

The Effect of a Multi-Component Smoking Cessation Intervention in African American Women Residing in Public Housing

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Abstract: The purpose of this study was to test the effectiveness of a multi-component smoking cessation intervention in African American women residing in public housing. The intervention consisted of: (a) nurse led behavioral/empowerment counseling; (b) nicotine replacement therapy; and, (c) community health workers to enhance smoking self-efficacy, social support, and spiritual well-being. The results showed a 6-month continuous smoking abstinence of 27.5% and 5.7% in the intervention and comparison groups. Changes in social support and smoking self-efficacy over time predicted smoking abstinence, and self-efficacy mediated 6-month smoking abstinence outcomes. Spiritual well-being did not predict or mediate smoking abstinence outcomes. These findings support the use of a nurse/community health worker model to deliver culturally tailored behavioral interventions with marginalized communities. © 2007 Wiley Periodicals, Inc. *Res Nurs Health* 30:45–60, 2007

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Tobacco use is the leading cause of preventable death among all individuals in the United States (US), with widening gaps in health disparities occurring among ethnic minorities (U.S. Department of Health and Human Services, 1998).

African American women residing in urban subsidized housing developments report prevalence rates of 40–60% in some communities,

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which is at least twice the rate of women in the general population (Ahluwalia, Resnicow, & Clark, 1998; McGrady, Ahluwalia, & Pederson, 1998; Manfredi, Lacey, Warnecke, & Buis, 1992). African American women in subsidized housing developments indicate that cigarette smoking provides an alternate source of pleasure in the absence of other available resources, and that it is used to regulate mood and depression, manage stress, and cope with their living conditions (Andrews, Bunting, Felton, & Heath, 2004; Jarvis & Wardle, 1999; Manfredi, Lacey, Warnecke, & Balch, 1997).

Because of the limited research that has targeted African American women of low socioeconomic status who smoke, no evidence is available of the effectiveness of gender- and ethnic/racial-specific smoking cessation interventions (Piper, Fox, Welsch, Fiore, & Baker, 2001). The U.S. Public Health Service (PHS) Clinical Practice Guideline, *Treating tobacco use and dependence* (Fiore et al., 2000), recommends that intensive smoking cessation interventions encompass: (a) 4–7 sessions over a minimum of a 2-week period; (b) individual and/or group counseling with problem solving and skill training; (c) provision of social support; (d) pharmacotherapeutics (e.g., nicotine replacement); and (e) tailored education for ethnic groups.

Recommendations for specific smoking cessation interventions for low socioeconomic African American women also call for socioculturally appropriate strategies targeted to the specific community in which they are delivered (Jackson, 2002; Pederson, Ahluwalia, Harris, & McGrady, 2000). Tobacco-dependent African American women prefer group cessation programs that are non-judgmental and accessible, that promote support and understanding of their situations, and that offer strategies to cope with their lives (Andrews, 2004; Gritz, Nielson, & Brooks, 1996). A mechanism known as *sister circles* (Baldwin, 1996, p. 28) is often enhanced in organized group sessions with homogeneous African American women, with common bonds facilitating communication of vital information, psychosocial and spiritual support, and mentoring. Although spirituality, in particular, has been identified as a source of strength for African American women living in public housing and, therefore, a resource for women who are attempting to quit smoking (Andrews, Bunting et al., 2004; Manfredi et al., 1997; Nollen, Catley, Davies, Hall, & Ahluwalia, 2005), no studies have as yet shown the relationship of spirituality to smoking cessation.

Supportive social networks may have a positive influence on health-promoting behaviors, such as quitting smoking, as well as on cognitive states, such as self efficacy (Berkman & Glass, 2000; Musgrave, Allen, & Allen, 2002; Nollen et al., 2005). Both social support and self efficacy have been associated with successful smoking abstinence outcomes in African American women who smoke (Boardman, Catley, Mayo, & Ahluwalia, 2005; Nollen et al.; O'Hea et al., 2004). Self efficacy has been shown to mediate cessation outcomes in smokers receiving behavioral counseling and nicotine replacement (Cinciripini et al., 2003). Although social support has been shown to mediate the effects of psychological well being in African American women (Bender, Cook, & Kaslow, 2003; Salazar, Wingood, DiClemente, Lang, & Harrington, 2004), it has not been identified as a mediator of smoking cessation outcomes in this population.

Socioeconomically disadvantaged African American women have participated only minimally in organized smoking cessation trials because of lack of access and sociocultural relevance (King, Borrelli, Black, Pinto, & Marcus, 1997; Voorhees et al., 1996). Community partnership models that involve community health workers (CHWs) to provide outreach, socioculturally relevant information, and social support have been effective in providing access to behavioral interventions and in building individual and community competence to effect other behavior changes in African American women (Andrews, Felton, Wewers, & Heath, 2004; Sung et al., 1992). Pilot data findings suggest that CHWs who are ethnically, socioeconomically, and experientially indigenous to the community show promise in enhancing social support, building confidence in the ability to quit smoking, and in promoting spiritual well being among tobacco-dependent African American women in public housing (Andrews, Felton, Wewers, Waller, & Humbles, 2005).

The purpose of this research was to test the effectiveness of a community-partnered intervention to promote smoking cessation among African American women in subsidized housing developments. A collaborative participatory model described elsewhere (Andrews, 2004; Andrews, Bentley, Crawford, Pretlow, & Tingen, 2006; Andrews et al., 2006) involving an academic nurse researcher, a community advisory board, and community members, was used to plan, develop, and implement the culturally tailored, multi component intervention named *Sister to Sister*.

The following hypotheses were tested:

1. Adjusting for baseline differences, women who receive the *Sister to Sister* intervention will have higher 6-month continuous smoking abstinence (validated by biochemical markers) than women who do not receive the intervention;
2. Adjusting for baseline differences, women who receive the *Sister to Sister* intervention will have higher 7-day point prevalence abstinence than women who do not receive the intervention at 6, 12, and 24 weeks;
3. Women who receive the *Sister to Sister* intervention will have higher levels of social support, smoking cessation self-efficacy, and spiritual well being than women who do not receive the intervention at 6, 12, and 24 weeks;
4. Changes in social support, smoking cessation self-efficacy, and spiritual well-being scores (T4–T1) will mediate the effect of the 6-month continuous abstinence outcomes in women who receive the *Sister to Sister* intervention;
5. Group assignment, changes in social support, self efficacy, and spiritual well being (T4–T1) will predict 6-month continuous abstinence outcomes among all women.

METHOD

A quasi-experimental, repeated measures design with comparison group was used to test the *Sister to Sister* intervention. Data were collected from the intervention and comparison groups at baseline, and at weeks 6, 12, and 24.

Sample

Two of 16 subsidized housing developments in Augusta-Richmond County, Georgia were selected based on similar number of residents, housing units, and household income from data supplied by the Augusta Housing Authority. These two low-income housing communities were 99.5% African American, with 95% living at or below the poverty level. Approximately 500 women resided in these two communities, and an estimated 200 women were current smokers. These two communities were 15 miles apart and had different school zones and zip codes. From these two communities, one was randomly assigned (coin toss by independent evaluator) as the intervention community and the other as the comparison community. All research activities

with participants took place in the community center in each respective community.

Sample size was determined to be adequate for comparisons of 6-month continuous smoking abstinence proportions between the intervention and comparison groups. Six-month abstinence proportion estimates were based on minimal education interventions with African Americans (Resnicow et al., 1997), PHS Guideline findings from meta-analysis for intensive group sessions and nicotine replacement (Fiore et al., 2000), and pilot study findings (Andrews et al., 2005). Assumptions included an alpha level of .05, a power of .80, continuous smoking abstinence of 5% at 6 months in the comparison group, continuous abstinence of 25% at 6 months in the intervention group, and a one-sided chi-square test. Based on these assumptions, a minimal sample size of 44 for each group was determined to be necessary to detect a difference of 20%, corresponding to an $OR = 6.3$ between intervention and comparison groups.

Inclusion criteria for this study were: (a) non-pregnant or non-breastfeeding African American female; (b) over 18 years of age; (c) current daily smoker; (d) planning to quit smoking within the next 6 months; and (e) resident of intervention community or comparison community, and/or female relative or close friend of resident of these communities. Exclusion criteria were: (a) diagnosis of mental health disorder; (b) unstable angina or recent myocardial infarction within the past month; (c) plans to move within the next 6 months; and (d) in precontemplation stage of quitting.

Participant recruitment strategies for intervention and comparison communities included the distribution of flyers to all households, the community center, and other key locations in the respective community by the CHWs and influential community residents (e.g., neighborhood association officers). Other recruitment efforts were by word of mouth and advertisements in the community newsletters produced and distributed by the local housing authority.

A total of 157 women from both communities were screened during the recruitment period. Of those screened, 16 were ineligible for the following reasons: 8 were in the precontemplation stage of change; 3 did not live in the defined housing developments or had no family or friends who lived in the housing developments; 2 had not smoked in the previous 24 hours and had baseline carbon monoxide (CO) rates < 8 ; and 3 were < 18 years of age. Of the 141 remaining women eligible to participate, 103 (73%) volunteered to

participate in the study. Of these, 51 women resided in the intervention community and 52, in the comparison community, at baseline. For study participation, the women received \$20 for each data collection point, which was paid in the form of a check at the end of the study.

The sample ($N = 103$) ranged in age from 18 to 85 years ($M = 40.2$, $SD = 11.80$) and had household incomes ranging from \$0 to \$2,300 per month ($M = \$689$ per month, $SD = 573.4$). Approximately half of the women were single/never married (49%), and 31% were separated or divorced. Sixty-five percent of the women were unemployed, and 57% had a high school education or less. Forty-two percent (42%) of the women received either Medicare or Medicaid, and over half (58%) perceived their health as poor or fair. The women had smoked a range of 1–40 cigarettes per day ($M = 13.27$, $SD = 7.46$), for 1–56 years ($M = 17.5$, $SD = 11.54$), and 61% had attempted to quit at least once in the past 6 months. Over half (55%) of the women smoked high nicotine, mentholated cigarette brands. All women were in the contemplation or preparation stage of change (measured by the Stage of Change Questionnaire; DiClemente et al., 1991; Velicer, DiClemente, Rossi, & Prochaska, 1990).

Independent Variable: *Sister to Sister* Intervention

The *Sister to Sister* intervention consisted of three major components: (a) nurse-delivered behavioral/empowerment counseling in a group format; (b) nicotine replacement therapy (NRT); and (c) CHW personal contact to enhance smoking cessation self-efficacy, social support, and spiritual well being. A master's prepared nurse—a certified American Cancer Society smoking cessation facilitator with 10 years experience with smoking cessation interventions delivered the behavioral counseling component weekly for 6 weeks, with a booster counseling session at weeks 12 and 24. The curriculum for the group behavioral counseling was adapted from the PHS *Treating tobacco dependence guideline* (Fiore et al., 2000) and empowerment educational principles from Freire (1970, 1973). The behavioral-based program was modified to reflect the cultural preferences of African American women, which included food at meetings, ethnically appropriate graphics and content, spiritual themes and prayers, opportunities for storytelling, inclusion of kinship (e.g., mothers, daughters, sisters), and the mediating variables proposed in the

intervention (social support, self-efficacy, and spiritual well being). To facilitate individual and group interaction, each counseling group was limited to 10–12 participants. Each group session lasted approximately 1 hour. The development, content, and specific protocols of the nurse-led behavioral/empowerment counseling is described in further detail elsewhere (Andrews, 2004; Andrews et al., 2005, 2006).

The participants in the intervention group who progressed to the preparation stage were assisted to set a quit date (usually by week 2). They were offered over-the-counter NRT in the form of nicotine transdermal patches for a maximum of 6 weeks at no cost. The protocol for the patch distribution is described elsewhere (Andrews et al., 2005).

The two CHWs (African American women, former smokers, and indigenous to the intervention community) attended all group sessions with the intervention participants. Each CHW was assigned approximately 25 participants with whom to make personal contact weekly. The nurse and CHWs met after each group session to discuss the women's progress, phase of quitting, and recommendations on how to increase their social support, confidence, and spiritual guidance. Each CHW then made personal face-to-face or telephone contacts outside the group sessions with their assigned participants each week for 24 weeks to provide social support, to build confidence during the participants' cessation process, and to promote spiritual well being. The CHWs were instructed to use their own language and cultural style, share testimonials and personal experiences, and use strategies and information derived from the nurse/CHW evaluations at the end of each group counseling session.

To enhance social support, the CHWs provided emotional support (i.e., empathetic listening, displaying trust, and concern) and provided advice, suggestions, and information on smoking cessation (Andrews, Felton et al., 2004, Eng & Young, 1992; Flax & Earp, 1999). The CHWs assisted the participants to identify other positive support systems in the family and/or community to provide additional emotional support through the cessation process. To enhance smoking cessation self-efficacy, the CHWs encouraged the participants' success with comments such as: "I know you can quit smoking. . . if I can quit smoking, so can you." The CHWs provided advice and recommendations to avoid trigger situations and motivational strategies to encourage positive smoking behaviors (Boardman et al., 2005). To

enhance spiritual well being, the CHWs prayed with participants during the group sessions and at each weekly contact. The CHWs shared favorite biblical scriptures, poems, and inspirational meditations (Vanzant, 1996, 2000, 2001) during the defined intervention period.

The CHWs received 40 hours training on the CHW role, orientation to the study protocols and procedures, protocols for telephone or other personal contacts, and confidentiality and ethical requirements prior to the study. They were paid \$12 per hour during the study period.

Comparison Condition

The comparison community participants received the self-help written smoking cessation materials, *You Can Quit Smoking*, at baseline (Agency for Healthcare Policy and Research, 1997) and group attention during the study period. Participants received group education from a nurse at week 1 (on self-image); week 6 (on exercise; National Institute of Diabetes and Digestive Kidney Diseases, 2001), week 12 (on hypertension; National Heart, Lung, and Blood Institute, 2003), and week 24 (on smoking cessation; Centers for Disease Control, 2003). The research team completed all data collection at week 24 prior to the participants receiving the smoking cessation education. Groups were limited to 10–12 participants, and each group session lasted approximately 1 hour.

Instruments

Two levels of smoking abstinence were measured: 6-month continuous abstinence and 7-day point prevalence abstinence. Six-month continuous abstinence is the abstinence of smoking without relapse over a 6-month time period. Seven-day point prevalence abstinence is the abstinence of smoking at least 7 days prior to the time measured (weeks 6, 12, and 24). Smoking abstinence was measured by self-report and validated by the Bedfont Instruments (2002) EC50-Smokerlyzer (Innovative Marketing, Medford, NJ). This handheld breath, CO electrochemical sensor provides a numerical measure of CO in the range of 0–500 ppm. Ranges <8 ppm were used as the cut-off point for non-smokers and >9 ppm for smokers (Society for Research on Nicotine and Tobacco Subcommittee [SNRT], 2002). Participants were instructed on the 15-second breath-hold technique before exhaling completely into

the mouthpiece. Two CO readings were assessed at each data collection point, and the average of the two was recorded. The reported sensitivity and specificity of the EC 50 Smokerlyzer are both 90% (SNRT Subcommittee).

Social support was measured with the 19-item Medical Outcomes Study of Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991). This scale was designed to measure an individual's perception of the availability of support along four dimensions: (a) emotional/informational; (b) affectionate; (c) tangible; and (d) positive social interaction. This instrument assesses how often the different types of support are available if needed, with responses ranging from 1 (*none of the time*) to 5 (*all of the time*). Scale scores were transformed to a 20–100 scale, with higher scores reflecting higher levels of social support. The reported internal consistency reliability (Cronbach alpha) of the total scale and subscales range from .91 to .97 (Sherbourne & Stewart). Construct validity has been supported with hypothesis testing (Sherbourne & Stewart). The MOS-SSS total scale had a Cronbach alpha of .95 in the current study. Cronbach alphas of the subscales in this study were: emotional/informational support (.95), tangible support (.88), affectionate support (.87), and positive interaction (.87).

Smoking cessation self-efficacy was measured by the Smoking Efficacy/Temptation Scale, a 20-item, 5-point Likert type scale (DiClemente et al., 1991; Velicer et al., 1990). This scale measures smokers' level of temptation to smoke in 20 challenging situations. The scale consists of three subscales: (a) the negative/affective subscale measuring the degree of confidence when frustrated or facing conflict or emotional distress; (b) the habit/addictive subscale measuring the degree of confidence when the urge to smoke is felt; and (c) the positive/social subscale measuring confidence in resisting temptation in social or celebratory situations. The item responses range from 1 (*not at all tempted*) to 5 (*extremely tempted*). Summing the total subjective responses provides an overall score. Possible scores range from 20 to 100, with lower scores representing greater self-efficacy in refraining from smoking in these challenging situations. Reported reliability coefficients for this scale range from .88 to .92 (Velicer et al.) and acceptable construct and predictive validity have been demonstrated based on hypothesis testing and confirmatory factor analysis (DiClemente et al.; Velicer et al.). The Smoking Efficacy/Temptation Scale had a Cronbach alpha of .92 in the current study.

Cronbach alphas of the subscales in this study were: negative/affective (.94), habit/addictive (.89), and positive/social (.86).

Spiritual well being was measured with the 20-item, Spiritual Well-being Scale (SWB) that provides an overall measure of the perception of spiritual quality of life (Ellison, 1983). The Religious Well-being (RWB) subscale provides a self-assessment of one's relationships with God, while the Existential Well-being Subscale (EWB) provides a self-assessment of one's sense of life and life satisfaction. Scores for the two subscales were summed to provide an overall measure of spiritual well being. Each response on the SWB ranges from 1 to 6, with totalscale scores ranging from 20 to 120; the higher the score, the higher the spiritual well being. Reported coefficient alphas are .89–.94 (SWB), .82–.94 (RWB), and .78–.86 (EWB; Ellison). Test-retest reliability coefficients have been reported as .93 (SWB), .96 (RWB), and .86 (EWB; Paloutzian & Ellison, 1982). Construct validity is based on factor analysis (Ellison). SWB had a Cronbach alpha of .85 in this study. Cronbach alphas of the subscales in this study were: RWB (.84) and EWB (.83).

Data Collection Procedures

This study received Human Assurance Committee approval from two universities prior to study implementation. After obtaining informed consent from participants, the research team collected data on study variables at each group session at week 1 (baseline), week 6, week 12, and week 24 in both the intervention and comparison groups. Members of the research team read the instruments to the participants during the data collection process. Data collection sessions lasted approximately 30–45 minutes.

Data Analysis

All statistical analyses were conducted using SAS 8.2. Statistical significance was assessed using an alpha level of .05. Descriptive statistics were calculated for all demographic variables. Differences between the groups were compared at baseline with *t*-test (continuous variables) and chi-square tests (categorical variables). For those women who dropped out of the study, differences in baseline characteristics were compared to those who remained in the study with *t*-test and chi-square tests.

An intent-to-treat analysis was used, indicating that those who dropped out of the study were considered smokers. To examine the effect of the intervention on 6-month continuous smoking abstinence (having been abstinent at weeks 6, 12, and 24), logistic regression was used. Participants with CO levels <8 ppm at weeks 6, 12, and 24 were categorized as *yes* on continuous abstinence and those with CO levels >9 were categorized as *no*. To examine whether the intervention remained statistically and clinically associated with abstinence after controlling for potential confounders, a multi-step logistic regression model building procedure was implemented (Hosmer & Lemeshow, 1989). In the first step of the model building strategy, all variables considered for inclusion were examined individually for a relationship with 6-month continuous abstinence in a univariable logistic regression model. In the second step, those variables with a *p*-value <.25 were included in an initial logistic regression model. Next, the predictor variable in the initial model with the lowest Wald statistic and highest *p*-value was removed and the model was run again. If the removal of the variable did not result in a significant reduction in model fit (as indicated by a change in the model $-2 \log$ likelihood), then the variable was removed from further steps. The removal and subsequent testing of change in model fit was repeated until all non-significant predictors were tested. Group assignment was maintained in all models to provide a test for treatment effect. This procedure resulted in a final main effects model with predictors of abstinence. Potential covariates included in the first step for the 6-month abstinence logistic regression models included: age, income, education, employment status, time to first cigarette (nicotine dependence), and change scores (T4–T1) in social support, self efficacy, spiritual well being. All possible two-way interactions were tested.

A repeated measures logistic regression using generalized estimating equation (GEE) modeling was used to determine whether differences in 7-day point prevalence abstinence existed between the intervention and comparison groups across time. Seven-day point prevalence smoking abstinence was dichotomized as *yes* or *no* at weeks 6, 12, and 24 and was the outcome of interest. Abstinence was assumed to have a binomial distribution and a logit link was used in the model. Fixed effects in the model were group assignment (intervention or comparison) and time (baseline, weeks 6, 12, and 24). Also included was the interaction between group and time. Covariates that were included in

the model were age, income, and education (<high school vs. \geq high school). Odds ratios and their corresponding 95% confidence intervals were determined at each time point.

A repeated measures analysis of variance (ANOVA) was used to determine whether differences in the various secondary-dependent variables (social support, smoking cessation self-efficacy, spiritual well being) existed between the intervention and comparison groups across time. Fixed effects in the model were group assignment (intervention or comparison) and time (baseline, weeks 6, 12, and 24). Participant was included in the model and nested within group and considered as a random effect. The two-factor interaction between group and time was also included in the model. The statistical test of interest was the *F*-test for the two-factor interaction between group and time. A statistically significant *F*-test indicated that the effect of group was different across time. Post hoc differences were assessed using a Bonferroni correction to the overall alpha level of .05.

Additional analyses were conducted to assess for mediator effects of social support, self-efficacy, and spiritual well being by using modeling methods Baron and Kenny (1986) described. The change score for each of these variables was calculated ($T_4 - T_1$) as the score of interest to be modeled, for the purpose of determining if the effect of change in these variables during the 6-months study period was associated with 6-month continuous smoking abstinence outcomes.

RESULTS

Of the 103 women who completed the baseline data collection, 13 were lost to attrition, yielding a retention rate of 87.4% during the 6-month study period. Seven participants (13%) dropped out of the comparison community and six participants (12%) dropped out of the intervention community. There were no differences in age [$t(101) = 0.38$, $p = .71$], income [$t(92) = 0.55$, $p = .58$], education levels [$\chi^2(8, N = 103) = 6.24$, $p = .62$], and employment status [$\chi^2(2, N = 103) = 0.66$, $p = .72$] between the participants who remained in the study and those who were lost to attrition.

The intervention group participants differed from the comparison group on several baseline demographics. The intervention group participants were: older; had a higher monthly household income; and more likely to have completed high school, as shown in Table 1.

Six Months Continuous Abstinence

Hypothesis 1 was supported. Six-month continuous abstinence proportions were 27.5% and 5.7% in the intervention and comparison groups, respectively. The logistic regression modeling showed that group assignment (i.e., intervention or comparison) was a predictor of abstinence, with the intervention group participants six times more likely to quit smoking than the comparison participants (OR = 6.18, 95% CI = 1.65–23.01). When controlling for baseline differences, group remained a significant predictor of cessation (OR = 6.25, 95% CI = 1.20–32.44), while age (OR = 1.026, 95% CI = 0.98–1.07), education (OR = 1.12, 95% CI = 0.83–1.50), and income (OR = 1.01, 95% CI = 0.99–1.02) were not associated with cessation.

Seven-Day Point Prevalence Abstinence

Hypothesis 2 was supported. The 7-day point prevalence abstinence proportions at weeks 6, 12, and 24 were 49%, 39.2%, 39.2% for the intervention group, and 7.6%, 15.3%, 11.5% in the comparison group, respectively. The results of the repeated measures logistic regression GEE model for the 7-day point prevalence abstinence for each group at each time point are presented in Table 2. The odds of quitting were higher in the intervention group than the comparison group at weeks 6, 12, and 24. There was a statistically significant group by time interaction [$\chi^2(2, N = 90) = 11.18$, $p = .004$], a significant group main effect [$\chi^2(1, N = 90) = 11.09$, $p < .001$], and a significant time main effect [$\chi^2(2, N = 90) = 7.10$, $p = .03$] controlling for age [$\chi^2(1, N = 90) = 0.16$, $p = .69$], education [$\chi^2(1, N = 90) = 0.44$, $p = .59$], and income [$\chi^2(1, N = 90) = 2.46$, $p = .12$]. The main effect for the intervention group variable (i.e., disregarding time) indicated that the odds of quitting in the intervention group were significantly higher than the odds of quitting in the comparison group (OR = 6.56, 95% CI = 2.17–19.86, $p = .001$).

Social Support, Self Efficacy, Spiritual Well being

Hypothesis 3 was partially supported. With the total social support scores, there were significant

Table 1. Demographic and Health Survey Descriptive Statistics, Chi-Square, or *t*-tests by Intervention Group (*N* = 103)

| Variable | Intervention (<i>n</i> = 51) | | Comparison (<i>n</i> = 52) | | <i>p</i> |
|---|----------------------------------|--------|--------------------------------|--------|----------|
| | <i>n</i> | % | <i>n</i> | % | |
| Age (<i>M</i> , <i>SD</i>) | 44.45 | 11.21 | 33.00 | 11.04 | < .001 |
| Income (<i>M</i> , <i>SD</i>) | 742.42 | 652.17 | 346.24 | 362.21 | < .001 |
| Employment status | | | | | .08 |
| Employed FT | 15 | 29.41 | 6 | 11.54 | |
| Employed PT | 6 | 11.76 | 9 | 17.61 | |
| Unemployed | 30 | 58.82 | 37 | 71.15 | |
| Homemaker | 9 | 32.14 | 16 | 50.00 | |
| Student | 3 | 10.71 | 5 | 15.63 | |
| Retired | 4 | 14.29 | 0 | 0.00 | |
| Disabled | 9 | 32.14 | 6 | 18.75 | |
| Other | 3 | 10.71 | 5 | 15.63 | |
| Level of education | | | | | .009 |
| 8th grade or less | 0 | 0.00 | 3 | 5.77 | |
| Some HS | 8 | 17.02 | 20 | 38.46 | |
| High school | 9 | 19.15 | 7 | 13.46 | |
| GED | 4 | 8.51 | 8 | 15.38 | |
| Some Tech school | 11 | 23.40 | 6 | 11.54 | |
| Some college | 9 | 19.15 | 7 | 13.46 | |
| College degree | 5 | 12.77 | 1 | 1.92 | |
| Number of quit smoking attempts | | | | | .11 |
| Never | 10 | 19.61 | 10 | 19.61 | |
| 1–5 Times | 35 | 68.63 | 28 | 54.90 | |
| 6–10 Times | 2 | 3.92 | 7 | 13.73 | |
| 11–20 Times | 2 | 3.92 | 0 | 0.00 | |
| More than 20 | 2 | 3.92 | 6 | 11.76 | |
| Number of cigarettes smoked in past 24 hours (<i>M</i> , <i>SD</i>) | 13.86 | 6.79 | 12.67 | 7.52 | .39 |
| Time to first cigarette (minutes) (<i>M</i> , <i>SD</i>) | 30.88 | 63.42 | 52.24 | 76.30 | .13 |

differences between the two groups and group \times time interaction, demonstrating that the effect on time on social support was different in the two groups, as shown in Table 3. The intervention group had: (a) significantly higher emotional support at weeks 6, 12, and 24 than the comparison group; (b) significantly higher tangible support at weeks 12 and 24; (c) significantly higher affec-

tionate support than the comparison group at weeks 12 and 24; and (d) significantly higher positive interaction than the comparison group at week 12.

There were significant differences between the two groups in the total self-efficacy scores and group \times time interaction, indicating that the effect of time on smoking cessation self-efficacy

Table 2. Seven-Day Point Prevalence Abstinence and Odds Ratios for Intervention and Comparison Groups (*N* = 103)

| Time Value | Intervention Group (<i>n</i> = 51) | | Comparison Group (<i>n</i> = 52) | | OR | 95% CI ^a | <i>p</i> |
|------------|--|-------------|--------------------------------------|-------------|-------|---------------------|----------|
| | <i>n</i> | % Abstinent | <i>n</i> | % Abstinent | | | |
| 6 Weeks | 25 | 49.0 | 4 | 7.6 | 11.55 | 3.63–36.55 | < .001 |
| 12 Weeks | 20 | 39.2 | 8 | 15.3 | 3.71 | 1.19–11.62 | .02 |
| 24 Weeks | 20 | 39.2 | 6 | 11.5 | 4.90 | 1.51–15.89 | .008 |

^aConfidence intervals that do not contain "1" are considered significant.

Table 3. Repeated Measures ANOVA—Social Support Scale (N = 103)

| Outcome | Intervention Group (n = 51) | | Comparison Group (n = 52) | | F-value | p |
|-----------------------------|--------------------------------|------|------------------------------|------|---------|---------|
| | Mean | SE | Mean | SE | | |
| Total Scale | | | | | | |
| Group | | | | | 8.0 | .005* |
| Participant | | | | | 7.51 | <.001* |
| Week | | | | | 5.02 | .002* |
| Group × Week | | | | | 6.70 | .005* |
| Baseline | 69.3 | 1.52 | 67.9 | 1.51 | | .53 |
| 6 Weeks | 76.6 | 1.68 | 69.5 | 1.68 | | .003** |
| 12 Weeks | 79.2 | 1.75 | 64.8 | 1.66 | | <.001** |
| 24 Weeks | 80.8 | 1.68 | 68.2 | 1.67 | | <.001** |
| Emotional support | | | | | | |
| Group | | | | | 10.19 | .002* |
| Participant | | | | | 6.27 | <.001* |
| Week | | | | | 3.50 | .02* |
| Group × Week | | | | | 5.09 | .002* |
| Baseline | 29.5 | 0.74 | 28.3 | 0.74 | | .24 |
| 6 Weeks | 32.6 | 0.82 | 28.9 | 0.82 | | <.001** |
| 12 Weeks | 32.9 | 0.86 | 26.7 | 0.81 | | <.001** |
| 24 Weeks | 34.5 | 0.82 | 27.9 | 0.82 | | <.001** |
| Tangible support | | | | | | |
| Group | | | | | 5.09 | .02* |
| Participant | | | | | 7.60 | <.001* |
| Week | | | | | 3.33 | .02* |
| Group × Week | | | | | 2.94 | .03* |
| Baseline | 14.4 | 0.38 | 13.6 | 0.37 | | .12 |
| 6 Weeks | 15.3 | 0.41 | 13.9 | 0.41 | | .02 |
| 12 Weeks | 16.4 | 0.43 | 13.3 | 0.41 | | <.001** |
| 24 Weeks | 16.2 | 0.41 | 14.1 | 0.41 | | <.001** |
| Affectionate support | | | | | | |
| Group | | | | | 4.92 | .03* |
| Participant | | | | | 6.15 | <.001* |
| Week | | | | | 2.66 | .05* |
| Group × Week | | | | | 9.16 | <.001* |
| Baseline | 11.6 | 0.29 | 11.9 | 0.28 | | .43 |
| 6 Weeks | 12.7 | 0.31 | 12.2 | 0.32 | | .26 |
| 12 Weeks | 13.5 | 0.33 | 11.2 | 0.31 | | <.001** |
| 24 Weeks | 13.6 | 0.31 | 14.1 | 0.31 | | <.001** |
| Positive interaction | | | | | | |
| Group | | | | | 4.33 | .40 |
| Participant | | | | | 4.69 | <.001* |
| Week | | | | | 5.78 | .001* |
| Group × Week | | | | | 5.29 | .001* |
| Baseline | 10.3 | 0.31 | 10.8 | 0.31 | | .33 |
| 6 Weeks | 12.0 | 0.35 | 10.8 | 0.34 | | .01 |
| 12 Weeks | 12.4 | 0.36 | 10.3 | 0.34 | | <.001** |
| 24 Weeks | 12.6 | 0.34 | 10.8 | 0.31 | | .005 |

*Significance $\leq .05$.**Significance $\leq .003$ when compared to baseline (Bonferroni Correction).

was different in the two groups, as shown in Table 4. The intervention group had: (a) lower total self-efficacy scores (i.e., improved scores) than the comparison group at weeks 12 and 24;

(b) lower (i.e., improved) positive affect subscale scores at weeks 6, 12, and 24; (c) lower (i.e., improved) negative affect subscale scores at week 12; and (d) lower (i.e., improved) habit

Table 4. Repeated Measures ANOVA—Self-Efficacy Scale (N = 103)

| Outcome | Intervention Group (n = 51) | | Comparison Group (n = 52) | | F-value | p |
|------------------------|--------------------------------|------|------------------------------|------|---------|---------|
| | Mean | SE | Mean | SE | | |
| Total Scale | | | | | | |
| Group | | | | | 5.05 | .03* |
| Participant | | | | | 5.55 | <.001* |
| Week | | | | | 29.81 | <.001* |
| Group × Week | | | | | 6.60 | .003* |
| Baseline | 72.7 | 1.89 | 69.8 | 1.90 | | .29 |
| 6 Weeks | 54.0 | 2.08 | 62.3 | 2.09 | | .006 |
| 12 Weeks | 50.6 | 2.19 | 63.7 | 2.06 | | <.001** |
| 24 Weeks | 47.9 | 2.09 | 59.7 | 2.09 | | <.001** |
| Positive affect | | | | | | |
| Group | | | | | 5.76 | .018 |
| Participant | | | | | 5.78 | <.001* |
| Week | | | | | 22.77 | <.001* |
| Group × Week | | | | | 6.07 | .001* |
| Baseline | 19.3 | 0.57 | 18.8 | 0.57 | | .50 |
| 6 Weeks | 14.3 | 0.63 | 17.2 | 0.63 | | .002** |
| 12 Weeks | 13.3 | 0.65 | 17.5 | 0.62 | | <.001** |
| 24 Weeks | 12.7 | 0.64 | 16.1 | 0.63 | | <.001** |
| Negative affect | | | | | | |
| Group | | | | | 2.98 | .09 |
| Participant | | | | | 4.31 | <.001* |
| Week | | | | | 21.09 | <.001* |
| Group × Week | | | | | 2.40 | .07 |
| Baseline | 25.0 | 0.74 | 24.7 | 0.75 | | .73 |
| 6 Weeks | 19.5 | 0.82 | 22.1 | 0.82 | | .03 |
| 12 Weeks | 18.55 | 0.86 | 22.3 | 0.81 | | .002** |
| 24 Weeks | 17.87 | 0.82 | 20.0 | 0.82 | | .07 |
| Habit/craving | | | | | | |
| Group | | | | | 3.46 | .07 |
| Participant | | | | | 5.65 | <.001* |
| Week | | | | | 22.39 | <.001* |
| Group × Week | | | | | 6.21 | <.001* |
| Baseline | 16.4 | 0.53 | 15.4 | 0.53 | | .17 |
| 6 Weeks | 11.4 | 0.58 | 13.2 | 0.58 | | .03 |
| 12 Weeks | 10.7 | 0.61 | 13.6 | 0.57 | | <.001** |
| 24 Weeks | 10.5 | 0.59 | 13.8 | 0.58 | | <.001** |

*Significance $\leq .05$.

**Significance $\leq .003$ when compared to baseline (Bonferroni Correction).

craving subscale scores at weeks 12 and 24 than the comparison group.

The baseline scores for spiritual well being were significantly higher in the intervention group than the comparison group for the total score and each subscale score, and remained higher at each time period, as shown in Table 5. In determining possibilities to explain the higher baseline scores in the intervention group, baseline spiritual well being was positively associated with income ($r = .25$, $p = .01$), but not with age ($r = -.04$, $p = .70$) or education ($r = .09$, $p = .37$). Although,

there were significant within group changes in the intervention group for the total score, religious well-being score, and the existential well-being score, the group \times time interaction was not significant.

Mediating Effects

Hypothesis 4 was partially supported. To examine potential mediating effects, the changes in the total score (T4–T1) of each hypothesized variable

Table 5. Repeated Measures ANOVA—Spiritual Well-being Scale (N = 103)

| Outcome | Intervention Group (n = 51) | | Comparison Group (n = 52) | | F-value | p |
|-------------------------------|--------------------------------|------|------------------------------|------|---------|---------|
| | Mean | SE | Mean | SE | | |
| Spiritual well being | | | | | | |
| Group | | | | | 14.09 | <.001* |
| Participant | | | | | 7.49 | <.001* |
| Week | | | | | 9.22 | <.001* |
| Group × Week | | | | | 0.65 | .58 |
| Baseline | 96.1 | 1.29 | 88.1 | 1.28 | | <.001** |
| 6 Weeks | 101.0 | 1.42 | 90.3 | 1.43 | | <.001** |
| 12 Weeks | 103.1 | 1.49 | 93.3 | 1.41 | | <.001** |
| 24 Weeks | 104.2 | 1.45 | 92.6 | 1.43 | | <.001** |
| Religious well being | | | | | | |
| Group | | | | | 12.89 | <.001* |
| Participant | | | | | 6.50 | <.001* |
| Week | | | | | 8.04 | <.001* |
| Group × Week | | | | | 0.91 | .44 |
| Baseline | 50.9 | 0.75 | 46.3 | 0.74 | | <.001** |
| 6 Weeks | 52.8 | 0.82 | 48.2 | 0.82 | | <.001** |
| 12 Weeks | 54.4 | 0.86 | 49.9 | 0.81 | | <.001** |
| 24 Weeks | 55.0 | 0.83 | 48.3 | 0.82 | | <.001** |
| Existential well being | | | | | | |
| Group | | | | | 9.81 | .002* |
| Participant | | | | | 7.47 | <.001* |
| Week | | | | | 6.13 | <.001* |
| Group × Week | | | | | 1.08 | .36 |
| Baseline | 45.1 | 0.76 | 41.9 | 0.75 | | .002** |
| 6 Weeks | 48.2 | 0.83 | 42.1 | 0.83 | | <.001** |
| 12 Weeks | 48.7 | 0.87 | 43.4 | 0.82 | | <.001** |
| 24 Weeks | 49.1 | 0.85 | 44.3 | 0.83 | | <.001** |

*Significance $\leq .05$.**Significance $\leq .003$ when compared to baseline (Bonferroni Correction).

(i.e., social support, self-efficacy, spiritual well-being) were evaluated. To test the hypothesis for total social support score changes as a mediator of 6-month continuous smoking abstinence, the first equation regressed changes in total social support on group assignment ($\beta = -11.69$, $p = .001$). The second equation regressed 6-month continuous abstinence on group assignment ($\beta = .27$, $p = .003$). The third equation regressed 6-month abstinence on both total social support and group assignment. The hypothesized mediating variable, social support was a significant predictor in the final model ($\beta = .02$, $p = .035$). Yet, this final equation did not meet the requirements for a mediator effect because the independent variable, group assignment, was not reduced ($\beta = .28$, $p = .001$). Therefore, the changes in total social support did not mediate 6-month abstinence outcomes.

To test the hypothesis for changes in smoking cessation self-efficacy (total score) as a mediator

of cessation, the first equation regressed changes in self-efficacy on group assignment ($\beta = 12.86$, $p = .007$). The second equation regressed 6-month continuous abstinence on group assignment ($\beta = 0.27$, $p = .003$). The third equation regressed 6-month abstinence on both self-efficacy and group assignment. This final equation met the requirements for a mediator effect since: (a) the mediator variable, self-efficacy was significant in the model ($\beta = 0.01$, $p < .001$); and (b) the independent variable, group assignment, was reduced ($\beta = 0.11$, $p = .13$) in this model. Therefore, smoking cessation self-efficacy mediated 6-month continuous smoking abstinence in the intervention group participants over time.

Changes in total spiritual well-being scores were not predicted by group assignment (OR = 0.98, 95% CI = 0.95–1.02). Furthermore, because spiritual well-being was not associated with 6-month continuous smoking abstinence (OR = 1.02, 95% CI = 0.97–1.07), it failed to

meet the requirements for mediation. Changes in spiritual well-being did not mediate 6-month continuous smoking abstinence in the intervention participants over time.

Predictors of Cessation

Hypothesis 5 was partially supported. The final main effects model using logistic regression to predict abstinence outcomes is reported in Table 6. The independent variables that remained in the final model that predicted 6-month continuous abstinence were: (a) group; (b) changes (T4–T1) in social support; and (c) changes (T4–T1) in smoking cessation self-efficacy.

DISCUSSION

Women who received the *Sister to Sister* intervention were six times more likely to quit smoking than women who received group attention and minimum self-help written materials. In this study, 27.5% of the women in the intervention group maintained smoking abstinence for a 6-month period as validated by exhaled CO measurements. To our knowledge, there are no other studies in which researchers used an intensive education/behavioral and pharmacotherapeutic approach with low socioeconomic African American women. Yet, these findings show abstinence rates higher than previous tobacco cessation intervention studies with African Americans who were at similar stages of change at baseline (i.e., contemplators or preparers). In one study with 410 motivated, urban, Southeastern US, African Americans, the 6-month continuous abstinence rate was 17.1% for those who received the nicotine patch and self-help guides (Ahluwalia, McNagny, & Clark, 1998). In another study with 1,344 low-income African Americans who received self-help cessation guides, video, and booster calls, the 6-month continuous abstinence was 11.2% (Resnicow et al., 1997).

Table 6. Main Effects Model for Predictors of 6-Month Continuous Smoking Abstinence (N = 103)

| Variable | Adjusted OR | 95% CI | p |
|------------------|-------------|------------|-------|
| Group | 11.46 | 1.41–93.15 | .003 |
| Δ Social support | 1.05 | 1.01–1.10 | .047 |
| Δ Self-efficacy | 1.09 | 1.04–1.13 | <.001 |

Δ Represents differences from T4 to T1.

The intensity, duration, and group format of the *Sister to Sister* intervention may have been a contributing factor to the higher abstinence outcomes than previously reported studies in African Americans, with evidence that intensive group smoking cessation programs are twice as effective in promoting abstinence than self-help interventions (OR = 2.4, 95% CI = 1.69–2.60; Stead & Lancaster, 2005). The use of pharmacotherapeutics (e.g., nicotine patch), in addition to the intensive behavioral intervention was also favorable. Meta analyses of over 100 randomized control trials have been conducted that have examined the efficacy of the nicotine patch (in predominantly White samples) and reported 6-month abstinence of 20.5%–22% (Fiore, Smith, Jorenby, & Baker, 1994; Hughes, Shiffman, Callas, & Zhang, 2003; Silagy, Mant, Fowler, & Lodge, 1994). In almost all of the trials included in these meta-analyses, at least some degree of behavioral support was provided. The results of our study also corroborate findings in the PHS Guideline (Fiore et al., 2000) that combined use of pharmacotherapy and intensive behavioral treatment yields higher quit rates than less intensive intervention approaches.

Our findings demonstrate that all measures of social support increased significantly over time among the participants receiving the *Sister to Sister* intervention. In an attempt to control for possible confounding of social support from group processes, the study design incorporated group attention for both groups. The intervention participants received both intra-treatment social support within the group process and extra-treatment support outside the group sessions weekly over the 24-week study period from the CHWs. Furthermore, the social support measures continued to rise in the intervention group at weeks 12 and 24, despite lack of weekly group interaction during weeks 7–11 and weeks 13–24.

A key finding in this study was that changes in social support (i.e., improved scores from baseline to 24 weeks) predicted cessation. This is consistent with the PHS Guideline (Fiore et al., 2000) and others (Manske, Miller, Moyer, Phaneuf, & Cameron, 2004; Nollen et al., 2005) in which cessation programs that boost social support mechanisms are more likely to promote cessation. The indigenous CHWs, both of whom were former smokers, and had ethnic, linguistic, and life experiences similar to the participants, were able to promote effective social support that was valued by the participants. During the evaluation process, women reported that the CHWs encouraged them to quit smoking, communicated con-

cern and caring, actively listened to their concerns about quitting, and assisted them to identify other supportive individuals in their immediate environment. Previous researchers have qualitatively assessed social support enhancement by CHWs with health promotion initiatives (Andrews et al., 2005; Earp et al., 2002; Swider, 2002). Our study quantitatively measured social support outcomes with CHW interventions targeting African American women.

Our study findings also demonstrate that women who received the *Sister to Sister* intervention had improved smoking cessation self-efficacy over time. Improved smoking cessation self-efficacy over time not only predicted cessation, but also mediated cessation outcomes, indicating that building confidence in quitting may explain how the intervention group participants were able to quit smoking. These results support other findings that demonstrated smoking cessation self-efficacy to be a predictor of cessation (Brandon, Tiffany, Obremski, & Baker, 1990; Hahn, Folsom, Sprafka, & Norsted, 1990; O'Hea et al., 2004), and a mediator of cessation when both pharmacological and behavioral counseling were provided (Cinciripini et al., 2003). As with the social support measures, smoking cessation self efficacy improved in the intervention group over each time period, which reinforced the contributions of the CHWs in the absence of group meetings.

Ours is the first study to measure CHW enhancement of self-efficacy with a health promotion intervention in ethnic minority women. The indigenous CHWs had their own experiences with personal smoking cessation attempts and navigating the same sociocultural environment as the participants. Not only were they effective in offering simple, practical, and realistic suggestions to which the women could relate, but also in empowering women to identify their own solutions to combat tempting situations and to overcome the urges to begin smoking again in various situations.

Spiritual well-being scores improved among women receiving the *Sister to Sister* intervention with scores at week 24 higher than baseline. Yet, changes in spiritual well being over time neither predicted nor mediated cessation in the intervention participants. The intervention participants participated in a group prayer at the end of each group session, and the CHWs encouraged the use of prayer, meditation, and scripture/spiritual literature during the extra-treatment contacts. The extent to which women participated in these extra-treatment activities was not measured.

Nollen et al. (2005) found that baseline religiosity scores did not predict cessation outcomes in a sample ($N=496$) of urban African Americans who received the nicotine patch and follow-up telephone calls.

We found no other reports that addressed spirituality measures and tobacco cessation outcomes in African American women or that featured the use of CHWs to enhance these effects among other women. Although the findings concerning the spiritual component of the intervention were not statistically significant, the incorporation of this sociocultural preference likely contributed favorably to the intervention for the participants. Research is needed to explore behavioral mediating factors that improve the health of low-income African American women, including spirituality. Other study findings indicate that spirituality is associated with positive health outcomes in African American women (Musgrave et al., 2002; Sowell et al., 2000). Further research is needed to design and test protocols and instrumentation for spiritual interventions targeting smoking cessation and other lifestyle behaviors so that their effectiveness can be further evaluated.

Limitations

Limitations of this study include: the random assignment of communities rather than individuals; use of only two communities; and not using the most precise and reliable biomarker to measure smoking abstinence (i.e., cotinine). Also limiting the generalizability of the results of this study are selection bias, with the intervention group older, and with higher incomes and levels of education; potential confounding of the intervention by extraneous community variables and varying dosages of the intervention; and potential procedural errors with a lack of defined protocols for spiritual well-being enhancement.

CONCLUSIONS

Yet, our results show promise for enhancing sustained smoking abstinence in these low-income African American women. Further research is needed to test the effectiveness of this intervention using a randomized controlled design and cotinine to validate long-term smoking cessation outcomes. Our findings have significant implications for nurses and other health professionals who intervene with marginalized

communities to promote positive behavior change. Indigenous CHWs who share similar cultural values and life experiences can serve a crucial role in promoting culturally relevant smoking cessation interventions in low-income African American women. Not only CHWs are able to identify, intervene, and evaluate health concerns of the community, but they may also be able to promote community advocacy, cultural competence, and empower others in ways that “outsiders” cannot. Additional research is needed to explore different uses and levels of activities of CHWs with smoking cessation and other lifestyle behavioral changes with low-income African American women. Further studies that evaluate the dosage and intensity of CHW interventions, as well as their potential cost effectiveness, are needed.

Community-based approaches for the delivery of innovative health behavior interventions are needed to eliminate health disparities in marginalized communities. A collaborative partnership with communities is crucial to understanding the context and meaning of health behaviors as well as developing effective strategies to sustain long-term behavioral and social change.

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