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Expressive writing as a smoking cessation treatment adjunct for young adult smokers

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This investigation evaluated the efficacy of expressive writing as a treatment adjunct to a brief office smoking cessation intervention plus nicotine patch therapy in young adults. Participants aged 18–24 years were randomized to a brief office intervention (n=99) or to an expressive writing plus brief office intervention (n=97). Both conditions received four individual visits plus 6 weeks of nicotine patch therapy, which began on the quit date following the week 2 visit. Participants in the expressive writing plus brief intervention condition wrote for 2 consecutive days before and 3 consecutive days after the quit date. The brief office intervention group completed a control writing assignment. At end of treatment (week 8), biochemically confirmed 7-day point-prevalence abstinence for the expressive writing plus brief office intervention condition was significantly greater than for the brief office condition (33% vs. 20%, p=.043, OR=2.0, 95% CI=1.0–3.7, from a logistic regression adjusting for gender). At 24 and 52 weeks, abstinence rates were similar for the brief office intervention versus expressive writing plus brief office intervention (12% vs. 11% at 24 weeks; 11% vs. 11% at 52 weeks). The results suggest that expressive writing has promise as a smoking cessation treatment adjunct for young adults. Lengthier interventions or the use of boosters should be tested to extend treatment effects. However, participants reported a low level of enthusiasm for the expressive writing, which may be a barrier to implementing it over a longer time frame. Therefore, other modes of delivering expressive writing to young adult cigarette smokers should be explored.

Introduction

Although the prevalence of cigarette smoking has declined among other adult age groups in the United States since 1983, smoking prevalence within young adults aged 18–24 years has remained stable, with a current prevalence rate of nearly 24% (Centers for Disease Control and Prevention, 2005). From 1991 to 1999, the prevalence of smoking among college students rose from 23% to 31% (Johnston, O'Malley, & Bachman, 2003). However, smoking among college students declined in years 2000 to 2001 and has remained stable with a current prevalence rate of 27% (Johnston et al., 2003).

Despite the high prevalence of smoking in young adults, few intervention trials have been designed specifically for this age group. A review of the past 25 years of tobacco-related research involving adolescents and young adults (Sussman, 2002), in conjunction with our own literature review, revealed only four published intervention studies involving young adults (Ames et al., 2005; Hellman, O'Shea, Kunz, & Schimpfhauser, 1988; Rutter, 1990; Suedfeld, Landon, Pargament, & Epstien, 1972). Only Rutter (1990), an uncontrolled investigation conducted in 24 university students and utilizing a behavioral smoking reduction intervention, yielded significant results, with 7 of the 24 participants being abstinent from smoking at 1 year, and 8 participants reporting a reduced rate of smoking.

A novel approach with young adult cigarette smokers is a brief intervention for smoking cessation

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that includes a treatment component focused on reducing stress. Theoretical models of the initiation, maintenance, and relapse to cigarette smoking have included psychological stress as an important factor (e.g., Kassel & Shiffman, 1997; Pomerleau & Pomerleau, 1990). Smokers often report that smoking leads to reductions in stress (Spielberger, 1986). Moreover, stress has been found to prospectively predict smoking initiation (Byrne, Byrne, & Reinhart, 1995) and is associated with failure to achieve smoking abstinence (Koval & Peterson, 1999). One alternative to traditional forms of stress management (e.g., relaxation training) is expressive writing about emotional experiences (Pennebaker, 1997). This technique has significant advantages over other stress management interventions in that it requires very little participant training, is brief and portable, and is appropriate for a wide range of ages. Given the mobility of many young adults, brief, uncomplicated, and portable interventions may be advantageous because of their ease of use and dissemination. To date, no study has evaluated expressive writing as an intervention for smoking cessation or evaluated its effect on perceived stress and affect in individuals attempting to quit smoking.

Although research has found that expressive writing has positive effects on physical and mental health, the specific mechanisms of action by which expressive writing influences health are not well understood (Sloan & Marx, 2004a). One proposed mechanism is through a reduction in stress via reduction of active mental inhibition (Klein, 2002; Pennebaker, 1997). Active mental inhibition occurs as a byproduct of an individual's efforts to inhibit particular thoughts or feelings (Pennebaker, 1997). This inhibition requires physiological effort that is reflected in autonomic and central nervous system activity and can be conceptualized as a long-term, low-level stressor (Pennebaker, 1997). Thus, as inhibiting thoughts and feelings about noxious events produce stress, writing about these events reduces psychological stress caused by active inhibition (Pennebaker, 1997). Klein (2002) expanded on this proposed mechanism of action by suggesting that individuals may use working memory to avoid stressful thoughts and as a result may have less attention available for solving problems associated with stressful life events. These working-memory and problem-solving deficits may then perpetuate higher levels of stress. Recent research has supported this hypothesized mechanism of action, although research exploring the mechanisms of action for expressive writing is ongoing (for a review, see Klein, 2002).

The present investigation is an extension of earlier work (Ames et al., 2005) that examined the feasibility and magnitude of the effect of a stress management intervention involving expressive writing as an adjunct to brief office smoking cessation for young adults. Participants aged 18–21 years were randomized to a brief office intervention or to an expressive writing plus brief office intervention condition. The expressive writing adjunct was not found to be effective, and evidence indicated a statistically nonsignificant trend that participants in the expressive writing treatment adjunct condition did more poorly than those in the control group (10% vs. 20% tobacco abstinence).

The results of this earlier study raised several additional questions, and the methodology of the present investigation was designed to address these issues. First, we wondered if the timing of the intervention affected the tobacco abstinence outcomes, as participants were only instructed to complete expressive writing prior to their quit date. Therefore, in the present investigation, participants were asked to complete expressive writing both before and after their quit date. Second, the treatment in the prior investigation was brief (4 weeks) and did not include nicotine replacement therapy (NRT); current guidelines recommend pharmacotherapy for smoking cessation, and more intensive behavioral treatment (e.g., greater number of sessions) enhances success (Fiore et al., 2000). Thus, a longer behavioral intervention including NRT and expressive writing may be more effective. Therefore, the intervention included in the present investigation was expanded and includes nicotine patch therapy.

The primary aim of this investigation was to evaluate the efficacy of expressive writing as a treatment adjunct to brief office smoking cessation intervention plus nicotine patch therapy. Because little is known about the mechanisms of action by which expressive writing exerts its effects, a secondary aim was to examine the impact of expressive writing on proposed mediators of change, including psychological stress and both positive and negative affect. We hypothesized that treatment effects would be mediated through changes in perceived stress and affect. Participants in the expressive writing treatment condition would show greater reductions in perceived stress and negative affect and increased positive affect compared with the control treatment condition.

Method

Participants

This study was approved by the Mayo Clinic Institutional Review Board. Participants included 196 young adult cigarette smokers who were interested in stopping cigarette smoking. Participants

were recruited from the northeastern Florida general community. Inclusion criteria were (a) provision of written informed consent, (b) age between 18 and 24 years, and (c) history of smoking at least 10 cigarettes/day during the past 6 months. Exclusion criteria were (a) use of behavioral or pharmacological treatment for tobacco dependence in the past 30 days, (b) use of nicotine-containing medication or tobacco products other than cigarettes in the past 30 days, (c) currently pregnant or breast feeding, (d) alcohol dependence during the past 3 months or non-nicotine drug dependence (other than marijuana) in the past 12 months, (d) clinical depression, or (f) a medical condition that would preclude use of the transdermal nicotine patch.

Procedure

Participants were recruited via advertisements posted on local college campuses and printed in college newspapers and citywide publications targeted to young adults. Participants were paid a total of US$95 for their participation. This study used a randomized, two-group design with repeated assessments at baseline, at each treatment session (weeks 1–8), and at follow-up at weeks 16, 24, and 52. Blocked randomization stratified according to gender was used. At baseline, participants were randomized to one of two treatment conditions: (a) Brief office intervention (n=99) or (b) expressive writing plus brief office intervention (n=97). Treatment was delivered by research staff with prior training in delivering behavioral smoking cessation interventions. Staff received regular supervision to ensure treatment fidelity. The target quit date for all participants was the day of treatment session 2.

All participants received a brief office intervention based on the U.S. Department of Health and Human Services (USDHHS) *Clinical Practice Guideline for Treating Tobacco Use and Dependence* (Fiore et al., 2000). Participants met with the research counselor for weekly treatment sessions during the first 4 weeks of the study. Each session lasted 30–40 min, of which approximately 10–15 min was devoted to a control writing assignment. During the initial session (week 1), the counselor assessed the following four factors, which determined the content of the intervention: Stage of change, social influences from family and friends to use or not use cigarettes, psychological factors including the presence of emotional distress that results in cigarette use as a coping method, and addiction (presence of physical or psychological dependence). The content of the intervention was restricted to these four general areas. Additionally, the research counselor utilized a motivational interviewing approach throughout. All participants also received 6 weeks of 21-mg/24-hr transdermal NRT (i.e., nicotine patches) beginning on their target quit date on the day of treatment session 2.

In addition to the 4 weeks of brief office intervention and 6 weeks of nicotine replacement, participants were randomized to the brief office intervention condition, in which they received a control writing treatment component, or to the expressive writing plus brief office intervention condition, in which they received an expressive writing treatment component. The content of these two writing conditions is detailed below, and a summary of the visit schedule is outlined in Table 1. (Full verbatim instructions for the expressive writing treatment component or the control writing condition can be obtained from the corresponding author upon request.)

Brief office intervention. The control writing assignment consisted of instructing participants at treatment session 1 to write on their own (e.g., at home) for a total of 20 min each day for 2 consecutive days, and at treatment session 2 (i.e., target quit date) for 3 consecutive days about time management. This control writing assignment emphasized that participants were to describe specific objects and events in detail without describing their thoughts or feelings. This assignment has not been found in prior studies to relate to any health outcome and has been recommended for use as a control condition in expressive writing studies (Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Petrie, Booth, Pennebaker, Davison, & Thomas, 1995).

Participants were asked to bring in their writing assignments to the next treatment session so that compliance could be evaluated. Participants were not asked to turn in their writings and were assured that the content would not be read. Writing assignments were not collected, in an effort to enhance participants' emotional disclosure in the active writing condition. Therefore, to make the methodology of control writing condition consistent with the expressive writing condition, the control writing assignments were not collected either.

Expressive writing plus brief office intervention. Participants randomized to this condition received an expressive writing treatment component. The expressive writing component consisted of instructing participants at treatment session 1 to write on their own (e.g., at home) for a total of 20 min each day for 2 consecutive days, and at treatment session 2 (i.e., target quit date) for 3 consecutive days about their very deepest thoughts and feelings related to smoking or stopping smoking and how smoking relates to problems or conflicts in their life.

Participants were asked to bring their writing assignments to their next treatment session so that

Table 1. Schedule of baseline, treatment, and follow-up assessments.

Week	0	1	2	3	4	5→7	8	16	24	52
Scheduled visit	X	X	X	X	X		X	X	X	X
Screening/baseline	X									
Treatment phase		X	----------	----------	----------	----------	X			
Target quit date			X							
Expressive writing			X	----------	X					
Nicotine patch			X	----------	----------	----------	X			
Follow-up phase							X	----------	----------	X
Visit attendance, number										
BOI	99	95	90	79	73		61	50	46	55
EW+BOI	97	92	90	76	78		67	56	53	62

Note. BOI, brief office intervention; EW, expressive writing.

compliance could be evaluated but were not asked to turn in their writings and from the outset of treatment were assured that the content would not be read. Compliance with expressive writing was evaluated by the research counselor via a very brief scanning of the writing sample to evaluate that text was written. However, the written content of the writing sample was not scrutinized. Participants were given standardized, lined paper for completing the writing assignments to aid the research counselor in this review. Since emotional disclosure is of paramount importance in the expressive writing paradigm, writing assignments were not collected in an effort to enhance participants' emotional disclosure and to maximize compliance by assuring participants' confidentiality.

Measures

Descriptive data. Basic demographic information and tobacco use history were assessed using a self-report form to evaluate the similarity of the treatment groups. Stage of change (Prochaska & DiClemente, 1983) was assessed to evaluate participants' interest in discontinuing cigarette smoking. Severity of nicotine dependence was evaluated using the Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991).

Tobacco use. Participants' 7-day point-prevalence tobacco use was evaluated at weeks 8, 16, 24, and 52. To evaluate changes in tobacco use during the treatment phase, participants' 7-day point-prevalence tobacco use was evaluated at treatment sessions held at weeks 1–4. Participants were considered abstinent from tobacco if they self-reported no smoking (i.e., "not even a puff") or use of any other form of tobacco over the previous 7-day time period and had an expired-air carbon monoxide (CO) level of less than 8 ppm. Biochemical confirmation of abstinence for participants who were unavailable to attend the follow-up appointments at weeks 12, 24, and 52 was obtained using salivary cotinine returned via mail. Expired-air CO of less than 8 ppm and salivary cotinine level of less than 15 ng/ml are widely used and accepted cutoff levels for nonsmoking, and recent guidelines issued by the Society for Research on Nicotine and Tobacco (SRNT) Subcommittee on Biochemical Verification recommend using these cutoff levels (Benowitz et al., 2002). Individuals who did not provide a self-report of smoking status (e.g., missed visits or were lost to follow-up), or for whom biochemical verification of smoking was not obtained, were classified as smoking. The average number of cigarettes smoked per day over the past 7 days also was assessed at each time point.

Psychological stress. The Life Experiences Survey (LES; Sarason, Johnson, & Siegel, 1978), a widely used self-report measure of major life events, was self-administered at baseline to assess for any potential treatment group differences in major life events during the past 12 months. The LES contains a list of 60 items designed to represent major life stressors experienced by the general population. Respondents are asked to rate the perceived positive or negative impact of each item that occurred. Examples of stressors listed on the LES include events such as death of a spouse, experiencing a serious illness, or being fired from a job. The LES was scored by calculating the sum of the negative perceived impact ratings for all items endorsed as occurring in the past 12 months. Items rated as occurring but perceived as having a positive impact were not included in calculation of the score.

Additionally, the Perceived Stress Scale-10 (PSS; Cohen, 1988), a 10-item self-report instrument designed to measure the extent to which situations in an individual's life are appraised as stressful over the prior 7 days, was self-administered as a treatment process measure at all time points. This 10-item scale is a shorter version of the 14-item Perceived Stress Scale.

Positive and negative affect. The Positive and Negative Affect Scales (PANAS; Watson, Clark, & Tellegan, 1988) were self-administered at baseline and week 8 as a treatment process measure to assess changes in positive and negative affect.

Treatment compliance and acceptability. Used and unused nicotine patches were collected and expressive writing assignments were visually inspected to evaluate compliance with treatment. Treatment compliance was defined as completing at least three of the four visits during the treatment phase and completing writing assignments at each visit. Treatment completion was defined as remaining enrolled in the study through the 8-week treatment phase. To evaluate treatment acceptability, participants in both groups were administered a semistructured interview at the end-of-treatment visit (week 8). This interview collected feedback from participants about the perceived helpfulness of the intervention.

Data analyses

Biochemically confirmed 7-day point-prevalence tobacco abstinence at the end-of-treatment assessment (week 8) was identified a priori as the primary efficacy endpoint. The sample size requirements were determined based on this endpoint. Baseline demographics of participants from each treatment group were summarized and compared using the rank sum test for continuous variables and the chi-square test or Fisher's exact test for categorical variables.

Gender was included as a stratification variable for this study based on evidence of gender differences in smoking cessation treatment outcome among adult smokers (e.g., Ward, Klesges, Zbikowski, Blis, & Garvey, 1997; Wetter et al., 1999). This stratification ensures that treatment allocation was balanced within each gender. In addition, to allow for a potential reduction in error variance, gender was included as a covariate in all analyses. Tobacco abstinence outcomes were analyzed using logistic regression to assess treatment efficacy after adjusting for gender. In all cases, an initial analysis was performed with the treatment × gender interaction term included to assess whether the effect of treatment was moderated by gender.

All participants were included in the analyses of abstinence endpoints. For these analyses, participants with missing information at a given visit for any reason (e.g., withdrawing from study, related to a missed visit) were classified as using tobacco. Additional secondary analyses were performed to assess whether the treatment effect was moderated by level of stress over the last 12 months (LES negative impact score) or level of nicotine dependence (FTND $\leqslant 5$ vs. FTND $\geqslant 6$). These analyses were performed by including the given moderator variable as a covariate in a logistic regression analysis along with the moderator × treatment interaction effect.

To assess for potential mechanisms of change, PSS and PANAS scores at week 8 (end of treatment) were compared between treatment groups using analysis of covariance (ANCOVA) with the baseline value and gender included as covariates (Vickers & Altman, 2001). Additional analyses were performed using ANCOVA to assess whether change from baseline to end of treatment for these variables differed between treatment groups after adjusting for smoking status.

Results

Participant characteristics

The present study, approved by the Mayo Clinic Institutional Review Board, was conducted from July 2001 to June 2005. A total of 196 participants were enrolled in this clinical trial and randomized to the brief office intervention ($n=99$) or to the expressive writing plus brief office intervention condition ($n=97$). Treatment groups were well balanced on demographic and baseline smoking history characteristics (Table 2).

Table 2. Baseline subject characteristics.[a]

Characteristic	Brief office ($n=99$)[b]	Expressive writing plus brief office ($n=97$)[b]
Age, years (*SD*)	20.8 (2.0)	20.9 (2.0)
Gender, *n* (%)		
Female	55 (56)	55 (57)
Male	44 (44)	42 (43)
Race, *n* (%)		
Caucasian	93 (94)	90 (93)
Black/African American	1 (1)	1 (1)
Hispanic	0 (0)	3 (3)
Asian/Pacific Islander	2 (2)	1 (1)
Native American/Alaskan Native	2 (2)	1 (1)
Other	1 (1)	1 (1)
Cigarettes per day, *n (SD)*	18.2 (5.9)	18.1 (6.3)
Years of regular smoking, years *(SD)*	4.9 (2.8)	5.3 (2.4)
Stage of readiness to change, *n* (%)*		
Contemplation	3 (3)	11 (11)
Preparation	94 (97)	86 (89)
FTND score of 6 or greater, *n* (%)	22 (22)	15 (16)
Number of smoking friends, *n* (%)		
None of them	2 (2)	2 (2)
Just a few of them	15 (15)	14 (14)
Some of them	28 (29)	29 (30)
Most of them	46 (47)	43 (44)
All of them	7 (7)	9 (9)
Previous stop attempts, *n* (%)		
None	8 (8)	13 (13)
1	39 (39)	31 (32)
2 or more	52 (53)	53 (55)
Longest abstinence in the past year, *n* (%)		
<24 hr or not at all	22 (22)	29 (30)
1–7 days	36 (36)	26 (27)
8–14 days	10 (10)	12 (13)
15+ days	31 (31)	29 (30)

Note. [a]Data are reported as means with standard deviations (*SD*) for continuous variables and *n* (%) for categorical variables. [b]The number of smoking friends was not reported by one subject in the control group, stage of readiness to change was missing for two control subjects, the longest abstinence in the past year was not reported for one stress management subject, and years of regular smoking was missing for three control and one stress management participant. *Chi-square $p=.026$.

Tobacco abstinence

Biochemically confirmed 7-day point-prevalence and continuous tobacco abstinence rates are shown in Figure 1 according to treatment. At the end of the treatment phase, the point-prevalence abstinence rate for participants who received the expressive writing plus brief office intervention was significantly higher than for those receiving the brief office intervention (33% vs. 20%; $p=.043$, $OR=2.0$, 95% $CI=1.0–3.7$). Separate analyses were performed to assess whether the effect of treatment was dependent on gender, level of stress over the last 12 months (LES negative impact score), or level of nicotine dependence (FTND $\leqslant 5$ vs. FTND $\geqslant 6$). From these analyses, no significant moderator effects were identified (gender × treatment interaction, $p=.448$; FTND × treatment interaction, $p=.502$; LES × treatment interaction, $p=.610$).

The percentage of participants who were continuously abstinent from target quit date through the end of the treatment phase was 14% for the expressive writing plus brief office intervention group and 9% for the brief office intervention group ($p=.249$, $OR=1.7$, 95% $CI=0.7–4.1$). Among those who self-reported smoking at the end of the treatment assessment (week 8), the mean change in smoking rate from baseline was −13.4 cigarettes/day ($SD=7.8$) for the control group and −13.8 cigarettes/day ($SD=8.9$) for the expressive writing plus brief office intervention group. Although both treatment groups demonstrated statistically significant reductions in smoking rate from baseline, the change in smoking rate did not differ between treatment groups ($p=.84$). At 6 months and 1 year, the point-prevalence abstinence rates were similar for the two treatment groups (6 months: 12% vs. 11% for expressive writing plus brief office vs. brief office; 1 year: 11% vs. 11%, respectively). The percentage of participants who were continuously abstinent from target quit date through 1 year was 2% for the expressive writing plus brief office group and 2% for the brief office group.

Potential mechanisms of change

Perceived stress (PS), positive affect (PA), and negative affect (NA) were hypothesized to reflect potential mechanisms of change associated with the smoking treatment. Among participants who had data available at both baseline and end of treatment, we found no evidence to suggest that these variables changed significantly over time within each treatment group (paired t test, $p\geqslant.09$ in all cases). From ANCOVA we found no evidence to suggest that any of these variables differed between treatment groups at the end of treatment ($p=.944$, $p=.156$, $p=.300$ for PS, PA, and NA, respectively).

The change of the measures from baseline to end of treatment (week 8) differed between those who were smoking and those who were abstinent, with abstinent participants having a more favorable change on PS, PA, and NA ($p=.020$, $p=.031$, $p=.014$, respectively). However, after adjusting for

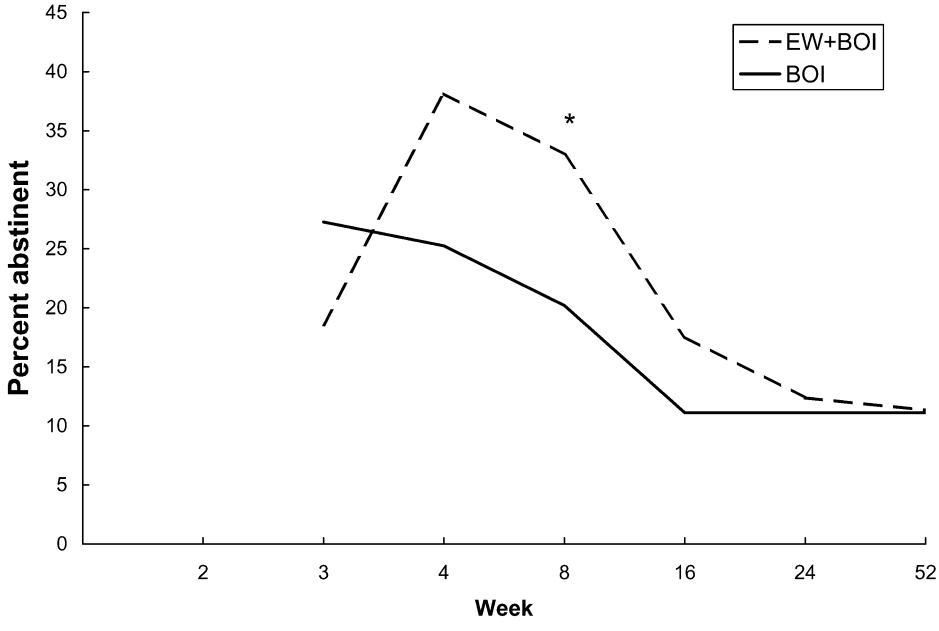

Figure 1. Biochemically confirmed 7-day point-prevalence tobacco abstinence according to treatment group. Writing assignments were to be completed during the first and second weeks, with the day following the week 2 visit being the target quit date (TQD). Nicotine patch therapy was continued through the end of week 8 (EOT). *$p=.043$; at week 8 the abstinence rate for subjects assigned to the expressive writing plus brief office intervention (EW+BOI) was significantly higher than that for subjects assigned to the brief office intervention (BOI).

these differences, we still found no differential change in perceived stress or affect based on treatment group (all p-values $>.217$). Results for PA and NA were similar at the weeks 16, 24, and 52 assessments to what was found at the end of treatment (week 8). The change in PS did not differ between those who were smoking versus those who were abstinent at the week 16 assessment ($p=.449$). A significant change was observed in PS between baseline and week 24 only for the expressive writing plus brief office participants ($p=.032$). Results for PS were similar at week 52 to what was found at the end of treatment (week 8).

Treatment compliance and acceptability

Of the 196 participants, 56 (29%) discontinued study participation prior to the end of the 8-week treatment phase (25% for expressive writing plus brief office vs. 32% for brief office, $p=.240$). Nearly all (89%; 50/56) of these participants self-reported smoking at their last study visit prior to discontinuation. The overall number of visits attended did not differ significantly between groups ($Mdn=8$ for expressive writing plus brief office vs. 7 for brief office; rank sum test $p=.209$). Table 1 details the number of participants who attended each study visit. The percentage of participants who were compliant with treatment was 68% (69% for expressive writing plus brief office vs. 67% for brief office; $p=.718$).

With regard to participant compliance with the nicotine patch, the percentage of patches used was 58% (59% for expressive writing plus brief office vs. 57% for brief office; $p=.623$). The number of days that expressive writing was completed did not differ significantly between those who were smoking versus those who were abstinent at either week 4 or 8. The median number of writing assignments completed was 5 for those who were abstinent vs. 5 for those who where smoking at week 4 (rank sum test $p=.707$); the median number of writing assignments completed was 5 for those who were abstinent vs. 5 for those who were smoking at week 8 (rank sum test $p=.682$).

Participants rated both how helpful they considered smoking cessation treatment in general and specifically how helpful the expressive writing component was on a 5-point scale (5 indicating maximum perceived benefit and 1 indicating no benefit at all). For the item about smoking cessation treatment in general, the 123 participants completing the item gave ratings ranging from 3 to 5; 94% rated it as a 4 or 5. On the item that asked about the perceived helpfulness of the expressive writing component, the 66 participants in the expressive writing condition completing the item gave ratings ranging from 1 to 5; 76% rated it as a 1, 2, or 3.

Participant responses to open-ended questions regarding aspects of the treatment that were most and least helpful were summarized, and themes were identified. The majority of participants randomized to either treatment condition (75% for the brief office condition and 65% for the expressive writing plus brief office condition) reported that the support of the research counselor and the structure associated with the weekly treatment sessions were the most helpful aspects of treatment. When asked about the least helpful aspect of the study, the most common response from participants was that writing was the least helpful treatment component (49% for the brief office condition and 39% for the expressive writing plus brief office condition). The second most common response was "nothing" or that "everything was helpful" (30% for the brief office condition and 39% for the expressive writing plus brief office condition).

Discussion

This is the second published investigation exploring the use of expressive writing for smoking cessation and is an extension of a prior investigation (i.e., Ames et al., 2005). The point-prevalence abstinence rate for participants who received the expressive writing treatment adjunct was significantly higher than for those in the control condition. Unfortunately, this treatment effect did not persist beyond the end-of-treatment assessment point, and the 24- and 52-week follow-up assessment point-prevalence smoking abstinence rates were similar for the two treatment groups.

The long-term smoking abstinence rate produced by the present study is somewhat lower than that produced by other studies among adults using standard forms of treatment. A meta-analysis presented in the USDHHS clinical practice guideline (Fiore et al., 2000) for interventions that used the nicotine patch in adults yielded an average smoking abstinence rate of 17.7%. Given that only four prior smoking cessation treatment studies have been published specifically pertaining to young adults, it is difficult to compare our treatment outcomes with previous research involving this specific age group. However, prior smoking cessation interventions among adolescents have produced a mean treatment abstinence rate of 12% versus 7% for control groups at 3- to 12-month follow-up (Sussman, 2002).

The significant treatment group differences at the end of treatment suggest that young adults might benefit from longer use of expressive writing. Warranting additional attention are the optimal number of writing assignments and the use of "booster" expressive writing assessments to sustain the significant early treatment effect. Additionally,

the finding that treatment effects faded rapidly following the end of treatment suggests that young adults may benefit in general from interventions of a longer duration. Some evidence also suggests that expressive writing assignments spaced out over a longer period of time are more effective (Smyth, 1998). However, participants were not enthusiastic about the expressive writing component, which may be a barrier to implementing it over a longer time frame. Other avenues to deliver expressive writing, such as the Internet, may be more appealing to young adults. Our decision not to collect participants' writings may have affected the outcome in some way. However, prior research has not investigated whether participants' belief that their writings will be read affects outcome. Future research should explore these issues.

A possible limitation of this study is that participants were instructed to write about a specific topic (i.e., smoking cessation). Prior research has found that the instructional set given to participants affects treatment outcome, with participants who are allowed to choose the topic of their writing having the most favorable outcome (Smyth, 1998). Future research should explore whether allowing individuals to choose their writing topic is more effective for smoking cessation.

Given that our investigation did not include a control condition that delivered smoking cessation as it would typically be delivered in a real-world setting, without the inclusion of any sort of writing assignment, we cannot be sure how expressive writing compares with "treatment as usual." Also, the control writing assignment might have prompted some thought about smoking cessation, resulting in a weaker finding. Future research should investigate these issues. Future research exploring the use of expressive writing for smoking cessation also might include a wait-list control condition.

The finding that participants in the expressive writing plus brief office condition initially had lower abstinence rates than participants in the brief office condition are reminiscent of those from our prior investigation (i.e., Ames et al., 2005), in which participants completed expressive writing only before cessation. In the earlier study, 6-month abstinence was lower for the expressive writing condition than for the control condition (10% vs. 20%), although this difference was not statistically significant.

Expressive writing has been found to create a short-term aversive mood state (Pennebaker, 1997), and we speculate that timing the quit date immediately following the expressive writing intervention in our earlier study may have paired the quit attempt with the peak of an adverse mood state. This may have unwittingly hindered the quit attempt. In the present investigation, we see an indication of this same pattern, with a lower percentage of participants initially being abstinent in the expressive writing condition. However, given that the present study included post-quit-date expressive writing, we speculate that this is what accounted for the improved rate of tobacco abstinence for the expressive writing condition seen after the quit date that continued to the end of treatment. Future research should explore the optimal time point for initiation of expressive writing and its duration in treatment.

None of the hypothesized mechanisms of change including perceived stress (PS), positive affect (PA), and negative affect (NA) were found to change significantly over time. Nor did these variables differ between treatment groups at the end-of-treatment assessment. However, degree of change in PS, PA, and NA between baseline and end of treatment differed significantly between those who were abstinent versus not abstinent; those who were abstinent had a more favorable change. Considered collectively, these results do not suggest that the impact of expressive writing on tobacco abstinence was mediated through changes in affect or perceived stress, as we had hypothesized. Although others have proposed that the effects of expressive writing might be mediated via changes in stress (Klein, 2002; Pennebaker, 1997), at present a limited amount research has explored the mechanism of action for expressive writing. Recent research has identified emotional arousal, assessed via salivary cortisol and self-reported arousal, as a mediating variable by which expressive writing exerts its positive effects (Sloan & Marx, 2004b; Sloan, Marx, Epstein, 2005). Cognitive processing that promotes assimilation and development of a better understanding of an event also has been hypothesized to mediate the effects of expressive writing (Pennebaker, Mayne, & Francis, 1997). Given that there exist several other hypothesized mechanisms of action that our investigation did not assess, future research should examine these other possible mediators of change.

The responses gathered from participants regarding their perceptions of aspects of the intervention that were helpful versus not helpful indicate that they benefited most from the support and structure associated with the weekly brief office intervention treatment sessions. Having this weekly structure in future studies and interventions with this population is recommended. Lacking was enthusiasm for the expressive writing treatment component. Unfortunately, neither investigation asked participants about the specific reasons they perceived expressive writing as the least helpful aspect of treatment or why they did not consider it to be helpful. Despite participants' indication that writing was perceived as the least helpful aspect of treatment, however, compliance with writing was superior to that of compliance with the nicotine patch.

Similar to other investigations involving younger populations of smokers, the present investigation had difficulty with participant retention and adherence. We are unable to compare our participant retention and compliance with other investigations involving young adults because so few studies have been conducted involving this age group. However, the rates from the present study are similar to findings from studies that have examined retention and treatment compliance rates of adolescents involved in smoking cessation interventions. A comprehensive review of treatment programs for adolescent smokers found retention rates ranging from 33% to 100% with a mean of 78% (Sussman, 2002). With regard to treatment compliance, investigators have found that approximately 50% of adolescents complete a smoking treatment intervention (Sussman, Dent, & Lichtman, 2001; Sussman, Lichtman, Ritt, & Pallonen, 1999). Several studies examining compliance with the transdermal nicotine patch among adolescents have found compliance rates ranging from 41% to 84% (Alterman, Gartit, Cook, & Cnaan, 1998; Hanson, Allen, Jensen, & Hatsukami, 2003).

A related shortcoming of the present study is that we included only 6 weeks of 21-mg/day nicotine patch therapy and did not taper the dose. The nicotine patch methodology, although acceptable when the research grant application for this investigation was written, is not consistent with the current USDHHS clinical practice guideline (Fiore et al., 2000) and may have had an adverse effect on participant adherence. Nicotine patch compliance might have improved had the length of treatment been longer and a tapered dosing schedule been used, consistent with the current guideline. A final limitation is that we did not collect the expressive writing assignments; thus we do not have any information about their content. Investigators continuing this line of research should consider collecting these writing samples in future studies. These expressive writings may provide insight into individuals' experiences with smoking cessation and may suggest new mechanisms of action by which expressive writing exerts its effects.

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