consistently scored significantly higher than NS. ES also scored significantly or marginally higher than NS, whereas differences between CS and ES failed to reach significance in post hoc testing. About 10% of current and ES were on antidepressant medication, compared with 6% of NS, though the difference proved significant only for current vs. NS after adjustment for covariates.

Thus, with respect to most measures of depression, ES “looked” much more like CS than like NS. Although our data collected from quitters of at least 6-month duration do not permit resolution of questions about the etiology of smoking-related depression, they suggest that stopping smoking neither elevates depressed mood nor significantly reduces it over the long run. Since Depressed Affect and Anhedonia showed patterns similar to Somatic Features, we found little evidence to support the suggestion that elevated Somatic Features scores associated with increased health problems attendant upon smoking contribute differentially to the frequently observed excess depression in smokers. The lack of significant differences in Interpersonal Distress suggest that depression in smokers is based on negative affect and psychomotor retardation rather than on perceptions of hostility in others.

Alcohol intake showed not only strong overall group differences but also significant differences in all pairwise post hoc comparisons. Thus, even though CS and ES are comparable in levels of depression, alcohol intake is significantly lower in ES, suggesting that the link between smoking and alcohol intake is mediated by factors other than or in addition to depression.

In studies comparing CS with ES, there is a concern that the ES may have been able to quit because they were less dependent than CS. A particular strength of the current study, therefore, is that participation as an ES required that the individual have at one time smoked as many days per week, and for the same minimum duration, as those participating as smokers. Indeed, at the time of the interview, the smoking rate of the CS was significantly less than that of the highest-ever smoking rate of the ES. Since the CS’s highest-ever smoking rate significantly exceeded that of the ES, however, it is possible that despite our best efforts, the CS were more addicted than the ES had ever been.

Our study shares the limitations of all cross-sectional data, and longitudinal studies will be needed to track changes in depression associated with changes in smoking status as well as the nature of the relationship among smoking, depression, and alcohol intake. Moreover, our conclusions rest on a single instrument, the CES-D. Although this measure is appropriate to

nonclinical samples such as ours, studies using other measures of depression will be needed to confirm and extend our findings.

Depression constitutes a major women's public health problem in its own right, taking a large toll in terms of lost productivity and diminished quality of life. To the extent that it is associated with an increased likelihood of smoking or greater difficulty in quitting, the health consequences are magnified. Our study, conducted in a large national sample of randomly selected CS, ES, and NS, suggests that examining specific patterns of depressive symptomatology as well as gross differences in overall depression may contribute to a better understanding of the smoking–depression link. In addition, our observation that ES exhibit levels of depressive symptomatology comparable to those seen in CS suggests that appropriate interventions for depressed smokers may need to take into account the likely persistence of depression following cessation.

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