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Smoking relapse and weight gain prevention program for postmenopausal weight-concerned women: A pilot study

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Abstract

Objective—Postmenopausal women have substantial concerns about weight gain when quitting smoking, which may contribute smoking relapse. There is a need for smoking cessation and weight gain prevention programs effective in this population.

Methods—Two formats of a smoking cessation/weight gain prevention follow-up intervention in postmenopausal weight concerned women were compared: a minimally-tailored group format and a highly tailored, multidisciplinary individual format. Effects on sustained abstinence and postcessation weight gain were assessed. Postmenopausal smokers received 6 sessions of behavioral counseling over a 2-week period, 8 weeks of the nicotine transdermal patch, and subsequent random assignment to receive follow-up relapse prevention sessions at 1, 3, 8, and 16 weeks postcessation in either group or individual format.

Results—The sample ($N = 98$), was 67% Caucasian; 33% African-American. Age: $m=52.3(7.8)$ years, follicle stimulating hormone: $m=42.6(25.7)$, body mass index (BMI): $m=27.4(6.2)$, daily smoking rate: $m=20.3(11.5)$, for $m=29.4(10.7)$ years, Fagerström Test for Nicotine Dependence

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(FTND): $m=6.4(2.1)$, and carbon monoxide: $m=23.8(13.0)$ ppm. Abstinence rates in the group condition were significantly higher at 8 weeks posttreatment. Group format significantly predicted abstinence rates at 8 and 16 weeks posttreatment, even while controlling for age, race, BMI, CPD, years smoking, FTND, and weight concern. Weight concern predicted postcessation weight gain at 8 and 16 weeks posttreatment.

Conclusions—Results indicate that smoking cessation programs for postmenopausal women may best be delivered in a group format and that postcessation weight concerns be dealt with prior to a quit date.

Keywords

postmenopausal smokers; weight concern; smoking cessation; postcessation weight gain

1. Introduction

Postmenopausal women experience increased risk for cardiovascular disease (CVD) and other illnesses. In addition, smoking prevalence rates among peri- and postmenopausal women reach 21.4% in women 45-54 years of age and 11.5% among women over 65 years of age (Morbidity & Mortality Weekly Report, 1999). Interventions for peri- and postmenopausal women are needed in which modifiable health-risk behaviors, including cigarette smoking are targeted (Allen, Hatsukami, & Christianson, 2003; Copeland et al., 2006a; Oncken et al., 2007).

Postmenopausal women face unique negative consequences from smoking. Cigarette smoking has antiestrogenic properties and has been associated with altered estrogen metabolism and serum estrogen levels (Michnovicz et al., 1986; Tanko & Christensen, 2004). The antiestrogenic effects of smoking worsen the health risks associated with menopause, including earlier onset, increased hot flashes, and vaginal atrophy (Cramer et al., 1995; Kalogeraki et al. 1996, Staropoli, Flaws, Bush, & Moulton, 1998; Whiteman et al., 2003).

Weight gain is a known outcome of smoking cessation (Williamson et al., 1991). Women gain more weight postcessation than men (Williamson et al., 1991), and women are more likely than men to experience major weight gain, with O'Hara et al. (1998) reporting that 7.6% of men gained greater than 20% of their body weight postcessation, whereas 19.1% of women experienced that level of weight gain. Further, there is evidence that smoking suppresses age-related weight gain (Jacobs & Gottenburg, 1981; Lisner, Bengtsson, Lapidus & Bjorkelund, 1992).

Older women also gain more weight upon quitting smoking than do younger women (Caan et al., 1996; Williamson et al., 1991), with one study showing an additional 1 kg of weight gain for every ten-year increase in age (Caan et al., 1996). The health benefits of smoking cessation outweigh the negative health consequences of postcessation weight gain experienced by smokers (Burnett, Meilahn, Wing, & Kuller, 1998; Williamson et al., 1991). However, menopause is already a time of increased weight gain and redistribution of weight to an android (abdominal) adiposity pattern (Gambacciani et al, 2001; Rosano, Vitale,

Marazzi, & Voltaerrain, 2007; Wing et al., 1991). Both weight gain and an android weight gain pattern contribute to increased cardiovascular risk (Colombel & Charbonnel, 1997). Further, smoking cessation is associated with the development of diabetes in postmenopausal women (Luo et al., 2012). Thus, given the increased risk of weight gain and associated increased CVD risks and metabolic disorders, postcessation weight gain should be kept minimal in this population.

Concern about postcessation weight gain has been identified as a potential barrier to quitting smoking among women of all ages (Copeland et al., 2006a; Jeffry et al., 2000; Ogden & Fox, 1994; Sepinwal & Borelli, 2006). Women smokers have reported substantial concern about gaining weight upon quitting smoking, with 39% of women smokers in the United States reported being very concerned about postcessation weight gain, and an additional 28% report being somewhat concerned (Pomerleau, Zucker, & Stewart, 2001). Jeffery et al. (2000) demonstrated that weight concern specific to smoking cessation is predictive of smoking relapse at one year, whereas more general weight control behaviors are associated with superior smoking cessation outcomes. Research has also demonstrated that smoking cessation-specific weight concern is predictive of failing to initiate a quit attempt after enrolling in a cessation program, a phenomena labeled “prequit attrition” (Copeland et al., 2006a; Namanek Brower & Pomerleau, 2000). Whereas younger women may have greater levels of weight concern than older women, there is evidence that smoking cessation-related weight concerns remain high in post-menopausal women and may be a serious deterrent to smoking cessation (Pomerleau & Kurth, 1996).

Programs aimed at changing health behaviors have proposed that interventions tailored for the individual, rather than targeted solely toward basic skill acquisition, may be effective in changing behavior. Individualized programs have been recommended for a variety of weight maintenance behaviors, including exercise (Calfas et al., 1996) and dietary modification (Brownell & Cohen, 1995). Programs tailored to address comorbid issues, such as depression, have also been beneficial in smoking interventions (e.g., Hall, Muñoz, & Reus, 1994).

Smoking cessation programs for weight-concerned women may be more effective if they were tailored to address individual vulnerabilities to overeating and inactivity that lead to postcessation weight gain, and if they included cognitive restructuring of attitudes about smoking and appetite/weight control, in addition to skills acquisition. In the present study, we attempted to do so by incorporating a multidisciplinary, individually tailored dietary and weight control program into a smoking cessation program that meets the Clinical Practice Guidelines for Treating Tobacco Use and Dependence (Fiore et al., 2000; 2008).

The goal of the study was to compare the relative effectiveness of a postcessation follow-up intervention delivered in an individually tailored format versus in a group format, as assessed by smoking abstinence rates and weight change throughout a follow-up period after completion of a 2-week smoking cessation program. The primary hypothesis was that the individually tailored condition would predict greater smoking abstinence and less postcessation weight gain than the group condition.

2. Materials and Methods

2.1. Participants

Participants were weight-concerned (as defined by endorsing either of the following questions: Do you use smoking as a way to control your weight? Are you afraid of gaining weight if you quit smoking?), postmenopausal women smokers, who smoked at least 10 cigarettes per day for at least 1 year, had a BMI ≥ 18 , and a CO level of ≤ 10 ppm. Postmenopausal status was determined by a follicle stimulating hormone (FSH) level above 30 mIU/ml and self-reported cessation of menses for at least 12 months. Exclusion criteria included: pharmacological or behavioral weight loss regimens, weight fluctuation ≥ 20 pounds within the previous 6 months, active substance use disorders, major affective disorders, eating disorders, psychosis, and history or presence of severe physical illness (e.g., renal failure, hepatic failure, cancer, immunological disease). We did not exclude women using HRT. Participants were recruited from the Baton Rouge, LA community by way of newspaper and billboard advertisements between 2003 and 2005. Sample size was determined by statisticians at Pennington Biomedical Research Center where the study was conducted. Calculations were based on .80 power in order to detect significant differences in the outcomes of smoking status (total abstinence) and weight gain in pounds.

2.2. Measures

2.2.1. Biochemical Verification—Carbon Monoxide (CO) Measurement. BreathCo monitors were used (Vitalograph Inc.) to determine expired CO level (ppm). A cutoff of <10 ppm was used to confirm nonsmoking status. *Serum Cotinine:* Cotinine, and active metabolite of nicotine, was assessed via blood serum levels. Serum cotinine levels of >10 ng/ml were used to determine smoking vs. nonsmoking status (Bramer & Kallungal, 2003). *Follicle Stimulating Hormone (FSH):* FSH levels were assessed via blood serum levels. Normal FSH levels are $10\text{--}15$ mIU/ml, and >30 mIU/ml in women who are postmenopausal.

2.2.2. Screening Information—A phone screen gender, age, ethnicity, and 3 additional questions using a dichotomous (yes/no) response format: Do you smoke more than 10 cigarettes per day? Do you use smoking as a way to control your weight? Are you afraid of gaining weight if you quit smoking? **Structured Clinical Interview for DSM-IV (SCID;** First, Spitzer, Gibbon, & Williams, 1995) assessed psychoactive substance abuse/dependence, current major affective disorders, current eating disorders, or psychotic disorders.

2.2.3. Primary Outcome Measures—Anthropometric Data: Baseline body weight and height were converted into Body Mass Index (BMI, in kg/m^2). Participants were also weighed at each of the 6 follow-up sessions. Smoking status (abstinent/relapsed) was assessed at each session and follow-up meeting and was verified with CO and cotinine levels.

2.2.4. Measures Used to Tailor Intervention—Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The FTND

assessed nicotine dependence, current and past smoking patterns. *Decisional Balance Questionnaire* (DBQ; Velicer, DiClemente, Prochaska, & Brandenburg, 1985). The DBQ is a 24-item measure of the decision-making process across the stages of change for smoking cessation. The subscales have good internal consistency (Pro scale: .87; Con scale: .90) and predictive utility. Participant baseline DBQ responses were used to tailor the smoking relapse prevention materials. *Smoking Self-Efficacy Assessment* (Velicer, DiClemente, Rossi, & Prochaska, 1990). This form includes 3 subscales: Positive/Social Situations, Negative Affective Situations, and Habit/Addictive Situations. Participants rate the items for confidence in abstaining and temptation to smoke. These subscales have good internal consistency (.80 - .95). Participant baseline responses to this form were used to tailor the smoking relapse prevention materials. *Weight Concern*. Participants rated how concerned they were about postcessation weight gain using a 9-point scale and reported on weight loss history, highest and lowest adult weights, and ideal weight. *Body Shape Questionnaire* (BSQ; Cooper, Taylor, Cooper, & Fairburn (1987). The BSQ is a 34-item self-report questionnaire used to assess concerns about body size and shape (Cooper et al., 1987). The BSQ has good concurrent validity and was correlated with Body Dissatisfaction scores on the Eating Disorders Inventory. BSQ information was used in the tailored follow-up treatment sessions to provide feedback to participants regarding body image and weight concern. *Weight Efficacy Lifestyle Questionnaire* (WEL; Clark et al., 1991). The WEL is a 20-item measure consisting of 5 situational factors: Negative Emotions, Availability, Social Pressure, Physical Discomfort, and Positive Activities. The WEL global and subscale scores have been sensitive to change and have good predictive validity with clinical populations in treatment studies. *Positive and Negative Affect Schedule* (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS contains two 10-item scales representing positive and negative affect. Participants rate each item according to their mood for the past week. Coefficient alpha is > .85 for both scales. The PANAS was used to monitor participants' mood and to tailor mood-related relapse prevention materials. *Weekly Stress Inventory* (WSI; Brantley, Jones, Boudreaux, & Catz, 1997). The WSI is an 87 item measure assessing the number and perceived stressfulness (on a 0 to 7 Likert scale) of minor stressors over the past week. Internal consistency ranges from .96 - .92. The WSI was used to tailor the stress- and mood-related relapse prevention materials. *Block Food Questionnaire* (Block et al., 1986), and diet records collected during the pretreatment assessment phase, which were later analyzed for macronutrient intake. This information was used in the treatment relapse prevention phase to tailor dietary feedback for participants. Physical activity assessment included the *Seven-Day physical activity Recall interview* (SDR; Blair, 1984), and step test (stepping at a minimum rate of 22 steps/minute for 3 minutes on a 16.25" bench). A 20-second recovery heart rate was then obtained and used to estimate cardiovascular fitness level (McArdle et al., 1972). *Kupperman Menopausal Index* (Kupperman, Blatt, Wiesbader, & Filler (1953). The Kupperman was used to assess menopausal symptoms in participants. It yields scores for symptoms of insomnia, hot flashes, tingling/prickly sensations in extremities, irritability, depression, dizziness, muscle aches, headaches, night sweats, fatigue, vaginal dryness, skin dryness, hair loss, heart palpitations, and nervousness.

2.3 Procedure

Pretreatment Assessment. Participants were screened as they called in response to advertisements in local media. Those who met the initial inclusion criteria were scheduled for a screening interview and two assessment meetings before entering a 2-week cessation group. Assessments included CO breath analysis to verify self-reported smoking status, cotinine, FSH, Kupperman, SCID, anthropometric assessment, and the questionnaires listed above. Participants assigned to group vs. individual follow-up sessions significantly differed on mean age (53.6 vs. 50.2), FSH (38.0 vs. 50.1), years smoking (31.2 vs. 26.4), and percent use of hormone replacement therapy (HRT; 80% vs. 59.5%), but were comparable on other baseline measures (see Table 1). **Smoking Cessation.** Smoking cessation treatment groups (5-15 participants) were led by therapist pairs of clinical psychologists and doctoral students. Groups met for 6 sessions over 2 weeks for a structured cognitive-behavioral protocol of nicotine and smoking psychoeducation, stimulus control, relapse prevention, and cognitive restructuring. Eight weeks of the nicotine transdermal patch was distributed in 2-week supplies. Participants attended an orientation meeting 1 week prior to the first treatment session during which they were informed of their quit date and provided their 1st patches. CO level and nicotine patch use were monitored throughout the cessation program. **Follow-Up Sessions.** Individual participants were randomly assigned to follow-up condition (individual vs. group) once they completed the initial cessation program. Therapists were blind to participant follow-up treatment condition assignment until the last meeting of the cessation program. Statisticians generated the random assignment sequence for follow-up condition. Because this was done using individual participants, not cohorts, as the randomization unit, intraclass correlation coefficients were not appropriate in data analyses.

Multidisciplinary teams of clinical psychologists, registered dietitians, and exercise physiologists led group and individual follow-up sessions. Each team developed and implemented a manualized intervention protocol. They used the same didactic protocol for the individually tailored and group follow-up sessions (tailored intervention materials were prepared prior to the sessions to address specific participant vulnerabilities). The protocol included a 15-20 minute timetable for each team to present their respective information followed by a 10-15 minute timetable for subsequent discussion with participants in the group and individual sessions.

Group and individually tailored sessions covered relapse prevention topics in this order: Session 1 (1 week posttreatment): Stress and smoking/weight; Session 2 (3 weeks posttreatment): Mood and smoking/weight; Session 3 (8 weeks posttreatment): Body image cognitive restructuring; Session 4 (16 weeks posttreatment): Smoking and weight gain high risk situations; **Clinical Psychology Component:** The therapists discussed coping with high risk relapse situations, including weight concern and negative mood. Cognitive behavioral treatment for weight management was provided (i.e., monitoring, stimulus control, contingency management, cognitive restructuring). Cognitive restructuring included information for body dissatisfaction (Rosen, Orosan, & Reiter, 1995) and normalization of cognitions related to the benefits of smoking for weight control (Klesges et al., 1998). These sessions were modeled after Fairburn's 1995 manual for use with bulimic patients. Specific content was modified to include: 1) factual information about energy and weight regulation,

2) evidence that there may be only minimal weight regulation benefit from smoking, 3) discussion of the relationship between preoccupation with body size, dieting, and overeating, 4) discussion of the importance of learning to plan and eat 3 balanced meals per day, 5) a challenge to overvalued ideas related to extreme thinness, 6) behavioral contracting for eating behavior and exercise, 7) discussion of rigid (e.g., calorie counting) versus flexible dieting (Stewart, Williamson, & White, 2002), and 8) modification of cognitive biases related to body image. Tailored participants' materials included individual information based on their baseline assessments. **Registered Dietitian Component.** The dietitians counseled all participants about eating patterns, drawing upon general dietary strategies for weight management, including incorporating foods and nutrients that may have been consumed in inadequate amounts during smoking (Subar, Harlan, & Mattson, 1990). The group sessions included advice on how to avoid high-fat and high-sugar foods, limit portion size, and maintain healthy eating. Tailored participants were counseled about specific eating patterns and food preferences from their Block Food Questionnaire and diet records. Weight management information was based on each woman's food intake data, and dietary counseling focused on vulnerability to overeating and changes in participants' food choices and caloric intake from pre- to postcessation. **Exercise Physiology Component.** The exercise physiologists counseled participants on energy expenditure requirements and exercise strategies aimed at balancing energy expenditure to minimize weight gain and account for postcessation metabolic changes. Program goals for the first 8 weeks included a brisk walking program of 4-5 days per week and a gradual increase to 50 minutes of walking per session. By week 16 the goal was to increase the intensity of the exercise program. Participants were instructed in methods to accumulate about 30 minutes of leisure/occupational activity and to overcome barriers to daily physical activity. With tailored participants, the exercise physiologists counseled participants on energy expenditure requirements based on their specific anthropometric information from baseline. **Retention Strategies:** Participants were provided a \$40 monetary incentive for completion of the pretreatment assessment phase, and \$40 for completion of the research requirements throughout the follow-up period.

3. Results

3.1. Participant Characteristics

Success in the initial smoking cessation phase of the study (total abstinence—no smoking in the last 2 sessions) was a prerequisite to testing the primary hypothesis about the relapse prevention interventions. Of the 98 participants who started the cessation program, 4 were unable to quit smoking and 2 dropped out (coded as smoking) of the 2-week program. Of the 92 remaining participants, 54 were randomly assigned to the group follow-up and 38 to the individually tailored follow-up. See Figure 1, a participant flowchart for retention information at follow up time points. Participants who dropped out did not differ significantly from those who completed the study on baseline variables. The tailored vs. group participants did not differ in mean number of follow-up sessions attended (see Table 1), nor in nicotine patch use and adherence, as assessed by chi-square analyses conducted for each initial and follow-up session attended (all *p*'s *ns*).

3.2. Smoking Cessation Outcomes

Relapse was defined as any smoking that occurred during the respective assessment period. Follow-up smoking status was assessed with 7-day point-prevalence and continuous abstinence, as suggested by the Society for Research on Nicotine and Tobacco (Hughes et al., 2003). Point-prevalence abstinence rates were calculated using 7 days of complete abstinence prior to the assessment as the criterion and continuous abstinence as prolonged abstinence following initial cessation. Abstinence rates for group vs. individual were respectively 63.6% vs. 42.1% at 8 weeks (2 months), and 43% vs. 26.3% at 16 weeks (4 months). Chi-square analyses showed that abstinence rates differed significantly at 8 weeks posttreatment, with group format associated with abstinence.

Hierarchical logistic regression analyses were conducted for 8 and 16 weeks posttreatment. Smoking status (abstinent vs. smoking) was regressed upon the predictor variables of age, race, BMI, CPD, number of years smoking, FTND, weight concern, and HRT on the first step, and treatment condition on the second step. At 8 weeks, step 1 approached significance [$X^2 (N = 64) = 14.26, p = .08$], with lower BMI significantly predicting smoking ($p = .03$). Step 2 was significant [$X^2 (N = 64) = 6.93, p = .008$], with lower BMI significantly predicting smoking ($p = .03$), use of HRT significantly predicting abstinence ($p = .03$); and group treatment condition ($p = .02$) significantly predicting abstinence. At 16 weeks, step 1 was not significant [$X^2 (N = 43) = 12.47, ns$], but again lower BMI predicted smoking ($p = .03$). Greater number of years smoking ($p = .04$) significantly predicted abstinence, and higher FTND predicted smoking ($p = .05$). Step 2 approached significance [$X^2 (N = 43) = 3.16, p = .08$], with higher BMI predicting smoking ($p = .03$), greater number of years smoking significantly predicting abstinence ($p = .03$), higher FTND scores predicting smoking ($p = .04$), and group treatment condition significantly predicting abstinence ($p = .04$). See Table 2 for regression coefficients on each step of the analyses, odds ratios, and confidence intervals.

3.3. Weight Gain Outcomes

Average weight gain for group vs. individual was 5.6 vs. 5.9 lbs. at 8 weeks and 8 vs. 7.9 lbs. at 16 weeks. Among participants who abstained from smoking, mean weight gain for group vs. individual was 5.46 vs. 7.1 lbs. at 8 weeks and 9.15 vs. 9.0 lbs. at 16 weeks. Analyses of variance (ANOVAs) with treatment condition as the factor and weight change from precessation as the dependent variables showed no significant differences in weight gain between abstainers in the group vs. individually tailored condition at 8 or 16 weeks posttreatment.

Hierarchical linear regression analyses were conducted for the 8 and 16 weeks posttreatment follow ups, including only those women who maintained abstinence. Weight gain was regressed on the predictor variables, age, race, BMI, CPD, number of years smoking, FTND, weight concern, and HRT on the step 1, and on treatment condition on the step 2. At week 8, neither step 1 nor step 2 was significant overall, but weight concern predicted weight gain on step 1 ($p = .036$) and step 2 ($p = .041$). At week 16, the step 1 model approached significance, $F(9, 16) = 2.38, p = .085$, with race ($p = .009$), BMI ($p = .046$), and HRT as significant predictors of weight gain. African-American race and higher BMI predicted

weight gain; HRT use predicted less weight gain. Step 2 was not significant overall, but African-American race ($p = .011$) and higher BMI ($p = .049$) were significant predictors of weight gain.

4. Discussion

Group format produced significantly higher rates of continuous abstinence from smoking at 8 weeks (2 months) postcessation, while controlling for age, race, BMI, CPD, years smoking, FTND, weight concern, and HRT. This finding was contrary to prediction, and inconsistent with the growing literature regarding the benefit of tailored interventions for smokers (e.g., Copeland, et al., 2006b; Hall et al., 1994, Muñoz, & Reus, 1994; Levine, Marcus, & Perkins, 2003). Although the individual sessions were intended to benefit participants with one-on-one provision of tailored materials, the group setting also allowed for provision of tailored information by therapists who had access to group participants' high risk information and had worked with these participants over the course of the study. It could therefore be that the amount of individualized information provided in the group format was sufficient, and that the group format itself was preferred by participants.

Anecdotally, participants assigned to the individual sessions expressed discontent in being separated from group members with whom they initially quit smoking. Participants in the individual sessions stated that they would have preferred to meet with the same therapist consistently versus various members representing each of the multidisciplinary teams. The group format provided participants with this consistency, as the same members from each multidisciplinary team led the smoking cessation and follow-up sessions with participants. Peer support may be particularly important for this population of smokers. The current findings regarding group sessions are encouraging in that group format would be more economical regarding time and cost than individual sessions and may be similarly potent regarding smoking outcomes.

Among abstainers, mean weight gain did not differ significantly between groups at any time point. Rather, pretreatment weight concern predicted weight gain regardless of session format. Perhaps cognitive restructuring of postcessation weight concern prior to cessation would benefit these women. Structure and content of tailored materials enabled us to include content relevant to postmenopausal women (e.g., health and appearance concerns related to postcessation weight gain), nonetheless, as prior studies suggest, weight concerned women smokers are particularly challenging in smoking cessation programs (Levine, Marcus, & Perkins, 2003). The present findings suggest that postmenopausal status does not mitigate the influence that weight gain concern has upon the smoking cessation process for women smokers. Rather, the findings suggest that addressing weight concerns pre- or postcessation, is just as critical for older/postmenopausal weight concerned smokers as it is for younger/premenopausal weight concerned smokers.

The results regarding HRT were interesting in that use of HRT was significantly predictive of abstinence at 8 weeks and with less weight gain at 16 weeks among those women who remained abstinent. Other studies have investigated the influence of HRT on postcessation weight gain, but have been inconclusive or have found that use of nicotine replacement

therapy (NRT) explains greater variance in postcessation weight gain than does HRT (Allen et al., 2004). The present findings indicate that HRT becomes an important factor in maintaining abstinence, suggesting its role is more influential on smoking status once the initial nicotine withdrawal process has subsided. In addition, the type of HRT may be significant, but in the present study we didn't detect these more subtle influences because we formed a dichotomy (HRT use; yes/no) with the relatively small number of participants. However, given known differences in the characteristics of individuals who self-select for HRT, these results should be regarded as tentative (Ballinger, 1985; Hardy & Kuh, 2005).

There are several limitations to the present study. We did not assess therapy provider adherence, and such ratings would have been useful in determining whether there were differences in adherence to the protocols between the two types of treatment. In addition, duration of the follow-up period was relatively brief to assess the impact of the follow-up interventions. Sample size was small with notable attrition, despite our monetary incentives for retention. We did, however, find differences despite the low power afforded by the sample size. Further, attrition was equally high between conditions, and therefore had little influence on the group differences found. Particular attention should be paid to these issues in future studies. Although *pretreatment* attrition is less problematic among postmenopausal women as compared to premenopausal women in clinical trials (Copeland et al., 2006a; Namenek-Brower & Pomerleau, 2000), as this study demonstrates, it is still a significant problem with postmenopausal women. Women who did enter the treatment phase had success with initial cessation, despite the documented tendency for weight-concerned women to be less successful in quitting smoking (Levine, Marcus, & Perkins, 2003) than non-weight-concerned women. Finally, there were significant baseline difference between women assigned to the tailored vs. group conditions on age, years smoked, FSH, and HRT use. These variables could have played a role in the outcome, though it's unlikely given that they were entered as predictor variables in the regression analyses.

As a next step, the individually tailored information and materials should be provided within a group context, which is economical regarding time and cost. Future studies should determine the most beneficial order and emphasis of weight-and body image-related content and cognitive restructuring. It may even be the case that exclusive focus on weight and body image in a smoking relapse prevention protocol would most benefit postmenopausal smokers.

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Highlights

1. Contrary to prediction, group format produced significantly higher rates of continuous abstinence from smoking at 8 weeks postcessation as compared to individually tailored sessions.
2. Peer support may be particularly important for cessation efforts with postmenopausal smokers.
3. Among abstainers, mean weight gain did not differ significantly between groups at any time point. Rather, pretreatment weight concern predicted weight gain regardless of session format.
4. The findings suggest that addressing weight concerns pre- or postcessation, is just as critical for older/postmenopausal weight concerned smokers as it is for younger/premenopausal weight concerned smokers.

Figure 1.
Flowchart

Table 1

Baseline Participant Characteristics

	Overall (N = 92)	Group (n = 54)	Individual (n = 38)	p
Age (years)	<i>M</i> = 52.3(7.8)	53.6 (7.9)	50.2 (7.1)	.029
% Caucasian	67%	71%	61.5%	<i>ns</i>
% African-American	33%	29%	38.5%	<i>ns</i>
BMI	<i>M</i> = 27.4 (6.2)	27.7 (6.1)	27.0 (6.4)	<i>ns</i>
FSH	<i>M</i> = 42.6 (25.7)	38.0 (23.1)	50.1 (28.2)	.027
CPD	<i>M</i> = 20.3 (11.5)	21.3 (10.4)	19.6 (11.4)	<i>ns</i>
Years smoking	<i>M</i> = 29.4 (10.7)	31.2 (9.9)	26.4 (11.4)	.026
FTND	<i>M</i> = 6.4 (2.1)	6.4 (2.1)	6.3 (2.0)	<i>ns</i>
CO (ppm)	<i>M</i> = 23.8 (13.0)	23.9 (13.2)	23.7 (13.0)	<i>ns</i>
Serum cotinine	<i>M</i> = 238.9 (131.2)	235.0 (134.3)	248.3 (125.5)	<i>ns</i>
# Quit attempts	<i>M</i> = 2.3 (1.6)	2.5 (1.6)	1.9 (1.4)	<i>ns</i>
Weight concern (1-9)	<i>M</i> = 7.3 (2.6)	7.3 (2.8)	7.4 (2.4)	<i>ns</i>
HRT (% yes)	72.2%	80%	59.5%	.037
Kupperman	<i>M</i> = 19.4 (12.3)	17.7 (10.8)	22.0 (14.1)	<i>ns</i>
# Sessions attended	<i>M</i> = 5.29 (.97)	5.22 (1.11)	5.39 (.69)	<i>ns</i>

Note: BMI = body mass index; FSH = Follicle stimulating hormone; CPD = cigarettes smoked per day; FTND = Fagerström Test for Nicotine Dependence; CO = carbon monoxide; HRT = hormone replacement therapy; Kupperman = Total score on Kupperman Symptom Inventory.

Table 2

Hierarchical Logistic Regression Results for Individually Tailored vs. Group Follow-up Treatment Condition Differences in Smoking at 8 and 16 Weeks Postcessation

Week 8	Step 1	OR	95% CI	Step 2	OR	95% CI
Age	-.08	.928	.805-1.070	-.08	.925	.779-1.097
Race (1)	.35	1.415	.190-10.542	1.40	4.055	.262-62.836
BMI	-.27*	.766	.602-.975	-.29*	.746	.570-.976
CPD	.10	1.100	.249-4.855	.27	1.312	.290-5.930
Years smoking	.06	1.057	.928-1.204	.13	1.136	.956-1.349
FTND	.14	1.150	.648-2.040	-.08	.920	.500-1.696
Weight concern	.13	1.134	.783-1.642	.23	1.256	.766-2.060
HRT (1)	-1.50	.223	.020-2.461	3.05*	.048	.002-.966
Session format				2.88*	17.847	1.563-203.747

Week 16	Step 1	OR	95% CI	Step 2	OR	95% CI
Age	-.03	.968	.837-1.120	-.00	.996	.849-1.168
Race (1)	.44	1.545	.094-25.283	1.01	2.744	.078-96.532
BMI	-.38*	.685	.489-.960	-.45*	.641	.434-.946
CPD	1.61	5.014	.570-44.086	1.81	6.085	.629-58.901
Years smoking	.22*	1.252	1.005-1.559	.30*	1.355	1.029-1.783
FTND	-1.15*	.316	.100-.998	-1.56*	.210	.048-.926
Weight Concern	.81	2.241	.789-6.365	1.17	3.214	.561-18.403
HRT (1)	.60	1.820	.093-35.776	-.94	.391	.011-14.200
Session format				2.38*	10.830	.624-187.877

Note: OR = Odds ratio; CI = Confidence interval; BMI = body mass index; CPD = cigarettes per day; FTND = Fagerström Test for Nicotine Dependence; HRT = hormone replacement therapy.

Table 3

Hierarchical Linear Regression Results for Individually Tailored vs. Group Follow-up Treatment Condition Differences in Weight Gain at 8 and 16 Weeks Postcessation

Week 8	Step 1	Step 2
Age	.15	.19
Race	-.27	-.31
BMI	.04	.07
CPD	-.15	-.13
Years smoking	.15	.22
FTND	-.14	-.20
Weight concern	.39*	.35*
HRT	-.22	-.16
Session format		.24

Week 16	Step 1	Step 2
Age	.56	.58
Race	-.74**	-.76*
BMI	.64*	.68*
CPD	-.46	-.51
Years smoking	-.12	-.13
FTND	.29	.28
Weight concern	-.004	-.014
HRT	-.48*	-.39
Session format		.13

Note: BMI = body mass index; CPD = cigarettes per day; FTND = Fagerström Test for Nicotine Dependence; HRT = hormone replacement therapy.