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EVALUATION OF A COGNITIVE-BEHAVIORAL MOOD MANAGEMENT
INTERVENTION FOR DEPRESSED COLLEGE SMOKERS

By

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Dissertation

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in Clinical Psychology

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Evaluation of a Cognitive-Behavioral Mood Management Intervention for Depressed College Smokers

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College smoking correlates positively with depressive symptoms, and given the relation between smoking and mood regulation, cigarette smoking is a major health concern among depressed college smokers. This randomized clinical trial examined smoking reduction and cessation among college smokers with elevated depressive symptoms participating in a group-based multi-component intervention including mood management, behavioral counseling, and motivational enhancement (CBT). Fifty-eight smokers (smoked 6 or more days in the past 30) were randomized to six sessions of the experimental intervention ($n = 29$) or a nutrition-focused attention-matched control group (CG; $n = 29$). Relative to CG participants, a significantly greater proportion of CBT participants reduced smoking intensity by 50 percent or more at end of treatment. In addition, confidence to reduce smoking increased significantly among CBT participants and decreased among CG participants from baseline to end of treatment. Overall, CBT participants maintained these changes at 3-month follow-up even though group differences were no longer statistically significant. Study findings demonstrate the feasibility of this intervention and support its utility for smoking reduction among depressed college students.

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INTRODUCTION

Cigarette Smoking among College Students

Smoking is relatively common among college students. Whereas 9% of college students smoke daily, many more smoke occasionally (30-44%) (Johnston, O'Malley, Bachman, & Schulenberg, 2007), and these occasional smokers have similar difficulties with quitting as adults (Okuyemi et al., 2002). In addition, although most people try their first cigarette before age 18 (Centers for Disease Control and Prevention, 1997a), cross sectional surveys show that 11-28% of students begin smoking regularly while in college (Everett et al., 1999; Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998). Furthermore, a recent longitudinal study found that 12% of non-smokers became occasional smokers and 14% of occasional smokers progressed to daily smokers over the course of four collegiate years (Wetter et al., 2004). Taken together, research on college students suggests that smoking patterns evolve during the college years. Moreover, adult smoking patterns might become established in early adulthood, and therefore, college students are important targets for interventions aimed at decreasing use and preventing future smoking.

Despite the high prevalence of tobacco smoking among college students and the feasibility of implementing programs into structured college or university settings (DeBernardo et al., 1999), few interventions have been designed and tested for this population. Existing cessation services often include 'quit kits', self-help materials, and low-cost or free pharmacological aids, yet few of these programs have been evaluated (Halperin & Rigotti, 2003; Ramsay & Hoffmann, 2004). Moreover, most intervention research targeting college students lacks methodological rigor, such as random sampling, control groups, random assignment to groups, and biochemical validation of self-reported smoking (Murphy-Hoefer et al., 2005). A

recent review of interventions designed to reduce tobacco smoking among college students found seven published studies in the past 20 years. Of these seven studies, reviewers rated two ‘satisfactory’ and one ‘unsatisfactory’ based on appropriateness of study design, follow-up and completion rates, and data analysis. The remaining four studies were not rated due to small sample sizes (≤ 25 participants) or lack of a comparison group (Murphy-Hoefer et al., 2005). Despite methodological problems, the authors concluded that tobacco smoking interventions may reduce tobacco use among college students (Murphy-Hoefer et al., 2005). Indeed, Ramsay and Hoffmann (2004) found that a peer-led cessation and intervention program resulted in 88.2% quit rates among college smokers. Chan and Witherspoon (1988) evaluated the efficacy of a brief feedback counseling intervention and found it to be effective in increasing quit rates, reducing number of cigarettes smoked per day, and preventing initiation of tobacco use. These studies, though limited in number, suggest that smoking interventions may be successful in altering use among college students. Clearly, additional intervention research is needed for this population.

Depression and Cigarette Smoking

Research with adolescents and adults documents the association between depression and cigarette smoking. Among adolescents, depressive symptoms and depression diagnoses demonstrate cross-sectional associations with nicotine smoking and dependence (Breslau, Kilbey, & Andreski, 1991; Patton et al., 1996). Furthermore, research identifies depression as an important factor in the initiation and progression of adolescent smoking behavior (Brown, Lewinsohn, Seeley, & Wagner, 1996; Kandel & Davies, 1986; Patton et al., 1998; Windle & Windle, 2001), and other research suggests this relationship is bidirectional such that smoking may increase the risk for subsequent depressed mood (Steuber & Danner, 2006; Wu & Anthony, 1999). Large population-based studies among adults observe higher rates of depression

diagnoses and symptoms in smokers than non-smokers (Anda et al., 1990; Glassman et al., 1990; Murphy et al., 2003). Other studies document a relationship between major depression (MDD) and nicotine dependence (Breslau et al., 1991; Breslau, Kilbey, & Andreski, 1993; Carton, Jouvent, & Widlocher, 1994), and level of nicotine consumption (Kendler et al., 1993). Furthermore, 61% of participants in a smoking cessation trial reported past MDD (Glassman et al., 1988), and other trials reveal that 34% to 48% of enrolled smokers present with clinically significant depressive symptomatology (Kinnunen, Doherty, Militello, & Garvey, 1996; Lerman et al., 1996; Lerman et al., 1998).

Numerous recent studies demonstrate that the relationship between depression and smoking extends to young adults, including college students. For example, a national study of young adult smokers found depressive symptoms to be a unique predictor of lifetime and current nicotine dependence (Hu, Davies, & Kandel, 2006). In other studies of young adults, nicotine dependence was associated with higher rates of MDD (Breslau et al., 1991), and a history of MDD increased the risk for progression to daily smoking (Breslau, Peterson, Schultz, Chilcoat, & Andreski, 1998) and nicotine dependence (Breslau, Fenn, & Peterson, 1993). Research among college students reveals a relationship between a history of depression and smoking (Lenz, 2004; McChargue, Spring, Cook, & Neumann, 2004). Recent research has also shown that current cigarette and tobacco users report a significantly higher number of depressive symptoms (measured by the CES-D) than non-cigarette and non-tobacco users (Lee Ridner, Staten, & Danner, 2005; Vickers et al., 2003). Furthermore, a positive correlation exists between depressive symptoms and smoking level among college smokers (Lee Ridner et al., 2005; Schleicher, Harris, Catley, & Nazir, In Press). To this writer's knowledge, only one study failed to observe a relationship between depressive symptoms and nicotine dependence (Psujek, Martz,

Curtin, Michael, & Aeschleman, 2004). Accordingly, development of novel and efficacious smoking interventions for the subpopulation of depressed college student smokers is warranted.

Depression and Smoking Cessation

There is some evidence to suggest that depression impedes smoking cessation efforts. With regard to the relationship between past MDD and smoking cessation likelihood, findings are equivocal. Whereas some studies observed that past depression decreases likelihood of smoking cessation (Anda et al., 1990; Glassman et al., 1988; Murphy et al., 2003), others have not (Breslau et al., 1998; Ginsberg et al., 1997; John, Meyer, Rumpf, & Hapke, 2004a; Niaura et al., 1999). Results of a recent meta-analysis suggest that history of MDD is not an independent risk factor for cessation failure (Hitsman, Borrelli, McChargue, Spring, & Niaura, 2003); however, recurrent MDD might have a stronger relationship with quitting than a single past episode (Covey, Hughes, Glassman, Blazer, & George, 1994; Hitsman et al., 2003).

Although a history of MDD is not consistently associated with cessation failure, currently depressed smokers (categorized based on symptoms of depression or diagnosis of depression) are less likely to stop smoking (Anda et al., 1990) and have higher relapse rates than nondepressed smokers (Hayford et al., 1999; Kinnunen et al., 1996; Niaura et al., 2001). Taken together, research suggests that current depressive symptoms may be a more important predictor of treatment outcome than history of MDD. This is especially true given that even low levels of baseline depressive symptoms predict poorer smoking abstinence rates (Niaura et al., 2001).

Self-medication Model of Smoking and Depression

A self-medication model has been used to account for the association between smoking and depression. According to this model, smokers “self-medicate” with nicotine to alter mood states by decreasing negative affect and increasing arousal (Carmody, 1989; Hall, Munoz, Reus,

& Sees, 1993; Hughes, 1988; Lerman et al., 1996; Pomerleau & Pomerleau, 1984). Research demonstrates that negative affect regulation expectancies, or beliefs about whether or not smoking will alleviate negative affect, might contribute to increased smoking. For example, among adolescents, affect regulation expectancy was related to experimental, regular, and established smoking (Mayhew, Flay, & Mott, 2000). In a sample of adults, depressed smokers reported smoking more in the presence of negative affect and had fewer coping resources than non-depressed smokers (Kinnunen et al., 1996). In other studies among adult smokers, negative affect regulation expectancies mediated the relationship between depressive symptoms and negative affect, on the one hand, and nicotine dependence on the other (Copeland, Brandon, & Quinn, 1995; Lerman et al., 1996). It is possible that depressed smokers have fewer coping resources than non-depressed smokers, and thus have a greater expectation that smoking will regulate mood.

College students also report smoking to manage depression and stress (Patterson, Lerman, Kaufmann, Neuner, & Audrain-McGovern, 2004). For example, college student tobacco users with elevated depressive symptoms appear to be more likely to use tobacco for mood improvement than tobacco users with low depressive symptoms (Vickers et al., 2003). While one study found that negative affect regulation expectancies did not mediate the relationship between a history of depression and smoking status among college students (McChargue et al., 2004), a different study found that these expectancies did mediate the relationship between depressive symptoms and college student smoking status (Schleicher et al., In Press). Consequently, it appears that current depressive symptoms may be a more important predictor of negative affect regulation expectancies than history of depression.

Mood Management Interventions for Depressed Smokers

Researchers have attempted to improve smoking cessation outcomes for depressed smokers with treatments targeting negative affect. Cognitive-behavioral mood management interventions (CBT) have become a recent focus of investigation as a smoking treatment adjunct for adult smokers with depression. Two studies by Hall and colleagues (1994; 1998) demonstrated that CBT was more effective than a behavioral smoking cessation treatment for smokers with a past history of MDD. However, when therapist contact time was controlled, there was no effect of CBT on smokers with a history of MDD (Hall et al., 1996). On the other hand, another study demonstrated that a 12-week CBT intervention was superior to a 12-week behavioral counseling intervention for adult smokers with histories of MDD and alcohol dependence (Patten, Martin, Myers, Calfas, & Williams, 1998). Results of two recent studies suggest that CBT may be superior to standard behavioral counseling for individuals with a history of multiple depressive episodes versus a single past episode of depression (Brown et al., 2001; Haas, Munoz, Humfleet, Reus, & Hall, 2004).

The findings in support of CBT for individuals with multiple past episodes of MDD parallels the research regarding historical depression and smoking abstinence and may explain the inconsistent results of the efficacy of CBT for historical depression. For example, smokers with recurrent MDD may have higher levels of mood disturbance than those with a single episode and thus may benefit from the addition of CBT to standard behavioral counseling (Haas et al., 2004). If this is the case, then CBT is likely to be valuable for smokers with clinically elevated depressive symptoms. Indeed, although most studies examining CBT for smoking exclude participants with current depression, additional research suggests that this type of intervention may be beneficial for smokers with current depressive symptoms. One study found

that smokers with high levels of baseline negative affect benefited more from CBT than smokers with low levels of negative affect (Brandon, Copeland, & Saper, 1995). In another study, participants high in baseline negative affect responded best to supportive counseling, while those low in negative affect responded best to skills training (Zelman, Brandon, Jorenby, & Baker, 1992). Furthermore, in a recent study of adult smokers with a past history of alcohol dependence, post-treatment abstinence rates were higher for smokers with high baseline depressive symptoms who participated in CBT than for those in behavioral counseling (Patten, Drews, Myers, Martin, & Wolter, 2002). On the other hand, smokers with low baseline depressive symptoms responded better to behavioral counseling than to CBT. These results were significant after adjusting for history of MDD. The authors concluded that current depressive symptoms provide additional information in predicting short-term outcome beyond a diagnosis of major depression (Patten et al., 2002). Interestingly, three other studies did not find independent effects for baseline depressive symptoms or negative mood on abstinence rates following CBT (Brown et al., 2001; Brown et al., 2007; Haas et al., 2004). The conflicting findings among studies evaluating the effectiveness of CBT interventions for smokers experiencing depressive symptoms or negative affect may be related to symptom severity. For example, mood management interventions may be more effective for those with clinically elevated depressive symptoms than low or moderate levels of symptomatology (Brown et al., 2007). Given the strong positive correlation between high depressive symptoms and smoking, it is imperative for research studies to continue to develop and test interventions for this population.

Summary

Traditional CBT depression interventions treat current low mood and stress, yet few studies have targeted smokers with current clinical elevations in depression. As noted above,

depression and smoking are related, and current depressive symptomatology has the potential to impact smoking cessation efforts. Given the possible benefit of CBT for smoking, researchers should continue to develop and test interventions for depressed smokers. The college years represent a unique opportunity for psychotherapeutic interventions with potential to alter the course of lifelong smoking patterns. Moreover, college is a period of transition in which many experience negative mood (Eisenberg, Gollust, Golberstein, & Hefner, 2007). The self-medication model suggests the likelihood that many college students will initiate, maintain, or increase smoking to cope with stress and negative affect. To date, however, no research has evaluated the effectiveness of mood management interventions for college student smokers experiencing high levels of depressive symptoms.

To address this need, this study implemented a group-based CBT intervention targeting smoking reduction and cessation among college student smokers (smoking ≥ 6 days in the past 30) with clinically elevated depressive symptomatology. For safety concerns, we excluded participants experiencing a current major depressive episode (MDE) ($n = 4$). The multi-component CBT intervention combined mood management, behavioral counseling and motivational enhancement. We targeted occasional and daily smokers with varying interest in quitting because we wanted to derive a sample representative of the smoking college student population and because recent research suggests that the prevalence of occasional smoking is increasing (Tong, Ong, Vittinghoff, & Perez-Stable, 2006). Our intervention included a motivational enhancement component because we did not recruit students seeking treatment for smoking and, therefore, anticipated variability in their motivation to change their smoking behavior. Finally, in addition to smoking cessation, we targeted smoking reduction because of recent positive findings regarding reduction interventions for smokers not motivated to quit

(Hughes & Carpenter, 2005) and the apparent finding that these reductions might facilitate future cessation efforts (Carpenter, Hughes, Solomon, & Callas, 2004; Hughes & Carpenter, 2006).

HYPOTHESES

Primary Hypotheses

Hypothesis 1

Relative to participants in a nutrition-focused attention-matched control group (CG), participants receiving a multi-component experimental intervention (CBT) for smoking will have significantly higher 30-day abstinence (defined as no cigarettes in the past 30 days) at end of treatment (session 6; 8 weeks from baseline).

Hypothesis 2

Relative to CG participants, a significantly greater proportion of participants receiving CBT will achieve 50% or greater reduction in number of cigarettes smoked per month at end of treatment (session 6; 8 weeks from baseline).

Secondary Hypotheses

Hypothesis 3

Relative to CG participants, participants receiving CBT will have significantly higher 30-day abstinence (defined as no cigarettes in the past 30 days) at 3-month follow-up (12 weeks from baseline).

Hypothesis 4

Relative to CG participants, a significantly greater proportion of participants receiving CBT will achieve 50% or greater reduction in the number of cigarettes smoked per month at 3-month follow-up (12 weeks from baseline).

Exploratory Hypotheses

Hypothesis 5

CBT for college student smokers with elevated depressive symptoms will be feasible, as evidenced by our ability to recruit and retain participants, treatment attendance, and participants' reports of treatment satisfaction.

Hypothesis 6

Comparing baseline to end of treatment and 3-month smoking levels, participants receiving CBT will have a significantly greater reduction in overall number of cigarettes smoked per month than participants in CG.

Hypothesis 7

Relative to CG participants, CBT participants will report significantly higher motivation and confidence to quit and reduce smoking at end of treatment and 3-month follow-up.

Hypothesis 8

Relative to CG participants, CBT participants will report significantly less severe depressive symptoms, negative affect, and negative affect regulation expectancies, and will report significantly higher positive affect and increased use of cognitive reappraisal strategies at end of treatment and 3-month follow-up.

Hypothesis 9

The relationship between baseline depressive symptoms and treatment attendance will be explored.

METHODS

Participants and Procedure

As presented in the sampling diagram (Figure 1), 1,380 participants aged 18 years or older completed screening measures over the course of three academic semesters (2007-2008).

Participants completed measures during “Testing Day,” an event sanctioned by The University of Montana Psychology Department in which students enrolled in introductory psychology courses earn required research participation credit. Study personnel contacted participants via telephone who agreed to follow-up contact and met the following screening criteria: smoking ≥ 6 days in the past 30, clinically significant depressive symptomatology (Center for Epidemiological Studies-Depression Scale (CES-D) sum ≥ 16 (Radloff, 1977)), and a degree of motivation to quit smoking (Contemplation Ladder rating ≥ 3 , indicating some awareness of problems associated with smoking (Abrams et al., 2003; Biener & Abrams, 1991)). During a follow-up phone call, study personnel described the study, assessed exclusion criteria, and enrolled interested and consenting participants. Participants were excluded if they reported recent (past 30 days) participation in a structured smoking cessation program ($n = 0$), and for safety reasons if they reported current suicidal intent or plans ($n = 0$) or current MDE ($n = 4$, indexed using a diagnostic algorithm from the Patient Health Questionnaire-9 (Kroenke, Spitzer, & Williams, 2001)). Table 1 summarizes inclusion and exclusion criteria.

As shown in Figure 1, 58 undergraduate smokers with clinically elevated depressive symptomatology were randomized to participate in the CBT and CG groups. The 58 eligible participants were individually randomized to groups using a random number table and blocked random assignment. We blocked according to CDC-defined (Center for Disease Control and Prevention, 1994) smoking level (occasional smoking ≤ 19 days in the past 30 vs. frequent smoking ≥ 20 days in the past 30) and motivation to quit (Contemplation Ladder score ≤ 5 vs. ≥ 6) so that groups were matched on these characteristics at baseline. Major assessment intervals occurred at screening, baseline (session 1: week 0), end of treatment (session 6: week 8), and 3-month follow-up (12 weeks from baseline). The first five group sessions occurred weekly, and

the last group session took place 30 days after session 5 in order to assess 30-day smoking outcomes at end of treatment. The following incentives were provided: 1) partial course credit; 2) non-monetary incentives (e.g., campus coupons and pizza at group sessions); 3) \$50 for completing study measures. In addition, for each attended group session, participants entered their names in a drawing to win an iPod at the final group session. The Institutional Review Board at The University of Montana (UM) approved all study procedures; participants provided informed consent at screening and baseline. Table 2 summarizes the study overview and disbursement of incentives.

Interventions

Treatment Condition

The treatment condition was an adaptation of a 12-week group-based combined behavioral counseling plus cognitive-behavioral mood management intervention (CBT). The original intervention significantly enhanced smoking treatment outcomes among abstinent alcoholics with a history of major depression in a previous study (Patten et al., 1998). This intervention was also found to be more effective than standard behavioral counseling for smokers experiencing high levels of current depressive symptomatology (Patten et al., 2002). We modified the 12-week intervention by reducing the number of sessions to 6 and keeping the session length at two hours for a couple of reasons. First, college students appear to value time-limited interventions (Black & Babrow, 1991), and Dr. David Brown, a psychologist and group psychotherapist at the UM student counseling center, advised against conducting more than 6 sessions due to participant attrition. Second, given that our primary outcome was 30-day smoking rate at end of treatment, we required 30 days between the final two sessions. This requirement made 6 sessions a more feasible option. We maintained the group-based approach

for the purpose of replication and time and cost considerations. Although the sessions were group-based, group discussion and problem solving allowed for some personalized instruction. In addition to the manual cited above, material from a clinical handbook on tobacco dependence treatment outlining an 8-week intensive mood management intervention was incorporated (Abrams et al., 2003). Participants were taught that smoking is a learned behavior, a physical addiction, and that smoking is related to mood. The CBT component outlined associations among triggers, thoughts, feelings, and behavior. Participants recorded their thoughts, and identified and challenged thought distortions related to negative mood and/or smoking. We also taught additional ways of managing mood, such as increasing pleasant smoke-free activities and relaxation. The behavioral counseling component included skills training such as self-monitoring of smoking and triggers, self-management strategies, making a quit or change plan, and relapse prevention. Finally, the smoking intervention included motivational approaches (Miller & Rollnick, 2002) such as expressing understanding, rolling with resistance, developing discrepancy (e.g., values clarification and pros and cons), and increasing self-efficacy. For example, participants ranked their motivation and confidence to quit on a scale from 1 (no motivation/confidence) to 10 (high motivation/confidence), and group leaders facilitated a dialogue about their locations on the scale. The group also created a pros and cons list of smoking and of quitting and/or reducing smoking. As outlined in Table 3, participants were given the opportunity to make a quit or change plan at session 4 and were given instructions on obtaining low-cost pharmacotherapy to support cessation efforts. Treatment groups were conducted by two graduate students in clinical psychology, including this writer, and they received weekly supervision from David Brown, Ph.D., a clinical psychologist at The University

of Montana's Counseling and Psychological Services (CAPS). In addition, Drs. Harris and Campbell provided consultation as needed.

Control Condition

The active control condition was a 6-session group designed to increase the consumption of fruit and vegetables to equate clinical contact time across experimental and control conditions. Neither smoking nor smoking cessation was discussed in the nutrition groups. Control groups were conducted by two graduate students in psychology or public health, and Drs. Harris and Campbell provided weekly supervision.

Table 3 outlines the topics covered in the treatment and control conditions. Treatment groups took place at CAPS and control groups took place either at CAPS or the psychology building on campus. For the first two cohorts, all group leaders and supervisors attended a two-hour peer-led motivational interviewing training. For the third cohort, all group leaders attended a two-day motivational interviewing workshop. Group leaders met at least once before groups began to review curricula. Weekly supervision included a review of plans for upcoming sessions.

Measures

Screening Measures

Demographics. At screening, socio-demographic information (gender, age, and year in school) was assessed via self-report.

Depressive Symptoms. The 20-item CES-D (Radloff, 1977) assessed depressive symptoms. Scores range from 0 to 60, with higher scores reflecting a greater number of depressive symptoms. The CES-D correlates highly with other self-report measures of depression and evidences good internal consistency ($\alpha = .85-.90$) and test-retest reliability ($r = .57$ for 2-8 weeks) (Radloff, 1977). We used the standard cutoff score (Sum ≥ 16) to define

clinically significant depression. For missing items on the CES-D, we used item-mean imputation for participants with four or fewer items missing ($n = 54$ one item missing, $n = 6$ two items missing) (Bono, Ried, Kimberlin, & Vogel, 2007). The CES-D evidenced good internal consistency in the present sample ($\alpha = .89$).

Smoking Status. The Center for Disease Control and Prevention open-ended question, “During the past 30 days, on how many days did you smoke cigarettes?” assessed smoking status (1997b). Those who reported smoking on 6 or more days were considered eligible.

Motivation to Quit. The Contemplation Ladder assessed motivation to quit smoking (Abrams et al., 2003; Biener & Abrams, 1991). This measure consists of an 11-point Likert scale measuring readiness to quit smoking, with a higher score representing greater motivation to change smoking behavior (e.g., “I have decided to quit smoking”) and a lower score representing less motivation to change (e.g., “I do not have a problem with smoking, and I do not intend to cut down or quit now”). Participants select the response that best describes their thoughts about their current smoking. The validity of the Contemplation Ladder has been demonstrated by comparing it to reported intention to quit and number of previous quit attempts, and by its ability to predict participation in treatment programs (Biener & Abrams, 1991). Participants scoring three or higher on this measure were considered eligible.

Major Depressive Disorder. The 9-item Patient Health Questionnaire (PHQ-9) assessed for current MDE (Kroenke et al., 2001). Items assess the frequency with which the respondent experiences the 9 DSM-IV criteria for MDE; items are scored from 0 (“not at all”) to 3 (“nearly every day”). Total scores range from 0-27. We used a scoring algorithm such that individuals were excluded on the basis of MDE if: (1) they endorsed experiencing 5 of the 9 symptoms for at least “more than half the days” in the past 2 weeks (i.e., score at least “2” on 5/9 questions), (2)

one of the symptoms was depressed mood or anhedonia, and (3) they endorsed an additional item that assesses whether any of the measure's nine symptoms causes clinically significant impairment (Kroenke et al., 2001). Research suggests that a PHQ-9 score of 10 or more is a reliable and valid indicator of MDE (Adewuya, Ola, & Afolabi, 2006; Kroenke et al., 2001). The PHQ-9 has demonstrated good construct, concurrent, and criterion validity, and has been shown to have good internal consistency and test-retest reliability (Adewuya et al., 2006; Kroenke et al., 2001). In addition, a recent study demonstrated that use of the PHQ-9 as a telephone screening assessment is concordant with self-administration and preserves the internal consistency of the items (Pinto-Meza, Serrano-Blanco, Penarrubia, Blanco, & Haro, 2005). The scale evidenced acceptable internal consistency in this sample ($\alpha = .71$).

Baseline, End of Treatment, and Follow-up Measures

Demographics. At baseline only, ethnicity and previous and current counseling experience were assessed via self-report (e.g. "Have you ever received psychological counseling in the past?" and "Are you currently receiving psychological counseling?").

Smoking Status. Baseline and outcome smoking status were assessed by two forms of self-report. First, participants answered a single Center for Disease Control and Prevention (1997b) question ("During the past 30 days, on how many days did you smoke cigarettes?"). Data from this question were used for descriptive purposes only. Second, timeline follow-back (TLFB) procedures (Harris et al., In Press; Sobell & Sobell, 1996) assessed number of cigarettes smoked in the past 30 days. Trained independent evaluators instructed participants to use a calendar and memory aids (e.g., key dates like birthdays, exams, holidays) to provide retrospective estimates of the number of cigarettes smoked each day. To reduce intentional inaccuracy of these data we obtained saliva samples at end of treatment, informing participants

that samples would be tested for nicotine (Murray & Perry, 1987). All smoking outcomes were derived from TLFB data. For missing TLFB data, we inserted data based on smoking patterns from weekday and weekend use reported in the current month. Five participants had one item missing and two participants had two items missing.

Motivation and Confidence. Four separate questions were modified from Miller and Rollnick (1991) to assess motivation and confidence to quit and reduce smoking at baseline and end of treatment. Participants indicated their levels of motivation and confidence to quit and reduce smoking on scales ranging from 0 (not at all motivated/confident) to 10 (Very motivated/confident).

Depressive Symptoms. The 21-item Beck Depression Inventory-II (BDI-II, Beck, Steer, & Brown, 1996) assessed depressive symptoms. Scores range from 0 to 63, with higher scores reflecting more depressive symptomatology. The BDI-II demonstrates good internal consistency reliability ($\alpha = .93$) and construct validity (Beck et al., 1996). At baseline the BDI-II evidenced good internal consistency in this sample ($\alpha = .90$). For missing BDI-II data ($n = 4$ one item missing) we replaced missing items with the mean values of the valid data by participant (Bono et al., 2007). Group leaders monitored suicidal ideation by assessing BDI-II item #9 (Suicidal Thoughts or Wishes). For any response other than '0' group leaders conducted a targeted suicide assessment. Participants reporting suicidal ideation or other concerning psychiatric symptoms were referred for treatment at CAPS.

Negative and Positive Affect. The 20-item Positive Affect Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988) assessed positive and negative affect. The PANAS consists of two 10-item scales (Positive Affect, PA and Negative Affect, NA). The two scales have high internal consistency reliabilities ($\alpha = .84$ to $.90$) and low intercorrelations ($r_s = -.12$ to

-23). At baseline, the NA scale evidenced acceptable internal consistency in this sample ($\alpha = .73$), and the PA scale evidenced good internal consistency ($\alpha = .88$).

Smoking Expectancies. The 4-item Negative Affect Reduction (NAR) subscale of the Brief Smoking Consequences Questionnaire (SCQ) for college students (Schleicher, Harris, Catley, Harrar, & Golbeck, 2008) measured participants' expectancies that smoking would assist with negative affect regulation. Participants indicated the likelihood of smoking consequences on a Likert-type scale ranging from 0-10 (0=Not at all likely, 10=Extremely likely); higher scores reflected greater outcome expectancies (e.g., "Smoking calms me down when I feel nervous," "If I am feeling irritable, a smoke will help me relax."). The NAR subscale evidenced good internal consistency reliability in another college sample ($\alpha = .92$) (Schleicher et al., 2008) and in this study at baseline ($\alpha = .85$).

Cognitive Reappraisal. The 6-item Reappraisal subscale of the Emotion Regulation Questionnaire (ERQ) assessed cognitive reappraisal (Gross & John, 2003). The Reappraisal subscale measures the extent to which participants use cognitive strategies to alter their emotions (e.g., "When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about"). Items are rated on a scale from 1 (strongly disagree) to 7 (strongly agree), with higher scores representing higher use of reappraisal as an emotion regulation strategy. In a college sample, the Reappraisal subscale demonstrated good internal consistency reliability (mean $\alpha = .79$ across 4 samples) and convergent and discriminant validity (Gross & John, 2003). At baseline, the Reappraisal subscale evidenced good internal consistency in this sample ($\alpha = .85$).

Pharmacotherapy Use. Pharmacotherapy use (i.e., any prescription drug) was assessed via self-report and included drug names, dosage, and dates of use. For descriptive purposes, drugs

were coded as present (1) or absent (2) for four drug categories of interest (anti-depressant, stimulant, mood stabilizer/anti-psychotic, and benzodiazepine). In addition, presence (1) or absence (2) of any psychotropic medication was coded.

Additional Measures

Treatment Attendance. Participants signed in at each weekly session (baseline included) and were coded as 0 (absent) or 1 (present/made up session). Attendance scores were summed with scores ranging from 0 (no sessions attended) to 6 (all sessions attended). This sum provided an index of treatment adherence.

Treatment Satisfaction. Slightly modified versions of the 8-item Client Satisfaction Questionnaire (CSQ-8) (Attkisson & Zwick, 1982) assessed participants' satisfaction with both intervention conditions at end of treatment. Two forms were created specific to each intervention; questions addressed the helpfulness of the intervention (e.g., "How would you rate the helpfulness of this group for quitting smoking (CBT)/increasing fruit and vegetable consumption (CG)?") and the likelihood of recommending the intervention to a friend (e.g., "If a friend were thinking about quitting or reducing his/her smoking (CBT)/increasing his/her fruit and vegetable consumption (CG), would you recommend our program to him/her?"). Items are scored on a 4-point Likert scale with "1" indicating the lowest degree of satisfaction and "4" the highest. Scores range from 8-32, with higher scores indicating higher satisfaction.

Therapist Adherence. To assess therapist adherence to the treatment manuals, group case notes for all cohorts and group sessions were read by two blind raters. Global topics were provided to the raters (e.g, CBT, behavioral counseling for smoking cessation, motivational enhancement, and fruit and vegetable education), and each rater indicated which topics were covered per session. Inter-rater agreement was high for CBT ($\kappa = .88$), behavioral counseling (κ

= .94), and fruit and vegetable education ($\kappa = .94$), and moderate for motivational enhancement ($\kappa = .53$). We chose to examine topics across sessions rather than per session for each cohort because dynamic improvements were made to the interventions (e.g., which topics were covered per session) for each cohort. The percent of sessions (averaged across raters) each topic was covered per cohort by intervention group is reported in table 4.

Power Analysis

An a priori power analysis indicated sufficient power (0.80) for $n = 50$ participants to detect a difference in abstinence rates at end of treatment between treatment and control groups. The abstinence rates for the control group (4% & 6%) were based on estimates of spontaneous and minimal intervention quit rates in the general population (Centers for Disease Control and Prevention, 1993; Curry, McBride, Grothaus, Louie, & Wagner, 1995; Glynn, Boyd, & Gruman, 1990). Abstinence rates for the treatment group (38% to 69%) were based on previous studies of CBT for smoking cessation among adult smokers with and without a history of depression (Brown et al., 2001; Hall et al., 1996; Patten et al., 1998).

Data Analyses

We conducted analyses using two-tailed tests with $p < .05$ level of significance. Descriptive statistics summarized sample characteristics at screening and baseline. Group differences were assessed using independent t-tests for continuous variables and Pearson's Chi-square test for categorical variables (Fischer's Exact when noted). We identified potential outliers for the TLFB ($n = 2$), NA subscale of the PANAS ($n = 1$), and BDI-II ($n = 2$) at baseline. Statistical significance of results did not change when outliers were excluded, so we included them in all analyses.

Primary and Secondary Hypotheses

To test 30-day point prevalence abstinence and 50% smoking reduction at end of treatment and 3-month follow-up (Hypotheses 1-4), we employed intent-to-treat analysis with all 58 randomized participants using the Chi-square statistic. For abstinence outcomes, participants were coded as smokers if they (1) reported smoking within the past 30 days; or (2) did not complete the end of treatment/3-month follow-up measures. For reduction outcomes, participants were coded as not reducing by 50% or more if they (1) did not reduce smoking by 50%; or (2) did not complete the end of treatment/3-month follow-up measures. In essence, the intent-to-treat analysis strategy identified participants with missing data as smokers. There were no significant differences between the intervention groups for any demographic or baseline variables. Thus, we did not statistically control for these variables in any of the models.

Exploratory Hypotheses

Feasibility estimates (Hypothesis 5) were determined by the ability to recruit and retain participants, treatment attendance, and treatment satisfaction, and were assessed by the following methods: Descriptive statistics summarized data related to participant recruitment and retention (Figure 1), including the total number of potential participants screened, excluded, and the number of participants that discontinued participation. In addition, descriptive statistics summarized treatment attendance and treatment satisfaction.

For the remaining exploratory analyses, participants who completed at least 1 treatment session and for whom we had end of treatment/3-month follow-up data were included ($n = 46$ for end of treatment and $n = 35$ for 3-month follow-up). We excluded from end of treatment analyses 12 participants who did not complete any treatment sessions ($n = 3$), did not provide end of treatment data ($n = 4$), or did not complete sessions and did not provide end of treatment

data ($n = 5$). We excluded from 3-month follow-up analyses 23 participants who did not complete any treatment sessions ($n = 3$), did not provide 3-month follow-up data ($n = 15$), or did not complete sessions and did not provide 3-month follow-up data ($n = 5$). Repeated measures analysis of variance (ANOVA) compared differences in the number of cigarettes smoked per month, motivation, confidence, and affective and cognitive measures (Hypotheses 6-8) between CBT and CG participants from baseline to end of treatment and 3-month follow-up. A main effect for time and a treatment by time interaction were assessed. Lastly, to examine the relationship between baseline depressive symptoms and treatment attendance, linear regression analyses were employed across treatment condition ($n = 53$) with treatment attendance (sum of sessions attended, range = 0-6) as the criterion and baseline depression (BDI-II) as a main effect predictor.

RESULTS

Screened participants ($n = 1,380$) were mostly female (61.6%), Freshmen (71.2%), and had a mean age of 19.68 years ($SD = 3.47$) (Table 5). The mean number of days smoked in the past 30 days was 3.88 ($SD = 8.90$, $Mdn = 0.00$), and the mean CES-D score was 13.81 ($SD = 9.21$). Scores on the Contemplation Ladder ($M = 5.57$, $SD = 3.47$) suggested that screened participants were thinking about quitting smoking at baseline, but had not made any definite plans to do so. Participants who consented to follow-up contact had significantly higher mean 30-day smoking ($t(616) = 6.32$, $p < .001$) and depressive symptoms (CES-D) ($t(410) = 3.28$, $p = .001$) than participants who preferred not to be contacted. As expected, relative to ineligible participants ($n = 1322$), eligible participants ($n = 58$) had significantly higher 30-day smoking ($t(62) = -19.81$, $p < .001$), depression ($t(1362) = -10.70$, $p < .001$), and Contemplation Ladder scores ($t(149) = -3.71$, $p < .001$). In addition, eligible participants were significantly older than

non-eligible participants ($t(60) = -2.34, p = .023$) (Table 5). Among participants contacted via telephone for follow-up screening, those who agreed to participate ($n = 58$) were similar to those who refused or could not be reached ($n = 24$) (all $ps > .05$) on age, smoking rate (number of days smoked in past 30), depressive symptoms (CES-D), and motivation to quit (Contemplation Ladder).

Table 6 presents demographic characteristics and baseline measure scores of the study sample that completed baseline questionnaires ($n = 53$) by intervention group (CBT and CG). No significant differences (all $ps > .05$) were observed between groups. At baseline, participants ($n = 53$) were mostly Freshmen (67.9%) and had a mean age of 21.19 years ($SD = 4.60$) (Table 6). Over half (60.4%) reported past psychotherapy experience and almost 20% reported taking a psychotropic medication. Specifically, 11.3% reported taking antidepressants, 5.7% stimulants, 3.8% mood stabilizers or anti-psychotics, and 3.8% benzodiazepines. The mean number of days smoked in the past 30 days was 24.77 ($SD = 7.11$) and 39.6% used other tobacco in addition to cigarettes. The mean BDI-II score was 13.71 ($SD = 8.82$), indicating mild depressive symptomatology. No significant differences existed between participants that completed baseline ($n = 53$) and those that did not complete baseline ($n = 5$) on screening variables such as demographic characteristics (age, gender, year in school), 30-day smoking, depression (CES-D and PHQ-9), and motivation (Contemplation Ladder) (all $ps > .05$).

For the secondary and exploratory outcome analyses, only participants who completed at least one group session and end of treatment/3-month follow-up data were included ($n = 46$ at end of treatment and $n = 35$ at 3-month follow-up). No significant differences existed between these participants ($n = 46$ and $n = 35$) and those who did not complete group sessions and end of treatment/3-month follow-up ($n = 12$ and $n = 23$) on screening variables (all $ps > .05$).

Primary Outcomes

Our primary outcome analyses (Hypotheses 1 & 2, $n = 58$) revealed that 30-day point prevalence abstinence did not differ significantly between CBT (6.9%; 2 of 29) and CG (3.4%; 1 of 29) ($\chi^2(1, N = 58) = .352, p = .553$). However, the proportion of CBT participants (34.5%; 10 of 29) that reduced their smoking by 50% was significantly greater than that of CG (10.3%; 3 of 29) ($\chi^2(1, N = 58) = 4.86, p = .028$) (Figure 2).

Secondary Outcomes

With regard to abstinence and smoking reduction at 3 month follow-up (Hypothesis 3 & 4), results revealed no significant differences between groups on 30-day point prevalence abstinence (10.3%; 3 of 29 in both groups, $\chi^2(1, N = 58) = .000, p = 1.000$). In addition, at 3-month follow-up no significant differences emerged between groups on the proportion of participants that reduced their smoking by 50% (CBT: 24.1%; 7 of 29 and CG: 17.2%; 5 of 29) ($\chi^2(1, N = 58) = .420, p = .747$) (Figure 2).

Exploratory Outcomes

Results related to Hypothesis 5 show that CBT for college student smokers with elevated depressive symptoms was feasible, demonstrated by the ability to recruit and retain participants, treatment attendance, and treatment satisfaction. Out of 1380 potential participants screened, 58 (4.2%) were randomized to participate in the study, which exceeds the estimated and proposed sample size of $n = 50$ (Figure 1). In addition, out of the participants that consented to be contacted and met screening criteria for smoking, depressive symptoms, motivation, and no MDD ($n = 82$), a moderate proportion (29.3%; 24 out of 82) refused to participate or could not be reached by study personnel (Figure 1). With regard to retention, 79.3% ($n = 46$, 23 in each

condition) of the 58 randomized participants completed at least one treatment session and end of treatment data. For treatment attendance, 75.9% ($n = 44$) of the 58 randomized participants completed at least 4 group sessions and numbers were similar across groups (CBT; $n = 21$, CG; $n = 23$). Participants reported that the incentives had a “moderate” influence in whether or not they continued to participate in the groups, and no significant group difference existed ($p > .05$). With regard to treatment satisfaction among the CBT participants, 60.8% ($n = 14$) found the group helpful for quitting smoking and 91.3% ($n = 21$) reported it was helpful for reducing smoking. Furthermore, all CBT participants said they would recommend the group to a friend for quitting or reducing smoking and 78.2% ($n = 18$) said they would come back to the group if they wanted to change their smoking in the future. Among the CG participants, 86.9% ($n = 22$) found the group helpful for increasing fruit and vegetable consumption. All CG participants said they would recommend the group to a friend for increasing fruit and vegetable consumption and 86.9% ($n = 20$) said they would come back to the group if they wanted to increase their fruit and vegetable consumption in the future. Of note, 78.1% ($n = 25$) of participants across two cohorts of CBT and CG groups reported that they would prefer the group format to individual sessions.

Table 7 presents exploratory outcome data for participants with complete data ($n = 46$ at end of treatment and $n = 35$ at 3-month follow-up). With regard to changes in number of cigarettes smoked in the past 30 days from baseline to end of treatment and 3-month follow-up (Hypothesis 6), repeated measures analysis of variance demonstrated a significant main effect for time ($F(1, 44) = 7.60, p = .008, \eta_p^2 = .147$) such that the average number of cigarettes smoked in the past 30 days decreased from 235.22 ($SD = 209.68$) at baseline to 189.86 ($SD = 227.32$) at end of treatment. In addition, the treatment group by time interaction approached significance ($F(1, 44) = 2.95, p = .093, \eta_p^2 = .063$). At 3-month follow-up, repeated measures analysis of variance

demonstrated a significant main effect for time ($F(1, 33) = 14.40, p = .001, \eta_p^2 = .304$), but no treatment group by time interaction ($F(1, 33) = 2.41, p = .130, \eta_p^2 = .068$).

For motivation to quit and reduce smoking (Hypothesis 7), a significant main effect for time emerged (Quit: $F(1, 44) = 10.96, p = .002, \eta_p^2 = .199$; Reduce: $F(1, 44) = 11.46, p = .002, \eta_p^2 = .207$) but not a significant treatment by time interaction at end of treatment (Quit: $F(1, 44) = 2.23, p = .143, \eta_p^2 = .048$; Reduce: $F(1, 44) = .02, p = .884, \eta_p^2 = .000$). No significant main ($F(1, 44) = 1.83, p = .183, \eta_p^2 = .040$) or interaction effect ($F(1, 44) = 0.12, p = .737, \eta_p^2 = .003$) emerged for confidence to quit smoking at end of treatment. However, a significant interaction effect was found for confidence to reduce smoking ($F(1, 44) = 4.35, p = .043, \eta_p^2 = .090$) at end of treatment. CBT participants' average level of confidence to reduce smoking increased from baseline to end of treatment to a significantly greater degree than CG participants (Figure 3). At 3-month follow-up, a significant main effect for time emerged for motivation to quit and reduce smoking (Quit: $F(1, 33) = 9.05, p = .005, \eta_p^2 = .215$; Reduce: $F(1, 33) = 4.57, p = .040, \eta_p^2 = .122$). Additionally, the treatment group by time interaction approached significance for motivation to quit ($F(1,33) = 3.18, p = .084, \eta_p^2 = .088$), but not for motivation to reduce ($F(1, 33) = 0.73, p = .401, \eta_p^2 = .022$). For confidence to quit or reduce smoking at 3-month follow-up, no significant main (Quit: $F(1, 33) = 0.48, p = .493, \eta_p^2 = .014$; Reduce: $F(1, 33) = 0.66, p = .423, \eta_p^2 = .020$) or interaction effect (Quit: $F(1, 33) = 0.31, p = .583, \eta_p^2 = .009$; Reduce: $F(1, 33) = 1.35, p = .254, \eta_p^2 = .039$) emerged.

With regard to affect (NA and PA), mood (BDI-II), and cognition (NAR expectancies and ERQ) outcomes (Hypothesis 8), no main ($F(1, 44) = 0.55, p = .461, \eta_p^2 = .012$) or interaction effect ($F(1, 44) = 0.28, p = .598, \eta_p^2 = .006$) was found for the NA subscale of the PANAS at end of treatment or 3-month follow-up (Main: $F(1, 33) = 0.68, p = .417, \eta_p^2 = .020$; Interaction: $F(1,$

33) = 0.75, $p = .394$, $\eta_p^2 = .022$). In addition, no main ($F(1, 44) = 0.00$, $p = 1.00$, $\eta_p^2 = .000$) or interaction effect ($F(1, 44) = 0.06$, $p = .815$, $\eta_p^2 = .001$) was found for the PA subscale of the PANAS at end of treatment or 3-month follow-up (Main: $F(1, 33) = 0.07$, $p = .795$, $\eta_p^2 = .002$; Interaction: $F(1, 33) = 2.59$, $p = .117$, $\eta_p^2 = .073$). For the BDI-II, a main effect for time approached significance ($F(1, 44) = 3.23$, $p = .079$, $\eta_p^2 = .068$), but no significant treatment by time interaction emerged ($F(1, 44) = 1.86$, $p = .180$, $\eta_p^2 = .041$) at end of treatment. At 3-month follow-up, no main ($F(1, 33) = 0.59$, $p = .448$, $\eta_p^2 = .018$) or interaction effect ($F(1, 33) = 0.19$, $p = .670$, $\eta_p^2 = .006$) was found for the BDI-II. For the Negative Affect Reduction (NAR) subscale of the SCQ, we detected a significant main effect for time ($F(1, 44) = 7.03$, $p = .011$, $\eta_p^2 = .138$), but no interaction effect ($F(1, 44) = 0.52$, $p = .474$, $\eta_p^2 = .012$) at end of treatment. In addition, at 3-month follow-up with the NAR subscale we found a significant main effect for time ($F(1, 33) = 12.14$, $p = .001$, $\eta_p^2 = .269$), but no interaction effect ($F(1, 33) = 0.17$, $p = .684$, $\eta_p^2 = .005$). No main ($F(1, 44) = 0.50$, $p = .484$, $\eta_p^2 = .011$) or interaction effect ($F(1, 44) = 0.09$, $p = .769$, $\eta_p^2 = .002$) was found for the Reappraisal subscale of the ERQ at end of treatment or 3-month follow-up (Main: $F(1, 33) = 1.95$, $p = .172$, $\eta_p^2 = .056$; Interaction: $F(1, 33) = 0.41$, $p = .528$, $\eta_p^2 = .012$).

For the relationship between baseline depressive symptoms and treatment attendance, linear regression analyses indicated that baseline depressive symptoms were not a significant predictor of treatment attendance ($B = .02$, $SE B = .03$, $\beta = 0.07$, $p = .620$).

DISCUSSION

College student smoking rates are high and there is evidence that smoking initiation and progression during the college years may influence adult smoking patterns. Furthermore, the presence of depressive symptoms among college smokers is concerning, especially because it may impede cessation efforts. Despite promising evidence for mood management interventions

among smokers with clinically elevated depressive symptoms, no interventions of this kind have been developed and tested for depressed college smokers. Thus, this study tested a multi-component psychotherapeutic smoking reduction/cessation intervention designed for college student smokers with elevated depressive symptoms.

The primary outcomes focused on smoking reduction and cessation. We found a significantly greater proportion of CBT participants reduced smoking by at least 50% compared to CG participants at end of treatment. This finding is remarkable given the small-scale nature of our study. Smoking reduction is important given that many college students are not interested in quitting immediately. For example, at baseline our sample had only a moderate interest in quitting or reducing tobacco use. Researchers have found that spontaneous reduction is rare and that smokers who reduce can maintain these reductions (Hughes & Carpenter, 2005). Therefore, smoking reduction can be viewed as a significant outcome for the CBT group because it is unlikely to happen on its own. In addition, there is some evidence that smoke exposure decreases for those who reduce (Hughes & Carpenter, 2005) suggesting direct health implications for reduction. Furthermore, given that smoking reduction increases the likelihood of future cessation (Hughes & Carpenter, 2006), reductions made by CBT participants are an important step on the path toward quitting. It is very possible that the smoking reductions that took place in the CBT group may build self-efficacy for future quit attempts.

Indeed, we found a significant interaction effect such that CBT participants' confidence to reduce smoking increased from baseline to end of treatment whereas it decreased for CG participants. Confidence to change smoking behavior is similar to 'quitting self-efficacy' which is related to initiation of quit attempts (Baldwin et al., 2006), intention to continue smoking (Landrum Sterling et al., 2007), and stage of change (Apodaca, Abrantes, Strong, Ramsey, &

Brown, 2007; Hoving, Mudde, & de Vries, 2006). It is likely that making a behavior change increases confidence and vice versa, and CBT participants may gain momentum toward cessation if they continue to experience the combined effects of reduction and increases in confidence. For instance, if confidence to reduce increases, then it may lead to confidence to quit over time. Building self-efficacy is important for those making a quit attempt because low self-efficacy may predict relapse after cessation (Baer, Holt, & Lichtenstein, 1986; McIntyre, Lichtenstein, & Mermelstein, 1983; Shiffman et al., 2000). Moreover, increasing confidence may be especially vital for depressed smokers given that currently depressed smokers have been found to have lower smoking cessation self-efficacy (Haukkala, Uutela, Vartiainen, McAlister, & Knekt, 2000; John, Meyer, Rumpf, & Hapke, 2004b). Although the interaction effect was not significant at 3-month follow-up, CBT participants' confidence to reduce smoking was maintained (Table 7). In addition, the interaction effect for motivation to quit at 3-month follow-up approached significance, suggesting that CBT participants' motivation increased from baseline to 3-month follow-up to a greater degree than CG participants. This promising finding may be related to the synergistic effects that behavioral change and increased confidence can have on motivation to quit. Increasing motivation to quit is an important step toward quitting.

Overall, few participants quit smoking across both groups. Although this finding differs substantially from outcomes of mood management interventions among depressed adult smokers, our study design differed from adult studies because we recruited occasional smokers not ready to quit immediately. Qualitative reflections of CBT group leaders suggested that few participants seemed interested in quitting, and participants' interest in reducing may have resulted from a compromise related to their ambivalence toward quitting (e.g., "I want to quit, but there are enough reasons to sustain my use. Reducing is appealing because it is a step toward

quitting, yet I am still able to smoke”). In addition, CBT participants commented that they were not ready to make a commitment to quitting now and talked about quitting as something they “just had to be ready for.” Based on anecdotal evidence provided by CBT group leaders, participants appeared aware of the current side effects of smoking, like difficulty breathing, coughing up blood, and the smell of tobacco smoke on their hands, breath, and clothes. Despite this awareness, they felt the immediate benefits of smoking (e.g., relieving stress, smoking being enjoyable, and smoking being associated with drinking and socializing) outweighed the negative physical effects. Participants reported awareness of the long-term risks of cigarette smoking (e.g., cancer), but appeared to consider the short-term benefits as more appealing than potential long-term consequences. Taken together, these observations based on clinical data from CBT participants suggest that smoking reduction might be a more feasible short-term outcome than cessation for smoking interventions among college smokers.

The secondary outcomes evaluated abstinence and reduction at 3-month follow-up. Results showed that neither smoking abstinence nor smoking reduction rates differed significantly between groups. Notably, abstinence and reduction rates increased from end of treatment to 3-month follow-up in both groups (with the exception of a small decrease in 50% reduction for the CBT group). These findings may indicate that progress in quitting and reducing smoking remained fairly consistent for the CBT group whereas it increased for CG participants over time. Indeed, number of cigarettes smoked in the past month did not increase, but remained largely the same from end of treatment to 3-month follow-up in the CBT group. Patten et al. (1998) found similar results such that abstinence rates in the CBT group were significantly higher than standard behavioral counseling at end of treatment and 12-month follow-up, but not

at 3-month follow-up. Six-month follow-up data for this study will be forthcoming and may show a similar trend.

The exploratory results related to overall reduction in number of cigarettes smoked in the past month revealed a trend toward greater reduction in the CBT group versus the CG group at end of treatment. With more statistical power, this finding would likely be significant given the medium effect size of the interaction term ($\eta_p^2 = .063$, where .02, .06, and .14 represent small, medium, and large effect sizes (Cohen, 1988)). This finding parallels the significant finding for 50% reduction at end of treatment and has similar implications for increased health, future quitting, and enhanced confidence to quit. Although group differences in reduction in number of cigarettes smoked in the past month were not significant at 3-month follow-up, it is important to note that reductions were maintained by the CBT group from end of treatment to 3-month follow-up. Maintenance of reduction by the CBT group suggests that the intervention might have durable effects.

Findings related to recruitment, retention, treatment adherence, and satisfaction support the feasibility of this intervention for depressed college student smokers. We recruited more participants than our projected sample size of 50, and a substantial number (70.7%) of those contacted to participate agreed. Likewise, we had low attrition and few missed sessions across both groups, which is especially notable given that participants were not necessarily seeking any type of treatment. It is important to mention that we were diligent about following up when participants missed sessions and about scheduling make-up sessions. Participant incentives were rated as only “moderately” important for participants’ continued engagement in the study. Consistent with this, CBT group leaders observed CBT participants’ comments that they had made a commitment to attending sessions and planned to honor that commitment, and that they

enjoyed meeting with a group of college students to discuss smoking. These observations suggested that group smoking interventions may be particularly useful for enhancing participation and lowering attrition.

Given that this is a new treatment in a previously understudied population, our findings for high treatment satisfaction in the CBT group are noteworthy. Over half (61%) of CBT participants found the group helpful for quitting smoking and almost all (91%) found it helpful for reducing smoking. Moreover, the likelihood that a similar intervention would be used in the future is high given that all participants said they would recommend the group to a friend. Nearly 80% of CBT participants reported they would return to the group in the future if they wanted to change their smoking. Thus, the intervention was useful for reducing smoking in a sample with low motivation to quit, and it was also well received and viewed positively by a group of non-treatment seeking college smokers. Treatment satisfaction was similarly high in the nutrition group. In conjunction with the lack of between group differences in retention and attendance, these satisfaction data support the use of this nutrition-focused group as an adequate control group.

With regard to negative affect and depressive symptoms, our findings showed trends in the expected direction at end of treatment such that negative affect and depressed mood decreased in CBT participants and remained largely the same in the CG group (Table 7). Statistically significant differences between groups would likely emerge with a larger sample size and might provide insight into the mechanism of action for the 50% reduction finding. Interestingly, both affect (NA and PA) and mood worsened slightly across groups from end of treatment to 3-month follow-up. It is difficult to know the source or stability of these changes, but 6-month follow-up data might provide more information. For example, if affect and mood

improve for both groups at 6-month follow-up it may mean that these variables are subject to slight fluctuations in a college sample. Despite the worsening of affect and mood at 3-month follow-up, cognitive reappraisal strategies increased slightly from end of treatment to 3-month follow-up. Again, this finding warrants follow-up because we would expect affect and mood and cognitive strategies to improve (or worsen) together over time.

Results related to the exploratory hypotheses also revealed significant main effects for time such that overall number of cigarettes smoked per month and negative affect regulation expectancies decreased, whereas motivation to quit and reduce increased from baseline to end of treatment and 3-month follow-up across groups. These main effects for time indicate that there might be some benefit to participating in a health-focused group. However, it is important to point out that an increase in confidence and significant reduction ($\geq 50\%$) occurred at end of treatment with the extra attention paid to smoking behavior in the CBT group.

Lastly, we examined the relationship between baseline depressive symptoms and treatment attendance because there is some evidence to suggest that smokers experiencing more depressive symptomatology are more likely to attend CBT treatment sessions compared to smokers with lower depressive symptoms (Patten et al., 2002). However, results revealed no significant relationship between baseline BDI-II scores and attendance. It is possible that we did not have enough variability in depression scores given that we selected for clinically elevated depressive symptomatology.

There are a few limitations to note. First, this was a small-scale study intended to evaluate the promise of this novel intervention before conducting a larger scale study. As such, our sample size is small, which might represent a limitation. On the other hand, the small sample places our significant results in context and suggests that some of the observed statistical trends

would likely achieve significance with a larger sample size. Second, our primary outcomes were examined at end of treatment and 3-month follow-up. Six-month follow-up data are being collected and planned analyses will confirm whether reductions were maintained over a longer length of time. Third, related to sample demographics, our study was conducted at a single site, and the majority of the participants were white and early in their college careers. Future studies should examine a more diverse group of participants and generalization of the present results should be done with caution. In addition, future studies could investigate which components (behavioral, mood management, or motivational) of the combined intervention are responsible for smoking reduction and increases in confidence. Lastly, it is not possible to biochemically confirm smoking cessation over a 30-day period. It should be noted that our results are based on self-report and that we used saliva samples to help increase the accuracy of self-reporting.

Concluding Comments and Reflections

To our knowledge, our study is the first to evaluate a multi-component treatment among college smokers with elevated depressive symptoms. Given this novelty, we encountered a few surprises and challenges along the way. With regard to surprises, CBT group leaders remarked how engaged participants were in group discussion. Some CBT participants commented that they do not talk about smoking with their friends and that they liked having the opportunity to talk with other college smokers about their experiences. Participants stated that they felt validated to hear that other people experience similar side effects, like coughing upon waking and difficulty breathing. Group leaders noted that participants had many shared experiences, like difficulty quitting when all their friends smoke and perceptions of isolation related to being the “odd man out” if everyone else at a party was smoking and they were not. In addition, group leaders commented that CBT participants enjoyed discussing how they felt irritated and wanted to

smoke more when strangers reacted negatively toward their smoking (e.g., plugging their nose as they walk by or saying, “That stuff will kill you”). Overall, there appeared to be the sense that if the participants were going to quit it would be on their own terms and in their own way. This quality of individuation and independence should be noted when working with college student smokers. Another surprise was that many participants did not seem to realize that they were in a group of moderately depressed individuals. CBT group leaders commented that when participants talked about mood regulation, they talked about stress, but not sadness or depression. Although it is possible that being in a group with other students may have made it more difficult for participants to talk openly about depressed mood; it is also possible that the link between depression and smoking was less clear to participants than group leaders intended it to be. In the future, it may be effective to talk about low mood directly and how it is associated with ineffective coping styles, such as smoking and how smoking may perpetuate low mood. Talking about how smoking as a coping strategy influences mood may be an avenue to tap into participant values because many people do not want to feel sad or depressed. Thus, depression may provide an opportunity to link smoking to values in terms of motivational enhancement. However, care should be taken when addressing mood and coping more directly in a group setting because people may feel sensitive about experiencing low mood. It might be helpful to talk about low mood as something that everyone experiences and how it affects coping, and then go from there. In other words, group leaders would not single people out, but would take care to talk about it in a more general sense.

With regard to challenges encountered, there was some difficulty in combining skills training (cognitive or behavioral) and motivational enhancement. For example, group leaders commented that it was challenging to teach coping skills to a group of participants that were not

motivated to use them. Over three cohorts of groups, CBT group leaders modified the treatment manual by incorporating more motivation in the beginning sessions and more skills training in the end. Most CBT smoking interventions have been designed for smokers engaged in a quit attempt where CBT is used to help smokers cope with that quit attempt. It is possible that mood management approaches are less appropriate for smokers not ready to quit immediately because they are not faced with the total absence of an apparently helpful but ultimately harmful mood regulating strategy (i.e., smoking). Therefore, it may be more effective for the CBT component to come later in the change process when smokers are ready to make a quit attempt. Also related to the discontinuity between skills training and motivation, most participants did not do assigned homework aside from self-monitoring of smoking. To compensate for this, group leaders had participants give examples of self-management of smoking, challenges of thought distortions, etc. in session. Additionally, group dynamics affected the motivational enhancement component. For example, in one cohort there was an outspoken “pro-smoking” group member, which seemed to influence the group dynamic in a direction away from change. However, for the other two cohorts, group leaders noted that more participants were at the upper end of the motivation scale which seemed to promote change talk. It may be the case that group motivational enhancement is more effective when the group overall leans in the motivated direction and that one strong dissenter can impact group progress. Rolling with resistance is a core principle of motivational interviewing and therapists should continue to work with dissenters in this manner. However, in groups therapist control over resistance may be reduced because non-motivational interviewing strategies may arise among group members (e.g., other members may not roll with resistance or be accepting of others’ point of view).

There were also a few challenges related to logistic issues. For example, our initial plan for monitoring therapist adherence was to use tapes from group sessions to rate adherence to the manuals. However, because this was a pilot study, we found that the outline of group topics needed to be modified by cohort to increase intervention effectiveness. In addition, tapes were incomplete and so we substituted case notes for a less-detailed analysis of therapist adherence. CBT group participants also reported that two hours was too long to sit in the group and that they preferred one and a half hour groups. Lastly, group CBT leaders recommended that the six sessions occur weekly instead of including a month break because of lost momentum over the break and participant fatigue at the end of the semester when the final group session took place.

Despite the limitations and challenges encountered, this study shows promising evidence for the utility of this multi-component treatment for smoking reduction among college smokers with elevated depressive symptoms. CBT participants reported that the groups made them more aware of their smoking and made their behavior less automatic, which helped them change their use. Depressed college smokers are an understudied population and positive behavior change in these smokers is significant given that they were not treatment seeking and were not motivated to quit immediately. The large smoking reductions found in our CBT group also have high clinical significance because reducing smoking may lower morbidity and lead to future smoking cessation.

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Table 1

Eligibility

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> ▪ Age 18 years or older ▪ Smoked on 6 or more days out of the past 30 days ▪ CES-D Sum \geq 16 ▪ Contemplation Ladder score \geq 3 ▪ Enrolled with undergraduate standing at The University of Montana ▪ Willing to participate in all study components ▪ Provided informed consent 	<ul style="list-style-type: none"> ▪ No current Major Depressive Disorder (MDD) ▪ No current suicidal intent or plan ▪ No participation in another structured cessation program in the past 30 days

Table 2

Study Overview and Incentives

Session	Week	Activity	Date range*	Incentive type
Screening	-1	Screen, Randomize	September	2 credits
Session 1 (Baseline)	0	CBT or CG Sessions Baseline Measures	October	4 credits
Session 2	1	CBT or CG Sessions	October	2 credits, \$5
Session 3	2	CBT or CG Sessions	October	\$5, Non-monetary incentives
Session 4	3	CBT or CG Sessions	October	\$5, Non-monetary incentives
Session 5	4	CBT or CG Sessions	October	\$5, Non-monetary incentives
Session 6 (End of treatment)	8	CBT or CG Sessions End of Treatment Measures	November	\$20
3-month follow-up	12	3-month Follow-up Measures	February	\$10

Note. *Date range from first cohort.

Table 3

Topics Covered in Group Sessions for Treatment (CBT) and Control (CG) Conditions

Session	CBT	CG
Session 1	Introduce social learning approach, assess motivation, and explain self-monitoring of smoking and triggers.	Assess motivation, discuss 5 a day, discuss health benefits, sample fruit/vegetable (f/v), plan and set goals.
Session 2	Introduce behavioral chain, assess motivation, introduce self-management approach, and introduce thought distortions.	Assess motivation, sample f/v, discuss portion size, discuss colorful f/v, plan and set goals.
Session 3	Assess motivation, review self-management approach, review behavioral chain, and introduce disputing thought distortions.	Assess motivation, sample f/v, discuss organic produce, discuss how to clean f/v, discuss fresh, canned, frozen, and dried f/v, discuss where to buy f/v, plan and set goals.
Session 4	Assess motivation, review self-management approach, review methods for disputing thought distortions, and set and plan for quit date.	Assess motivation, discuss label reading, field trip to local grocery store, plan and set goals.
Session 5	Assess motivation, review self-management approach, review disputing thought distortions, and introduce relapse prevention.	Assess motivation, discuss eating f/v on campus, sample f/v, discuss easy recipes, plan and set goals.
Session 6	Review progress, assess motivation, review self-management and disputing thought distortions, and plan for the future	Review progress, assess motivation, review, discuss establishing a routine, and plan for the future

Note. The session in which topics were covered varied slightly by cohort.

Table 4

Percent of Sessions Topics were Covered

Cohort, Intervention Group	CBT	Intervention Topics		
		Behavioral Counseling	Motivation	F/V Education
Cohort 1, CBT	91.7	100	58.6	0
Cohort 2, CBT	75.0	100	75.0	0
Cohort 3, CBT	66.7	91.7	91.7	0
Cohort 1, CG	0	0	41.7	100
Cohort 2, CG	0	0	66.7	91.7
Cohort 3, CG	0	0	91.7	100

Table 5

Screening Sample Characteristics

Characteristics of Sample <i>n</i> (%)	Total ^a 1380	Eligible		p-value
		Yes 58 (4.2)	No 1322 (95.8)	
Age: <i>M</i> (<i>SD</i>)	19.68 (3.47)	21.00 (4.45)	19.62 (3.41)	.023*
30-day Smoking: <i>M</i> (<i>SD</i>)	3.88 (8.90)	23.72 (7.79)	3.01 (7.88)	<.001*
CES-D Score: <i>M</i> (<i>SD</i>)	13.81 (9.21)	25.13 (8.20)	13.31 (8.93)	<.001*
Contemplation Ladder: <i>M</i> (<i>SD</i>)	5.57 (3.47)	6.66 (2.11)	5.32 (3.67)	<.001*
Gender: <i>n</i> (%)				.114
Female	850 (61.6)	30 (51.7)	820 (62.0)	
Male	530 (38.4)	28 (48.3)	502 (38.0)	
Year in School: <i>n</i> (%)				.683
Freshman	982 (71.2)	41 (70.7)	941 (71.2)	
Sophomore	246 (17.8)	13 (22.4)	233 (17.6)	
Junior	106 (7.7)	2 (3.4)	104 (7.9)	
Senior	29 (2.1)	1 (1.7)	28 (2.1)	
Other	17 (12.0)	1 (1.7)	16 (1.2)	

Note. * $p < .05$, Eligible = met inclusion/exclusion criteria, 30-day Smoking = number of days smoked in the past 30 days, CES-D = Center for Epidemiological Studies-Depression Scale. ^a

Total sample ($n=1380$) includes participants with missing data on 30-day Smoking ($n=1$), CES-D Score ($n=16$), and Contemplation Ladder ($n=75$).

Table 6

Demographic Characteristics and Baseline Measure Scores by Intervention Group

	Total ^a (<i>n</i> = 53)	Intervention group		<i>p</i> -value
		CBT (<i>n</i> = 26)	CG (<i>n</i> = 27)	
Demographic Characteristics, <i>n</i> (%)				
Age, <i>M</i> (<i>SD</i>)	21.19 (4.60)	20.58 (4.34)	21.78 (4.85)	.347
Gender				.217
Female	27 (50.9)	11 (42.3)	16 (59.3)	
Male	26 (49.1)	15 (57.7)	11 (40.7)	
Year in School				.361
Freshman	36 (67.9)	20 (76.9)	16 (59.3)	
Sophomore	13 (24.5)	4 (15.4)	9 (33.3)	
Junior	2 (3.8)	1 (3.8)	1 (3.7)	
Senior	1 (1.9)	0	1 (3.7)	
Other	1 (1.9)	1 (3.8)	0	
Ethnicity				.703
White	44 (84.6)	23 (88.5)	21 (80.8)	
Other	8 (15.4)	3 (11.5)	5 (19.2)	
Psychotherapy Experience, Yes				
Current	4 (7.5)	3 (11.5)	1 (3.7)	.280
Past	32 (60.4)	16 (61.5)	16 (59.3)	.865
Psychotropic Medication, Yes	10 (18.9)	6 (23.1)	4 (14.8)	.501 ^b
Other 30-day tobacco use, Yes	21 (39.6)	10 (38.5)	11 (40.7)	.865
Baseline Measures, <i>M</i> (<i>SD</i>)				
30-day smoking	24.77 (7.11)	25.50 (6.50)	24.07 (7.71)	.471
PANAS Negative Affect score	16.19 (5.30)	17.42 (5.99)	15.00 (4.32)	.096
Motivation to Quit	6.00 (2.70)	5.81 (2.80)	6.19 (2.65)	.616
Motivation to Reduce	7.00 (2.87)	7.27 (2.69)	6.74 (3.06)	.508
Confidence to Quit	6.89 (2.66)	6.96 (2.55)	6.81 (2.80)	.843
Confidence to Reduce	7.92 (2.34)	7.92 (2.33)	7.93 (2.39)	.997
PANAS Positive Affect score	25.43 (7.74)	24.31 (7.17)	26.52 (8.27)	.303
BDI-II score	13.71 (8.82)	15.49 (9.84)	12.00 (7.50)	.151
SCQ Negative Affect Reduction score	7.69 (1.95)	7.76 (1.94)	7.62 (1.99)	.798
ERQ Reappraisal score	4.37 (1.16)	4.38 (1.19)	4.36 (1.15)	.965

Note. ^aTotal sample (*n* = 53) includes one participant who refused to provide ethnicity data and excludes five participants (CBT *n* = 3, CG *n* = 2) who did not complete baseline data. ^bFisher's exact test used. 30-day Smoking = Number of days smoked in the past 30 days; PANAS = Positive and Negative Affect Schedule; BDI-II Score Beck Depression Inventory-II; SCQ =

Smoking Consequences Questionnaire; ERQ = Emotion Regulation Questionnaire.

Table 7

Means and Standard Deviations for Exploratory Outcomes by Intervention Group

Exploratory Outcome Measures	Total ^a (<i>n</i> = 46, EOT) (<i>n</i> = 35, 3-month)	Intervention Group	
		CBT (<i>n</i> = 23, EOT) (<i>n</i> = 20, 3-month)	CG (<i>n</i> = 23, EOT) (<i>n</i> = 15, 3-month)
Smoking			
Cigs 30-days			
Baseline	235.22 (209.68)	239.78 (170.01)	230.65 (246.95)
EOT	189.87 (227.32) ^b	166.17 (155.10)	213.57 (283.68)
3-month	178.97 (202.40) ^b	166.70 (166.54)	195.33 (247.67)
Motivation			
Motivation to Quit			
Baseline	5.74 (2.70)	5.83 (2.96)	5.65 (2.48)
EOT	6.85 (2.49) ^b	7.43 (2.37)	6.26 (2.53)
3-month	7.37 (2.26) ^b	8.05 (1.50)	6.47 (2.80)
Motivation to Reduce			
Baseline	6.65 (2.89)	7.13 (2.80)	6.17 (2.96)
EOT	8.15 (2.78) ^b	8.70 (2.31)	7.61 (3.15)
3-month	8.20 (2.68) ^b	8.60 (2.56)	7.67 (2.82)
Confidence to Quit			
Baseline	6.87 (2.71)	6.91 (2.64)	6.83 (2.84)
EOT	7.39 (2.83)	7.30 (2.69)	7.48 (3.03)
3-month	7.40 (2.84)	7.45 (2.72)	7.33 (3.09)
Confidence to Reduce			
Baseline	7.87 (2.45)	7.78 (2.43)	7.96 (2.51)
EOT	8.33 (2.85)	9.09 (2.02) ^c	7.57 (3.36) ^c
3-month	8.46 (1.92)	8.60 (1.64)	8.27 (2.28)
Affect, Mood and Cognition			
PANAS-Negative Affect			
Baseline	16.74 (5.43)	18.17 (5.95)	15.30 (4.53)
EOT	15.98 (6.03)	16.87 (7.12)	15.09 (4.68)
3-month	17.60 (6.80)	17.65 (7.43)	17.53 (6.12)
PANAS-Positive Affect			
Baseline	25.26 (7.32)	24.83 (7.38)	25.70 (7.39)
EOT	25.26 (7.20)	24.61 (7.81)	25.91 (6.64)
3-month	24.17 (7.45)	23.60 (8.29)	24.93 (6.36)
BDI-II			
Baseline	13.95 (9.12)	15.95 (10.37)	11.96 (7.38)
EOT	12.05 (8.21)	12.61 (8.74)	11.50 (7.80)
3-month	12.43 (10.38)	13.05 (11.42)	11.60 (9.14)
SCQ-Negative Affect Reduction			
Baseline	7.67 (2.07)	7.84 (2.03)	7.50 (2.13)
EOT	7.01 (2.60) ^b	7.36 (2.40)	6.66 (2.79)

3-month ERQ-Reappraisal	6.91 (2.39) ^b	6.91 (2.35)	6.92 (2.53)
Baseline	4.39 (1.22)	4.35 (1.25)	4.43 (1.21)
EOT	4.28 (1.28)	4.19 (1.23)	4.36 (1.35)
3-month	4.62 (0.98)	4.68 (0.64)	4.54 (1.33)

Note. ^a = Total sample at end of treatment ($n = 46$) excludes 12 participants who did not

complete any treatment sessions ($n = 3$), did not provide end of treatment data ($n = 4$), or did not do both ($n = 5$). Total sample at 3-month follow-up ($n = 35$) excludes 23 participants who did not complete any treatment sessions ($n = 3$), did not provide 3-month follow-up data ($n = 15$), or did not do both ($n = 5$). ^b = Significant main effect for time ($p < .05$); ^c = Significant treatment by time interaction effect ($p < .05$); EOT = End of Treatment; 3-month = 3-month Follow-up; Cigs 30-days = Number of cigarettes smoked in the past 30 days; PANAS = Positive and Negative Affect Schedule; BDI-II = Beck Depression Inventory-II; SCQ = Smoking Consequences Questionnaire; ERQ = Emotion Regulation Questionnaire.





