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The Effects of Depressed Mood on Smoking Cessation: Mediation by Postcessation Self-Efficacy

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This study evaluated the relationship between precessation depressed mood and smoking abstinence and assessed the mediation of this effect by postcessation self-efficacy, urges to smoke, nicotine withdrawal, and coping behavior. The sample included 121 smokers previously treated in a randomized controlled trial involving behavior therapy and the nicotine patch. The results showed that precessation depressed mood was inversely related to 6-month abstinence. This effect remained significant after controlling for treatment, possible depression history, baseline smoking rates, and several other demographic factors. Postcessation self-efficacy, at the 2-, 4-, and 8-week postquit assessments, was the strongest mediator of the effects of precessation depressed mood on abstinence, accounting for 32%, 38%, and 48% of the effect of mood on abstinence, respectively.

Negative affect is related to smoking and poor treatment outcome among smokers trying to quit. Variables indicative of negative affect that have been evaluated in relation to smoking cessation include past history of major depression and pre- and postcessation negative affect (e.g., self-reported ratings of dysphoria, depression, tension). Past history of major depression (American Psychiatric Association, 1994) has been associated with an increased prevalence of smoking (Breslau, Kilbey, & Andreski, 1991, 1993; Glassman et al., 1990; Kendler et al., 1993), nicotine dependence (Breslau et al., 1991), greater nicotine withdrawal severity, increased depressive symptoms during nicotine withdrawal (Borrelli, Bock, King, Pinto, & Marcus, 1996; Breslau, Kilbey, & Andreski, 1992; Covey, Glassman, & Stetner, 1990), and increased risk of a major depressive episode following cessation (Glassman, Covey, & Stetner, 2001). History of major depression has also been associated with a reduced likelihood of quitting (Anda et al., 1990; Brandon, Tiffany, Obremski, & Baker, 1990; Glassman et al., 1988, 1990; Wetter et al., 1999), particularly among those whose depressive symptoms increase following cessation (Burgess et al., 2002), although the connection between relapse and depression history has not been uniform (Breslau, Peterson, Schultz, Chilcoat, & Andreski, 1998; Ginsberg, Hall, Reus, & Muñoz, 1995; Morris & Mermelstein, 1999; Niaura et al., 1999).

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Increases in negative affect following a quit attempt have been related to treatment failure and relapse across studies using a variety of treatment modalities (e.g., behavioral, nicotine replacement therapy, bupropion; Borrelli, Niaura, et al., 1996; Kenford et al., 2002). Indeed, the presence of negative affect following cessation has been found to characterize over 50% of all smoking lapses, with 19% of all lapses occurring under conditions of extreme negative mood (Shiffman, Paty, Gnys, Kassel, & Hickcox, 1996). Several studies have suggested that precessation negative affect may also predict relapse (Ginsberg et al., 1995; Killen, 1996; Kinnunen, Doherty, Militello, & Garvey, 1996), although these effects may diminish when accounting for self-reported history of depression (Kenford et al., 2002). Precessation negative affect has been found to predict a more positive response to treatments that emphasize therapist support, relative to skill training only (Zelman, Brandon, Jorenby, & Baker, 1992), and in a study where counseling and nicotine replacement therapy (NRT) were supplemented by use of prerecorded motivational and coping phases (Brandon, Copeland, & Saper, 1995).

Clearly negative affect and especially depressed mood play a substantial role in the outcome of smoking cessation efforts. Studies evaluating this relationship have suggested that neurobiological mechanisms might be involved, particularly those related to nicotine withdrawal and depression. In smokers, postcessation negative affect profoundly influences both the direction and duration of nicotine withdrawal. Negative affect has also been shown to be the most robust predictor of relapse in models that emphasize physical dependence (including withdrawal severity) as well as affective regulation (Kenford et al., 2002). It has been suggested that chronic smokers are at risk for the development of depressive symptoms as a result of either the neuroadaptations brought about by chronic nicotine use (Balfour & Ridley, 2000) or the neurobiological factors that predispose smokers to both depression and nicotine dependence (Markou, Kosten, & Koob, 1998). In either case, however, nicotine withdrawal may trigger negative affect and substantially diminish the capacity to experience reward (Epping-Jordan, Watkins, Koob, & Markou, 1998) These effects may be

more pronounced among smokers with high levels of precessation negative affect, resulting in a reduced likelihood of quitting.

Behavioral processes may also mediate the impact of negative affect on relapse. Coping and self-efficacy are behavioral processes that have received a great deal of attention in the smoking cessation literature and may play an important role in the relationship between negative affect and smoking cessation outcome. Relapse-prevention-based treatments (Marlatt & Gordon, 1985) for smoking cessation assume that skills training leads to successful coping with urges in high-risk situations, including those involving negative affect, which in turn results in improved self-efficacy and better treatment outcome. Hall and colleagues (Hall, Munoz, & Reus, 1994; Hall et al., 1996, 1998) have developed a skills-based intervention that is specifically directed at managing negative affect. This intervention has produced equivocal outcomes for smokers with a history of depression versus those without a history of depression across several studies. However, smokers with recurrent depression have been found to have better outcomes with the mood management intervention relative to a standard smoking cessation intervention (Brown et al., 2001). The mood management intervention in these studies did not differentially affect depressive symptoms or self-efficacy for resisting smoking. Thus, one explanation for its lack of efficacy, relative to standard interventions, may be its failure to impact these potentially important mediating variables.

Studies have suggested that cravings (urges) are substantially elevated in the presence of negative affective cues (Maude-Griffin & Tiffany, 1996) and that the presence of negative affect may impair coping by reducing available cognitive resources (Brandon et al., 1990). Not surprisingly, coping and self-efficacy are inversely related to relapse in the presence of negative affect cues (Drobes, Meier, & Tiffany, 1994). Moreover, smokers who have the highest levels of negative affect at baseline (precessation depressed mood) begin treatment at a disadvantage, as they have the lowest levels self-efficacy (Haukkala, Uutela, Vartiainen, McAlister, & Knekt, 2000). Treatment, with a behavioral manipulation designed to systematically reduce smoking behavior prior to quitting, plus relapse prevention therapy (Cinciripini, Lapitsky, Wallfisch, Haque, & Van Vunakis, 1995), has been related to improvements in self-efficacy, coping behavior, and withdrawal. However, despite the numerous connections between coping and self-efficacy, on the one hand, and depression and nicotine withdrawal, on the other, none of these studies has explicitly evaluated the mediating or moderating effects of these variables on the precessation depressed mood and abstinence outcome relationship. The identification of factors that mediate the effects of depressed mood on relapse may enable the development of interventions that more specifically target the factors that have the greatest influence on treatment success.

The objectives of the current study were to (a) evaluate the impact of precessation depressed mood on abstinence and (b) assess the mediating effects of self-efficacy, urges to smoke, nicotine withdrawal, and coping behavior on the relationship between depressed mood and abstinence. We predicted that higher levels of depressed mood prior to cessation would be inversely related to abstinence at 6 months and that this effect would be mediated by postcessation self-efficacy, urges to smoke, nicotine withdrawal, and coping behavior, particularly during the early phases of quitting when smokers are most vulnerable to relapse.

Method

Participants

One hundred twenty-one smokers were recruited from the Houston–Galveston community. Inclusion criteria were a 3-year smoking history and consumption of 15 or more cigarettes per day. Exclusion criteria were other current cessation treatments, uncontrolled systemic illnesses, and recent history (within 1 year) of diagnosed major depression or treatment with antidepressants. Screening information was obtained during a telephone- and follow-up face-to-face interview.

Participants were randomly assigned to receive behavior therapy alone (BT) or BT plus the transdermal nicotine patch (BTP). Participants in the current report included 64 smokers for whom we have previously reported 6-month treatment outcome data (Cinciripini, Cinciripini, Wallfisch, Van Vunakis, & Haque, 1996) plus an additional 57 smokers who participated successively in a continuation of this same study design. The present report focuses on the relationship between the participant's level of precessation depressed mood and 6 months abstinence. Data on precessation depressed mood were not reported in the previous study.

Treatment Program

The behavioral treatment program has been described in detail in our previous report (Cinciripini et al., 1996). Treatment consisted of 9 weekly group-counseling sessions that used a standard coping-skills-training approach (Fiore et al., 2000) in the BT group plus 8 to 12 weeks of NRT in the BTP group. The quit date for all smokers was set to occur within 3 weeks of the baseline visit. Smokers in the BTP condition were provided with nicotine patches beginning on their quit date. Patch therapy was expected to continue for 8 weeks, although about 10% of the participants continued using the patch for up to 12 weeks. A dose titration was implemented in the BTP group. These participants received the 21-mg dose (Habitrol, Ciba Gigy Corp.) for approximately 4–6 weeks, followed by the 14 mg/day for 2–3 weeks, and 7 mg/day patches for 2–3 weeks. BT participants received no NRT but were instructed to quit smoking at the same point in time.

Psychological Assessments

In this analysis, we focused on baseline measures of depressed mood and postquit assessments of abstinence on the quit date (participants arrived 24–36 hr abstinent for this session) and at 1, 2, 4, and 8 weeks, and 6 months postcessation. The 1-, 2-, and 4-week postcessation assessment points were selected on the basis of research findings suggesting that symptoms of nicotine withdrawal are most intense and risk of relapse is highest within this period (Hughes et al., 1992; Kenford et al., 1994; Piasecki, Fiore, & Baker, 1998; Zhu et al., 1996). The 8-week postcessation assessment point corresponds to the end of treatment (EOT), and the 6-month postcessation assessment served as our long-term follow-up point. The following measures were assessed.

Profile of Mood States (POMS) Depression Scale (McNair, Lorr, & Droppleman, 1981). We used the standardized score on the POMS Depression Scale administered at the screening/baseline interview (2–3 weeks prior to the quit date) as a continuous measure of precessation depressed mood. This scale consists of 15 adjectives (e.g., *unhappy*, *sad*, *discouraged*, *hopeless*, *gloomy*, *helpless*, *guilty*) rated on a scale of 0 (*not at all*) to 4 (*extremely*). Only findings related to the POMS Depression Scale are reported here because the focus of the present study was specifically on precessation depressed mood. Previous studies have shown that POMS Depression Scale scores are positively related to major depression (Wilkins, Hamby, Robertson, & Seillier-Moiseiwitsch, 1995) as assessed by the Diagnostic Interview Schedule (Robins & Helzer, 1989), and to smoking abstinence (Gilbert et al., 1998).

Self-Efficacy Scale (Condiotte & Lichtenstein, 1981). This instrument uses a 0–10 rating scale to assess self-confidence in resisting urges to smoke across 44 situations (e.g., when you feel impatient, frustrated, angry, tired). Self-efficacy has been found to be positively related to treatment outcome in several studies (Baer & Lichtenstein, 1988; DiClemente, 1981; DiClemente, Fairhurst, & Piotrowski, 1995; DiClemente, Prochaska, & Gibertini, 1985; Gulliver, Hughes, Solomon, & Dey, 1995).

Minnesota Withdrawal Scale (MWS; Hughes & Hatsukami, 1986). The MWS consists of an 8-item list of tobacco withdrawal symptoms (i.e., desire to smoke, anger/irritability/frustration, anxiety/nervousness, difficulty concentrating, impatience/restlessness, hunger, awakening at night, and depression). Items were rated on a 0 (*none*) to 4 (*severe*) scale of symptom severity.

Coping Behavior Checklist for Smoking and Smoking Urges (Cinciripini, Lapitsky, Seay, et al., 1995). The Coping Behavior Checklist consists of 26 items describing typical coping strategies used during smoking cessation (e.g., "reviewed reasons for quitting" or "changed my routine"). The items were rated on a 4-point scale (0 [*0*], 1 [*1–2*], 2 [*3–5*], 3 [*>6 times*] week) for frequency of use. The scale also included a single item assessing average number of daily urges to smoke (range: 0, 1–4, 5–10, 11–20, >20/day).

The Fagerstrom Test for Nicotine Dependence (FTND; Fagerstrom, 1982). The FTND is a 6-item questionnaire that measures nicotine dependence by assessing various components of smoking behavior such as daily intake, difficulty in refraining from smoking, and other aspects related to patterns of intake. FTND scores have been positively correlated with cotinine level (Payne, Smith, McCracken, McSherry, & Anthony, 1994; Pomerleau, Pomerleau, Majchrzak, Kloska, & Malakuti, 1990) and inversely related to abstinence (Pinto, Abrams, Monti, & Jacobus, 1987).

Demographics and possible history of depression. Demographic information and health history measures were collected at the baseline visit (see Table 1). Participants were considered to have a possible history of major depression if they reported either a past diagnosis of major depression or previous use of antidepressant medication. A similar measure was used in another study and found to predict treatment outcome (Wetter et al., 1999). However, we recognize there may be significant limitations to this approach to assessment of depression history in that its relationship to more accepted measures of depression history such as the *Structured Clinical Interview for Axis I DSM–IV Disorders* (First, Spitzer, Gibbon, & Williams, 1994) has not been evaluated. Structured clinical interviews were not available on this sample. Given this limitation we chose to label this category as "possible" history of depression.

Table 1
Mean and Standard Deviation of Depressed Mood by Baseline Participant Characteristics

Participant characteristics	%	Depressed mood *M*	Depressed mood *SD*	*t* test *p*
Gender				
Female	71.1	44.0	7.8	.52
Male	28.9	44.9	7.1	
Ever quit				
Yes	82.3	44.6	7.5	.78
No	17.7	44.1	7.4	
Race				
White	91	43.9	7.1	.08
Non-White	9	48.1	9.1	
Possible history of depression[a]				
Positive	14	47.7	8.3	.04
Negative	86	43.8	7.1	

Note. $N = 121$.
[a] Possible history of depression refers to self-report of a previous diagnosis or treatment for major depression. Possible history of depression status was unavailable on three cases.

Assessment of Abstinence

Expired carbon monoxide (CO) was measured at each assessment. Participants were classified as abstainers at the 8-week postquit (end of treatment; EOT) and 6-month follow-up visits if they reported no smoking in the 7 days prior to the assessment and had CO values < 8 ppm. Those unavailable for assessment were counted as nonabstainers.

Results

Participant Characteristics

POMS baseline depression scores for the entire sample averaged 44.3 (SD = 7.3) and ranged from 37 to 66. To assess the stability of this measure during the prequit period, we performed a repeated measures analysis of variance on the POMS depression scores over the 3 weeks leading up to the quit date. In the first analysis, the baseline POMS score was used as a covariate and no significant change over time was noted, $F(2, 240) = 0.31$, $p = 0.73$. We also performed a similar analysis including the baseline value as a dependent measure and using a least squares mean procedure to evaluate differences between baseline and subsequent depressed mood scores. No significant differences were observed. Thus, precessation depressed mood appeared relatively stable.

Demographic and smoking status characteristics were evaluated for differences in baseline POMS depression scores by using t tests for dichotomous variables (i.e., gender, previous quitting experience, race, and possible past depression history) and Pearson correlations for continuous variables (i.e., baseline cigarettes, age, education, and Fagerstrom scores). As shown in Table 1 and Table 2, no significant differences were noted in the analysis, except that baseline POMS depression scores were higher for smokers with a possible history of depression.

Effects of Depressed Mood on Abstinence

We have previously reported that the BTP condition was associated with higher abstinence rates than the BT condition (Cinciripini et al., 1996), and those analyses will not be repeated here. The focus of the present study was on precessation depressed mood. Logistic regression analyses (Hosmer & Lemeshow, 1989) were used to evaluate the effects of precessation depressed mood on 6-month abstinence, with and without controlling for treatment and several baseline covariates. The effect of precessation depressed mood on 6-month abstinence was significant when in the model alone, odds ratio (OR) = .907, 95% confidence interval (CI) = .840–.980, or when controlling for treatment (OR = .901, 95% CI = .832–.934), treatment and possible depression history (OR = .898, 95% CI = .829–.974), or treatment, possible depression history, gender, baseline cigarettes, age, education, race, previous quitting, and Fagerstrom scores (OR = .752, 95% CI = .625–.903). Moreover, although baseline differences in depressed mood were noted for smokers with and without a possible depression history, the presence of possible depression history alone did not significantly predict abstinence at the 6-month follow-up when

Table 2
Pearson's Correlation Between Baseline Depressed Mood and Baseline Participant Characteristics

Participant characteristics	*M*	*SD*	Pearson *r* with depressed mood	*p*
Baseline cigarettes per day	25.07	11.90	.047	.61
Age (years)	43.1	12.3	−.004	.97
Education (years)	14.4	2.02	.180	.10
FTND	6.13	1.87	−.079	.39

Note. FTND = Fagerstrom Test for Nicotine Dependence.

tested in a single-predictor model (OR = .802, 95% CI = .212–2.49). Thus, baseline depressed mood was significantly related to abstinence and this effect was independent of treatment, possible depression history and other baseline characteristics of the smoker.

Tests for Mediation

We followed the procedures of Baron and Kenny (1986) to evaluate whether self-efficacy, coping behavior, urges to smoke, and symptoms of nicotine withdrawal mediated the effect of precessation depressed mood on long-term abstinence (6 months). Each measure was assessed at baseline (precessation), at the quit date, and at 1, 2, 4, and 8 weeks postquit (EOT). Mediation is said to take place when four conditions are met (Baron & Kenny, 1986). First, baseline depressed mood (the independent variable) must be significantly related to abstinence (the dependent variable). This condition is satisfied by the results of the logistic regression summarized above, in which 6-month abstinence was significantly related to precessation depressed mood.

Second, the hypothesized mediators (self-efficacy, coping, etc.) must be significantly related to baseline depressed mood. Condition 2 was evaluated by regressing each of the hypothesized mediators on baseline depressed mood using linear regression.

Third, the hypothesized mediator(s) must be significantly related to abstinence. This association was evaluated by regressing abstinence on each of the hypothesized mediators using logistic regression.

Fourth, the relation between baseline depressed mood and abstinence must be meaningfully reduced when controlling for the hypothesized mediator. To meet this fourth condition, hypothesized mediators that were significantly related to *both* baseline depressed mood (Condition 2) and abstinence (Condition 3) were further evaluated in several ways. First, as suggested by Baron and Kenny (1986), we used a series of two-step logistic regressions. Baseline depressed mood was used to predict abstinence on Step 1, followed by entry of the potential mediator variable on Step 2. Using this approach, we first determined whether the presence of a hypothesized mediator in the regression model (Step 2) reduced the observed relationship between depressed mood and abstinence (evaluated in Step 1). Second, we tested the null hypothesis of no mediation effect using a *z* test obtained by dividing the estimate of the mediation effect by its standard error (MacKinnon & Dwyer, 1993). In this case, the mediation effect was estimated by taking the product of the standardized regression coefficients for baseline depressed mood when predicting the hypothesized mediator, and the hypothesized mediator when predicting abstinence, while controlling for baseline depressed mood. This approach is suitable for situations involving a dichotomous outcome, as is the case for abstinence. Third, the relative magnitude of mediation was assessed by estimating the proportion of the total effect of baseline depression on abstinence attributable to the hypothesized mediator. This is computed by taking the standardized mediated effect and dividing it by the standardized total effect.

Relations Among Hypothesized Mediators, Baseline Depressed Mood, and Abstinence

The associations of each hypothesized mediator variable with baseline depressed mood (Condition 2) and 6 months abstinence (Condition 3) are summarized in Table 3. Each of the hypothesized mediators was regressed on baseline depressed mood, and abstinence at 6 months was regressed on each of the hypothesized mediators.

As shown in Table 3, only self-efficacy at 1, 2, 4, and 8 weeks after quitting and smoking urges at the 2-week postquit assessment met the initial criteria for mediation (i.e., were significantly related to both precessation depressed mood and 6 months abstinence). Neither coping nor total withdrawal scores (MWS) met these criteria for mediation at any assessment point.

Relations Between Depressed Mood and Abstinence Controlling for the Hypothesized Mediators

The final step in our mediation analysis was to assess the change in the relationship between baseline depressed mood and abstinence, after controlling for the hypothesized mediators (Condition 4). The hypothesized mediators advancing to this assessment step included self-efficacy from the 1st through the 8th week following quitting and smoking urges at the 2-week postquit assessment point (see Table 3).

Self-efficacy and mediation of 6 months abstinence. As shown in Table 4, the inclusion of self-efficacy at the 2-, 4-, and 8-week postcessation assessments, in the regression model predicting abstinence from depressed mood, eliminated the significant relationship between depressed mood and abstinence observed when only depressed mood was included in the model. When self-efficacy at the 1-week postcessation point was included in the model, the effect of baseline depressed mood on abstinence remained significant ($p = .046$). Similarly, the results of the *z* test for mediation, based on the product estimation method described previously (MacKinnon & Dwyer, 1993), showed no significant effect ($p > .05$) for self-efficacy at Week 1, but they were significant at Weeks 2, 4, and 8 postcessation ($p < .05$). Moreover, the proportion estimates of the relative magnitude of the mediation effect suggest that self-efficacy at 2, 4, and 8 weeks postcessation accounted for 32%, 38%, and 48%, respectively, of the total effect of baseline depression on abstinence. It should be noted, however, that these estimates are conservatively biased for sample sizes such as ours that are below 500 (MacKinnon, Warsi, & Dwyer, 1995)

Urges to smoke and mediation of long-term abstinence. As shown in Table 4, including urges to smoke at the 2-week postquit assessment point also reduced the relationship between depressed mood and abstinence observed when only depressed mood was included in the model. However the results of the *z* test for mediation described above (MacKinnon & Dwyer, 1993) showed

Table 3
Relation of Hypothesized Mediators to Baseline Depressed Mood and 6 Months Abstinence

	Depressed mood[a]			Abstinence[b]				
Hypothesized mediators	*B*	*SE*	*p*	*B*	*SE*	*p*	OR	95% CI
Baseline measures								
Self-efficacy	−0.019	0.025	.442	0.129	0.101	.202	1.138	0.933, 1.387
Brief Coping Scale	0.141	0.126	.267	−0.017	0.025	.502	0.983	0.935, 1.033
Urges	−0.752	1.149	.514	−0.003	0.003	.216	0.997	0.992, 1.002
MWS	0.393	0.086	<.001	0.005	0.028	.867	1.005	0.951, 1.061
Quit week measures								
Self-efficacy	−0.054	0.030	.093	0.121	0.093	.190	1.129	0.942, 1.354
Brief coping	0.000	0.209	.997	−0.022	0.015	.128	0.978	0.950, 1.006
Urges	−0.032	1.02	.975	−0.009	0.004	.012	0.991	0.984, 0.998
MWS	0.413	0.093	<.001	−0.042	0.027	.129	0.959	0.909, 1.012
1-week postquit measures								
Self-efficacy	**−0.064**	**0.026**	**.017**	**0.325**	**0.121**	**.007**	**1.384**	**1.094, 1.752**
Brief Coping Scale	−0.016	0.106	.970	0.005	0.024	.838	0.995	0.949, 1.04
Urges	1.19	1.05	.261	−0.010	0.004	.005	0.990	0.983, 0.997
MWS	0.324	0.097	.001	−0.028	0.027	.297	0.973	0.923, 1.025
2-weeks postquit measures								
Self-efficacy	**−0.091**	**0.029**	**.002**	**0.409**	**0.126**	**.001**	**1.506**	**1.175, 1.929**
Brief Coping Scale	−0.012	0.102	.901	0.000	0.025	.992	1.000	0.952, 1.051
Urges	**2.13**	**0.984**	**.033**	**−0.017**	**0.005**	**.003**	**0.984**	**0.973, 0.994**
MWS	0.419	0.095	<.001	−0.051	0.028	.069	0.951	0.900, 1.004
4-weeks postquit measures								
Self-efficacy	**−0.091**	**0.028**	**.001**	**0.443**	**0.133**	**.001**	**1.557**	**1.200, 2.002**
Brief Coping Scale	0.279	0.189	.142	−0.027	0.016	.101	0.974	0.943, 1.005
Urges	1.78	0.999	.076	−0.021	0.006	.001	0.979	0.967, 0.992
MWS	0.375	0.091	<.001	−0.046	0.029	.115	0.955	0.901, 1.011
8-weeks postquit (EOT) measures								
Self-efficacy	**−0.100**	**0.030**	**.001**	**0.550**	**0.143**	**<.001**	**1.734**	**1.310, 2.295**
Brief Coping Scale	0.279	0.138	.045	−0.026	0.019	.166	0.974	0.939, 1.011
Urges	1.62	1.10	.144	−0.022	0.007	.001	0.978	0.965, 0.990
MWS	0.347	0.084	<.001	−0.034	0.030	.259	0.967	0.911, 1.025

Note. Bold text indicates a significant relationship between the hypothesized mediator and both baseline depressed mood and 6-months abstinence. OR = odds ratio; CI = confidence interval; MWS = Minnesota Withdrawal Scale; EOT = end of treatment.
[a] Results of the regression of the hypothesized mediator (dependent variable) to depressed mood (independent variable). [b] Results of the regression of abstinence (dependent variable) to the hypothesized mediator (independent variable).

no significant effect ($p > .05$) for urges to smoke at the 2-week postcessation assessment. Given the fact that the mediation effect of urges was not statistically different from zero, the proportion of the effect of baseline depression on abstinence attributable to urges was not calculated.

Relations Between Depressed Mood and 6 Months Abstinence Controlling for Self-Efficacy Urges and Abstinence at 2, 4, and 8 Weeks Postcessation

The results of our mediation analyses show that self-efficacy 2, 4, and 8 weeks after quitting met all criteria for meditation of the relationship between precessation depressed mood and 6 months abstinence. To further explore the nature of the mediating effects of self-efficacy on relations between depressed mood and 6 months abstinence, we repeated the logistic regression analysis described in Table 4 for each of the confirmed mediators, while also controlling for abstinence at each time point on which the mediator was measured. In this analysis, we were interested in determining whether our previously confirmed mediators would continue to affect the significant relationship observed between depressed mood and 6 months abstinence when controlling for concurrent abstinence (i.e., abstinence at 2, 4, and 8 weeks after quitting).

As shown in Table 5, baseline depressed mood continued to predict 6 months abstinence after controlling for the effects of 2 and 4 weeks postquit abstinence in the logistic model. However, the relationship between depressed mood and 6 months abstinence became nonsignificant in the logistic models that included both self-efficacy and abstinence at either the 2 or 4 week time points. Thus, both 2 and 4 weeks postcessation self-efficacy continued to function as mediators of the effect of precessation depressed mood on 6 months abstinence even when accounting for a smoker's abstinence status at those points in time. Self-efficacy at 2 and 4 weeks postcessation accounted for 31% and 21%, respectively, of the total effect of baseline depressed mood on abstinence when controlling for abstinence at these same time points.

Unlike the 2- and 4-week postcessation assessment points, abstinence alone 8 weeks after quitting (EOT) reduced the previously significant effect of depressed mood on 6 months abstinence. Hence, there was no effect (of baseline depressed mood) left to mediate with 8-week abstinence in the model. The effect of baseline depressed mood on 6 months abstinence was virtually un-

Table 4
Relations Between Depressed Mood and 6 Months Abstinence Controlling for the Hypothesized Mediators

Variable	*B*[a]	*SE*	*p*	OR	95% CI
1-week postquit measures					
Baseline depressed mood alone	−0.095	0.039	.016	0.906	0.842–0.982
Self-efficacy alone	0.325	0.121	.007	1.38	1.09–1.73
Baseline depressed mood controlling for self-efficacy					
Baseline depressed mood	−0.070	0.04	.046	0.924	0.855–0.999
Self-efficacy	0.278	0.123	.024	1.38	1.09–1.75
2-weeks postquit measures					
Baseline depressed mood alone	−0.098	0.039	.013	0.907	0.840–0.980
Self-efficacy alone	0.409	0.126	.001	1.506	1.175–1.929
Urges alone	−0.017	0.005	.003	0.984	0.973–0.994
Baseline depressed mood controlling for self-efficacy					
Baseline depressed mood	**−0.070**	**0.040**	**.079**	**0.933**	**0.863–1.008**
Self-efficacy	0.364	0.129	.005	1.440	1.117–1.855
Baseline depressed mood controlling for urges					
Baseline depressed mood	−0.073	0.039	.061	0.929	0.861–1.003
Urges	−0.015	0.006	.006	0.985	0.974–0.996
4-weeks postquit measures					
Baseline depressed mood alone	−0.097	0.040	.014	0.907	0.839–0.981
Self-efficacy alone	0.443	0.133	.001	1.557	1.200–2.022
Baseline depressed mood controlling for self-efficacy					
Baseline depressed mood	**−0.064**	**0.040**	**.109**	**0.938**	**0.867–1.014**
Self-efficacy	0.395	0.136	.004	1.485	1.138–1.936
8-weeks postquit (EOT) measures					
Baseline depressed mood alone	−0.097	0.039	.012	0.907	0.841–0.979
Self-efficacy alone	0.550	0.143	<.001	1.734	1.310–2.295
Baseline depressed mood controlling for self-efficacy					
Baseline depressed mood	**−0.054**	**0.039**	**.172**	**0.948**	**0.877–1.024**
Self-efficacy	0.497	0.146	.001	1.644	1.235–2.188

Note. Bold text indicates a significant ($p < .05$) *z* test for mediation of the effect of baseline depressed mood on abstinence by the selected mediator. The only models tested were those models in which significant effects of baseline depression on abstinence were eliminated by inclusion of the mediator. OR = odds ratio; CI = confidence interval; EOT = end of treatment.
[a] Small variations ($n = 118–121$) in the number of participants with complete data for each instrument at each assessment point produced slight but insignificant variation in the regression coefficients associated with each model.

changed when both 8-week postcessation self-efficacy and abstinence were included in the model together (Table 5), in comparison to the model that included only 8-week postcessation abstinence.

Relations Between Depressed Mood and 6 Months Abstinence Controlling for Baseline Values of the Hypothesized Mediators

In addition to the analyses examining the hypothesized mediators at each particular time point, we repeated the entire set of analyses controlling for the baseline value of the hypothesized mediator. For example, we examined the relations of self-efficacy at 2 weeks with depression and abstinence after controlling for baseline self-efficacy, and we examined the reduction in the relation of depression with abstinence after controlling for both baseline and 2-week self-efficacy. These analyses adjust the value of the hypothesized mediator, at a particular follow-up time point, by its corresponding baseline value. The results from these analyses were virtually identical to the analyses that did not control for baseline values. Self-efficacy at 2, 4, and 8 weeks postcessation continued to function as mediators of the effects of depressed mood on abstinence even when controlling for the smoker's level of self-efficacy at baseline. Moreover, we concluded in our first set of analyses that baseline self-efficacy alone did not meet criteria for mediation.

This suggests that both the absolute level of self-efficacy achieved in the postcessation period as well as the baseline adjusted scores might mediate the effect of depressed mood on abstinence. To further explore this hypothesis, we also computed a change score between the baseline value of self-efficacy and the 2-, 4-, and 8-week postquit self-efficacy assessments. The change score provides an assessment of the magnitude of difference between the baseline and subsequent measures of self-efficacy. We regressed 6 months abstinence on these change scores in separate models for each time point. We also included baseline depressed mood and the corresponding absolute value of self-efficacy at each point in time in sequential steps of each model. This allowed us to assess the effect of baseline depressed mood on abstinence while controlling for the change in self-efficacy from baseline and the absolute value of self-efficacy at each point in time. The results showed that the presence of the change scores alone in the model did not appreciably reduce the relationship between depressed mood and abstinence. However, when the absolute value of self-efficacy was added to the model that included the change scores, the relationship between depressed mood and abstinence became statistically nonsignificant. Thus, the absolute value of self-efficacy at each time point continued to mediate the relationship

Table 5
Relations Between Depressed Mood and 6 Months Abstinence Controlling for Self-Efficacy Urges and Abstinence at 2, 4, and 8 Weeks Postcessation

Variable	*B*	*SE*	*p*	OR	95% CI
2-weeks postquit measures					
Baseline depressed mood controlling for abstinence					
Baseline depressed mood	**−0.096**	**0.039**	**.015**	**0.909**	**0.841–0.982**
Abstinence	2.545	1.049	.015	12.738	1.630–99.536
Baseline depressed mood controlling for abstinence and self-efficacy					
Baseline depressed mood	**−0.073**	**0.040**	**.069**	**0.930**	**0.860–1.006**
Abstinence	2.178	1.066	.041	8.831	1.092–71.395
Self-efficacy	0.292	0.134	.029	1.339	1.030–1.741
4-weeks postquit measures					
Baseline depressed mood controlling for abstinence					
Baseline depressed mood	**−0.082**	**0.041**	**.048**	**0.922**	**0.850–0.999**
Abstinence	3.013	1.044	.004	20.345	2.632–157.290
Baseline depressed mood controlling for abstinence and self-efficacy					
Baseline depressed mood	**−0.066**	**0.041**	**.113**	**0.937**	**0.864–1.016**
Abstinence	2.618	1.065	.014	13.702	1.698–110.564
Self-efficacy	0.244	0.139	.080	1.277	0.971–1.677
8-weeks postquit (EOT) measures					
Baseline depressed mood controlling for abstinence					
Baseline depressed mood	**−0.042**	**0.043**	**.323**	**0.958**	**0.881–1.043**
Abstinence	3.404	0.755	<.001	30.098	6.594–137.371
Baseline depressed mood controlling for abstinence and self-efficacy					
Baseline depressed mood	**−0.039**	**0.043**	**.368**	**0.962**	**0.885–1.046**
Abstinence	2.984	0.826	<.001	19.760	3.913–99.779
Self-efficacy	0.184	0.153	.229	1.202	0.890–1.624

Note. Bold text indicates the relationship between depressed mood and abstinence is not significant with both the mediator and abstinence in the model. OR = odds ratio; CI = confidence interval; EOT = end of treatment.

between depressed mood and abstinence, even after controlling for the magnitude of change in self-efficacy from baseline. We followed the same sequence of analyses using the residuals (instead of change scores) from a model regressing the value of self-efficacy at each point in time on the baseline value. The results of these analyses parallel those that included the change score in the model. The results of this series of analyses suggest that the absolute level of self-efficacy during the postcessation period may be a more important mediator of the effect of depressed mood on abstinence than either a smoker's baseline level or the relative change in self-efficacy from baseline.

Tests for Moderation of the Main Effects Due to Depression

In addition to the mediation analyses discussed earlier, we examined potential moderation of the effects of precessation depressed mood on 6 months abstinence. Evidence for moderation is indicated by the presence of a significant interaction between precessation depressed mood and a hypothesized moderator variable in the logistic regression predicting 6 months abstinence (Baron & Kenny, 1986). Hypothesized moderators included participant baseline characteristics (i.e., possible history of depression, gender, ever quit, race, cigarettes per day, age, education, and Fagerstrom scores); treatment; and measures of self-efficacy, withdrawal, urges to smoke, and coping behavior observed at baseline and at 1, 2, 4, and 8 weeks postcessation. None of the variables we tested met criteria for moderation.

Discussion

The purpose of the current study was to identify mediators of the effect of precessation depressed mood on abstinence. The identification of mediators has important clinical implications because interventions aimed at modifying precessation depressed mood may be made more efficacious if such factors are taken into account in the design of the treatment. We found a significant inverse relationship between baseline depressed mood and 6 months abstinence and examined the role of self-efficacy, urges to smoke, nicotine withdrawal, and coping behavior as mediators of this effect.

Our results suggest that postcessation self-efficacy between 2 and 4 weeks after quitting acts as a robust mediator of precessation depressed mood on relapse. Mediation effects of self-efficacy continued to be observed, even after controlling for concurrent abstinence, although the proportion of mediation attributable to self-efficacy at 4 weeks postcessation was reduced in comparison to that of self-efficacy alone. Although self-efficacy at 8 weeks postcessation also mediated the effect of baseline depressed mood on abstinence, no statistically significant effect of baseline depressed mood on 6 months abstinence remained, when controlling for abstinence 8 weeks after quitting. Additional analyses also confirmed that the absolute level of self-efficacy achieved during the postcessation period may be a more important mediator of the effect of depressed mood on abstinence than either a smokers baseline level or the relative change in self-efficacy from baseline. No evidence was found for a mediating effect of postcessation nicotine withdrawal, urges, coping behavior, or any of the psycho-

social variables measured between baseline and the quit date. Thus, the adverse effect of precessation depressed mood on abstinence appears to be mediated by the level of self-efficacy associated with the early experiences of quitting (i.e., self-efficacy within the first 2–4 weeks). The absence of mediation by quit date and Week 1 postcessation measures of self-efficacy suggest that this process may take some time to develop. Perhaps smokers with high levels of baseline depressed mood are sensitive to the cumulative effects of temptation and/or lapse that likely begin just after quitting. These cumulative effects may lead to progressively greater adverse effects on self-efficacy as time after quitting increases (e.g., within the second week). Although interesting, our data do not speak to this issue directly because of the limited number and timing of our assessment points. Daily data would have been more appropriate to address this question. Alternatively, the lack of mediation for quit week and Week 1 self-efficacy could be due to the influence of other cognitive or affective processes not assessed in this study, which may better account for the impact of precessation depressed mood on abstinence.

Although previous studies have shown that both pre- and postcessation self-efficacy are reliably associated with relapse (e.g. Baer, Holt, & Lichtenstein, 1986; Condiotte & Lichtenstein, 1981), to our knowledge this is the first study to evaluate the role of self-efficacy as a mediator of the relationship between depressed mood and long-term abstinence. Negatively biased thinking is a significant part of the clinical manifestation of a depressive disorder, and this may manifest itself in the low self-efficacy for quitting observed in smokers with depressed mood. Our data suggest that if such processes emerge, they are triggered by events transpiring in the first few weeks following cessation and are not simply a function of initial confidence when beginning a cessation attempt. This suggests that baseline depressed mood may serve as a marker for future vulnerability to relapse and low self-efficacy during quitting. Thus, enhancing the self-efficacy-building component of a behavioral treatment may be particularly valuable during the early postcessation period for individuals with high levels of precessation depressive affect.

A surprising result from this study was the finding that coping did not mediate the effects of baseline depressed mood on abstinence. Coping behavior did not predict 6 months abstinence at any point in time, nor was it significantly related to baseline depressed mood, with the exception of the 8-week postcessation assessment. We expected a stronger relationship between coping and precessation depressed mood, as smokers may have fewer cognitive resources available to respond to urges when mood is negative (Tiffany, 1990). One reason for our findings may be that we only assessed coping frequency and not coping effectiveness. Shiffman et al. (1996) have suggested that among smokers trying to quit, the frequency of coping behavior is uniformly high during temptations and lapses. However, the relative effectiveness of coping strategies or the speed and intensity with which they are applied may be the most important factors in averting relapse. Without a more sophisticated assessment of the effectiveness and quality of coping behavior during temptation and lapse situations, it is not be possible to determine how coping responses relate to a predisposition for depressed mood. The question of whether coping mediates the relationship between precessation depressed mood and abstinence outcome deserves further investigation.

Finally, we failed to find moderating effects for any of the predictors. This included a large number of demographic variables, as well as nicotine dependence, baseline levels of cigarette consumption, and possible depression history. These results suggest that the effects of baseline depressed mood on abstinence do not differ as a function of a smoker's demographics, possible depression history, or baseline smoking behavior. However, our power to detect such differences may have been limited by the size of our sample. In addition, our single-item measure of depression history may have been limited in the degree that it captured this construct.

In conclusion, we found a significant inverse relationship between precessation depressed mood and 6 months abstinence. Postcessation self-efficacy was a robust mediator of this effect, accounting for 32% to 48% of the relationship across the various measurement time points. None of the baseline characteristics or quit-day variables, including self-efficacy and urges to smoke, met criteria for mediation. Thus, a significant portion of the adverse effects of baseline depressed mood on quitting may be accounted for by changes in self-efficacy following cessation, and this impairment in confidence appears to be triggered by the smoker's experience during the first few weeks after quitting.

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