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Change in Smoking, Diet, and Walking for Exercise in Blacks

Carla J. Berg, PhD[1], **Janet L. Thomas, PhD**[1], **Lawrence C. An, MD**[2], **Hongfei Guo, PhD**[1], **Tracie Collins, MD**[3], **Kolawole S. Okuyemi, MD**[1], and **Jasjit S. Ahluwalia, MD**[1]

[1]University of Minnesota, Minneapolis, MN, USA

[2]University of Michigan, Ann Arbor, Michigan, USA

[3]University of Kansas School of Medicine–Wichita, Wichita, Kansas, USA

Abstract

Positive changes in one health behavior may be accompanied by other constructive health behavior changes. Thus, the authors investigated the association of smoking reduction and cessation to changes in fruit and vegetable (FV) intake and engaging in walking for exercise. This study included 539 Black light smokers (≤10 cigarettes per day ≥25 days/month) enrolled in a 2 × 2 factorial study (placebo vs. nicotine gum, health education vs. motivational interviewing). Reducing cigarette consumption ($p = .02$) and quitting smoking ($p < .01$), as well as receiving the nicotine gum ($p = .04$), was associated with increased FV intake, after controlling for baseline FV intake. Compared with those who did not reduce their smoking, both reducers ($p < .001$) and quitters ($p < .001$) were more likely to walk for exercise at follow-up, after controlling for baseline walking status ($p = .01$). Thus, addressing one health risk behavior may prompt other positive health behaviors, which may argue for developing interventions targeting multiple health risk behaviors.

Keywords

Blacks; health behavior change; smoking cessation; smoking reduction

Health risk behaviors such as smoking, unhealthy dietary patterns, and a sedentary lifestyle have an important influence on morbidity and mortality (Centers for Disease Control and Prevention, 2005; McGinnis & Foege, 1993; Mokdad, Marks, Stroup, & Gerberding, 2004). These behaviors not only influence individuals' health but also create burdens for the nation and society as a whole. Furthermore, people engaging in multiple health risk behaviors are at greater risk of developing chronic diseases and suffering injuries than those with only one health risk behavior (Laaksonen, Prattaila, & Lahelma, 2003; Pickett, Garner, Biyce, & King, 2002).

Health risk behaviors, which develop over time, are often related to one another (Bongers, Koot, ven der Ende, & Verhulst, 2004; Koivusilta, Honkala, Honkala, & Rimpela, 2003; Yen, Chiu, & Wu, 2006; Yen, Wen, Tseng, & Sun, 1999). Previous studies of multiple health behavior change have focused on identifying gateways to other behavior changes (Clark, Rossi, & Greaney, 2005; Emmons, Marcus, Linnan, Rossi, & Abrams, 1994; Nigg,

Corresponding Author: Carla J. Berg, Department of Medicine and Masonic Cancer Center, University of Minnesota, 717 Delaware Street SE, Suite 166, Minneapolis, MN 55414, USA, carlajberg@gmail.com.

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Burbank, & Padula, 1999). For example, participation in physical activity has been found to influence other important health behavior changes, including seat belt use and stress reduction (Costakis, Dunnagan, & Haynes, 1999), smoking cessation and relapse prevention (King, Marcus, Pinto, Emmons, & Abrams, 1996; Marcus, Albrecht, & Niaura, 1995; Marcus, Albrecht, Niaura, Abrams, & Thompson, 1991), and, with the exception of one report (Wilcox, King, Castro, & Bortz, 2000), dietary changes (Kano & Tucker, 1993; Tucker & Reicks, 2002).

One theory that may provide an explanation for why health risk behaviors may be associated is social cognitive theory (SCT), which describes learning in terms of the interrelationship between behavior, environmental factors, and personal factors (Bandura, 1977). According to SCT, self-efficacy is achieved when individuals reflect on and internalize their own successes and failures. Thus, having recently experienced success in one area may increase one's self-efficacy and therefore influence subsequent goal pursuits. Related to the current study, if individuals are successful in reducing or quitting smoking, they may also feel more confident or motivated to engage in other healthy behaviors, such as improving their diet or increasing their level of physical activity.

Specifically related to the objectives of this article, some important gaps in the literature exist in this area. First, little has been done examining the impact of smoking reduction or cessation on other health behaviors. Smoking reduction and cessation have been linked to improved health outcomes, such as significant reductions in the risk of lung cancer and coronary heart disease (Godtfredsen, Prescott, & Osler, 2005; Ockene, Kuller, Svendsen, & Meilahn, 1990). Both health behavior improvements may influence other modifiable health risk behaviors. One report found that changes in smoking habits showed no significant relationship to changes in physical activity but that cessation was related to significant increases in consumption of calories, sucrose, and fats 2 weeks after quitting (Hall, McGee, Tunstall, Duffy, & Benowitz, 1989). Outside of this report, research has largely neglected the study of health behavior changes related to changes in smoking patterns, and no positive subsequent health behavior changes have been demonstrated. Second, limited research has focused on demographic predictors of multiple health behavior change (i.e., who benefits most) or which targeted health behaviors result in changes in other behaviors. Thus, longitudinal studies could provide essential information about change across health risk behaviors and the factors that predict change (Anstey & Hofer, 2004). In addition, little has been done to examine the theoretical basis of these co-occurring behavioral changes. Specifically drawing from SCT, the role of changes in self-efficacy related to successfully engaging in one positive health behavior change has not been linked to subsequent or co-occurring health behavior changes.

In addition to these gaps in the literature, high-risk, underserved populations should be addressed in this line of research, particularly Blacks. Life expectancy in the United States at birth is 6.2 years shorter for Black males and 3.5 years for Black females versus their White counterparts (National Center for Health Statistics, 2006). In addition, Blacks are 21% more likely to die from all types of cancer than Whites, adjusting for age (National Center for Health Statistics, 2006). For lung cancer, Blacks have 2 to 3 times more risk than do other ethnic groups (Haiman et al., 2006). The prevalence of high blood pressure (a major risk factor for coronary heart disease, stroke, heart failure, and kidney disease) is 40% higher among Blacks than in Whites. Additionally, Blacks have higher morbidity and mortality rates associated with stroke (U.S. Department of Health and Human Services, 2000). Blacks are also more likely to smoke (Haiman et al., 2006), consume fewer servings of fruits and vegetables (Zenk et al., 2006), and have lower rates of physical activity (Centers for Disease Control and Prevention, 2008), which are all modifiable risk factors for cancer and cardiovascular disease (Breckenkamp, Blettner, & Laaser, 2004; McTiernan, 2006; Ness &

Powles, 1997; Steinmetz & Potter, 1991a, 1991b). Thus, focusing on this population will provide valuable information regarding how best to intervene in order to improve the health of high-risk populations.

Given these gaps in the literature, the present study investigated the association of smoking reduction and cessation with changes in other health behaviors. Specifically, we will examine the relationship between smoking reduction and cessation to changes in fruit and vegetable (FV) intake and engaging in walking for exercise among Black light smokers enrolled in an 8-week randomized clinical trial targeting smoking cessation from baseline to 26-week follow-up. Additionally, we will also examine the role of self-efficacy in this relationship to determine the extent to which changes in self-efficacy may play a role in these health behavior changes.

Method

The parent study (Okuyemi et al., 2007) was a placebo-controlled, 2 × 2 factorial design, randomized trial of 755 Black light smokers (i.e., defined as smoking ≤10 cigarettes per day on ≥25 days per month). Participants were randomly assigned to receive placebo or active nicotine gum and health education (HE) or motivational interviewing (MI). Participants were randomized and followed up at a community health center between March 2003 and January 2005. Participants provided written informed consent, and study procedures were approved and monitored by the University of Kansas Medical Center's human subjects committee (Ahluwalia et al., 2006). After excluding participants with missing data and those lost to follow-up at 6 months, the current investigation included 539 of the original 755 participants.

Participants

Eligible individuals, who self-identified as either “African American or Black,” were at least 18 years of age, smoked 10 or fewer cigarettes a day for at least 6 months prior to enrollment, smoked in at least 25 of the past 30 days, were interested in quitting in the next 2 weeks, spoke English, and had a permanent home address and working telephone. Smokers were recruited using clinic, media, and various community outreach efforts described in detail elsewhere (Okuyemi et al., 2007).

Procedure

At the randomization visit, participants were randomly assigned to receive an 8-week supply of either active 2 mg nicotine gum or a placebo. Instructions given for gum usage depended on number of cigarettes smoked at baseline. Participants were encouraged to set a target quit date for the day following their randomization visit. Participants were also assigned randomly to receive either MI or HE counseling, which exclusively targeted smoking cessation (i.e., neither the intervention materials nor counseling protocol discussed FV intake or walking for exercise). In general, participants received six counseling sessions: three in-person visits (at randomization, Week 1, and Week 8) and three by telephone (Week 3, Week 6, and Week 16). Counseling sessions were either focused on the health impact of smoking and the health benefits of quitting or included MI counseling strategies designed to increase participant motivation and confidence in quitting. Each call lasted approximately 20 minutes in duration. Participants were called and postcard appointment reminders were mailed before every visit. In addition, all participants completed a battery of assessments at established time points throughout the study. Among other incentives for participating in the intervention study, gift cards in the amount of $40 were given at the completion of the baseline and Week 26 evaluations to compensate participants for their time.

Measures

All questionnaire items were read to, or along with, participants by a trained research assistant. Baseline and Week 26 assessments included measures documenting demographic characteristics, self-efficacy, smoking behaviors, FV intake, and walking for exercise. We assessed self-efficacy and each of the following health behaviors at baseline and Week 26.

Smoking Self-Efficacy Questionnaire (SEQ-12)—The SEQ-12 (Etter, Bergman, Humair, & Perneger, 2000) is a two-dimensional 12-item scale measuring confidence in ability to refrain from smoking on a 5-point Likert-type scale (from 1 = *not at all sure* to 5 = *absolutely sure*). SEQ-12 scores range from 12 to 60 with higher scores indicating greater self-efficacy. It assesses this confidence using two subscales: (a) the Intrinsic Self-Efficacy subscale, which assesses confidence in ability to refrain from smoking when facing internal stimuli (e.g., feeling depressed) and (b) the Extrinsic Self-Efficacy subscale, which assesses confidence in ability to refrain from smoking when facing external stimuli (e.g., being with smokers). Scores for each of the subscales range from 6 to 30. Change scores for intrinsic self-efficacy and extrinsic self-efficacy were derived by subtracting baseline scores from Week 26 scores.

Fruit and vegetable intake—To assess FV intake, participants were asked, “Over the past 7 days, how many servings of fruit did you eat?” and “Over the past 7 days, how many servings of vegetables did you eat?” These two variables were then used to create an aggregate variable of average number of fruits and vegetables per day. The outcome for FV intake was average daily servings at Week 26.

Walking for exercise—To assess walking for exercise, participants were asked, “In the past 2 weeks, did you ever walk only to get exercise?” The outcome for walking was whether or not a participant walked for exercise at Week 26.

Smoking behavior change—To assess smoking behavior change, we asked, “During the past 7 days, have you smoked any cigarettes at all?” and “On average, how many cigarettes did you smoke in a day?” We used these questions to determine whether or not the participant quit smoking from baseline to Week 26 (i.e., “quitters”), reduced their smoking by at least one cigarette (i.e., “reducers”), or did not decrease their smoking or quit (i.e., “nonreducers”). At Week 26, self-reported quitters were asked to provide saliva samples to cotinine-verify their status. Only those participants who were cotinine verified were included as quitters in the analyses; self-reported but not cotinine-verified quitters were excluded from the analyses.

Data Analysis and Statistical Consideration

The primary predictor variables for the study were change in smoking behavior from baseline to Week 26 (quitter, reducer, nonreducer) and change in smoking self-efficacy from baseline to Week 26, and the main outcomes were (a) daily FV intake and (b) walking for exercise at Week 26.

Pearson correlations and *t* tests were used to examine baseline characteristics, treatment-related variables, change in self-efficacy, and changes in smoking patterns related to daily FV intake at Week 26. Chi-square tests and analyses of variance were used to examine baseline characteristics, treatment-related variables, and changes in smoking patterns related to walking for exercise at Week 26.

Inferential analyses were conducted using ordinary least squares regression for FV intake at Week 26 and binary logistic regression for walking for exercise at Week 26. Each analysis was conducted entering those variables (self-efficacy, treatment, and demographic) with $p < .05$, and a backward stepwise approach was used. In both models, baseline FV intake and baseline walking for exercise were forced into the models predicting FV intake and walking at Week 26, respectively. Only those participants whose data were collected at baseline and Week 26 were included in the analyses ($n = 539$). All analyses were conducted using SPSS 15.0.

Results

Of the 539 Black light smokers included in these analyses, 365 (67.7%) were female, and the average age was 45.73 years (*SD* = 10.49; see Table 1). The majority (55.3%) had a household income of less than $1,800 per month. With regard to changes in smoking behavior, 17.1% ($n = 92$) of the sample had reported quitting smoking and were cotinine verified at Week 26, 58.3% ($n = 314$) had reduced their smoking by at least one cigarette per day, and 24.7% ($n = 133$) did not reduce their level of smoking. Average change in intrinsic smoking abstinence self-efficacy from baseline to Week 26 was 4.02 (*SD* = 7.87); average change in extrinsic self-efficacy was 3.93 (*SD* = 8.32). Increases in self-efficacy were related to changes in smoking behavior, such that those who did not quit or reduce their smoking had a reduction in intrinsic self-efficacy of −0.48 (*SD* = 6.20), those who reduced their smoking had an increase in intrinsic self-efficacy of 3.30 (*SD* = 7.00), and those who quit smoking had an increase in intrinsic self-efficacy of 12.86 (*SD* = 5.57). Regarding extrinsic self-efficacy, those who did not reduce or quit smoking had an increase of 0.22 (*SD* = 6.98), those who reduced their smoking had an increase of 3.47 (*SD* = 8.16), and those who quit smoking had an increase of 11.09 (*SD* = 5.86). These change scores were significantly different among the three groups ($p < .001$).

Fruit and Vegetable Intake

At baseline, the average number of FV consumed per day was 2.04 (*SD* = 1.67), with an average FV intake of 2.25 (*SD* = 1.90) per day at 26-week follow-up. Bivariate analyses indicated that pharmacotherapy group, counseling group, age, gender, educational level, income level, and marital status were not related to greater FV intake at Week 26. Bivariate analyses also indicated that those who reduced their smoking or quit smoking had greater FV intake at Week 26 relative to non reducers (quitters: 2.57 ± 2.08; reducers: 2.33 ± 2.03; nonreducers: 1.85 ± 1.31; $p = .01$). Additionally, change in intrinsic self-efficacy ($r = .12$, $p = .004$) and change in extrinsic self-efficacy ($r = .12$, $p = .008$) were correlated with FV intake at Week 26, but neither was related to baseline FV intake.

Results of the final multivariate model indicated that after controlling for baseline FV intake ($p < .001$), both reducing cigarettes smoked per day ($p = .02$) and quitting smoking ($p < .01$) were associated with greater FV intake at Week 26 (see Table 2). Of particular note, no other significant predictors were found, including change in self-efficacy or treatment condition (i.e., pharmacotherapy, counseling).

Walking for Exercise

Of the 539 participants included in the analyses, 44.4% ($n = 193$) reported walking for exercise at baseline, and 50.0% ($n = 230$) reported walking at follow-up. Bivariate analyses indicated that pharmacotherapy group, counseling group, age, gender, education level, income level, and marital status were not related to walking for exercise at Week 26. Bivariate analyses did indicate that those who reduced their smoking or quit smoking were more likely to report walking for exercise at Week 26 (quitters: $n = 53$, 66.3%; reducers: $n = 141$, 51.1%; nonreducers: $n = 36$, 34.6%). Additionally, change in intrinsic self-efficacy was related to greater likelihood of walking for exercise at Week 26 (5.17 ± 8.26 among walkers vs. 3.41 ± 7.50 among nonwalkers; $p = .02$) but not baseline walking. Extrinsic self-efficacy was unrelated to walking at both assessments points.

Results of our final multivariate model indicated that after controlling for baseline walking for exercise ($p = .01$), both reducing cigarettes smoked per day ($p < .001$) and quitting smoking ($p < .001$) were related to increased likelihood of walking for exercise at Week 26 (see Table 3). Again, it is important to note that change in self-efficacy, treatment condition (i.e., pharmacotherapy, counseling), and other participant characteristics were not significant predictors of change in walking for exercise.

Discussion

This study is among the first to document that Black light smokers enrolled in a smoking cessation trial who reduce or quit smoking may also act to enhance their health by increasing their level of FV intake and becoming more physically active (i.e., walking for exercise). Interventions designed to change health risk behaviors (e.g., cigarette smoking, nutrition, exercise) often focus on a single risk behavior. The present study demonstrates that by focusing on smoking cessation, other health behaviors may improve. Thus, providing information or other resources to encourage health behavior improvements may be beneficial in enhancing this goal at a critical time when people may be inclined to make other behavioral changes.

Drawing from SCT, having made improvements in smoking behaviors (i.e., having either reduced or quit smoking) may have increased self-efficacy, which therefore set the stage for engaging in other healthy behaviors—in this case, increasing FV intake and engaging in walking for exercise (Bandura, 1977). Despite the fact that change in smoking abstinence self-efficacy was a not a significant predictor in the regression models predicting FV intake and walking for exercise at Week 26, change in self-efficacy was found to be related to these behaviors in the bivariate analyses. The reasons for these findings are unclear. It may be, however, that behavioral changes (changes in smoking in this case) are more robust predictors of future changes in behavior (FV intake and walking for exercise in this study) than attitudinal changes, such as beliefs regarding self-efficacy. This may be particularly true given our use of a smoking-specific self-efficacy assessment. Thus, this measure may not reflect changes in a more global self-efficacy resulting from positive behavioral changes. Future research may benefit from including a more global assessment of self-efficacy to determine if increases in overall self-efficacy predict behavioral changes in other domains.

Interventions designed to simultaneously address multiple risk behaviors have tremendous public health appeal; however, the design and implementation of multiple health behavior change interventions pose significant challenges in implementation. Changing more than one habit may be difficult to do. One issue that may make this difficult is that individuals who engage in multiple risks may have factors underlying these behaviors (e.g., depression) that inhibit success in changing any health risk behavior. Additionally, they may be confused about the relative importance of each risk behavior or may feel overwhelmed by the sheer number of “bad things” they need to improve. Mason, Ogde, Berreth, and Martin (1986) state that

> the very multiplicity of threats and the urgency with which they are presented make it difficult for most of us to sort out major from minor, proven from suspected, and most importantly, those that we as individuals can control from those we cannot. (p. 133)

There are those who argue that interventions should focus on one “habit” at a time. Ornstein et al. (1993) examined adherence to preventive service reminders for cholesterol screening and found that some recipients felt "overwhelmed" when receiving multiple messages. Similarly, Marlatt (1985) suggests that "one problem to avoid at all costs" is recommending too much behavior change too quickly. These assertions imply the need for a sequenced behavior change process that first identifies and prioritizes risk-related behaviors to change, then sequentially intervenes on the prioritized behaviors.

Given that many individuals engage in multiple health risk behaviors, there has been a call to action to develop and test methods for addressing multiple behaviors. An established method of identifying and prioritizing multiple health-related risk factors has been through health risk appraisal (Beery, Schoenbach, & Wagner, 1986; Strecher & Kreuter, 2000). Health risk appraisal collects epidemiological data regarding multiple risk behaviors, calculates risk based on population mortality data, and provides feedback to the users identifying their risk factors and the health benefit (usually in years of prolonged life expectancy) they can expect by modifying each risk behavior. The criteria used for prioritizing risk-related behaviors are based purely on these epidemiological estimates of life expectancy.

An alternative to using epidemiological criteria for prioritization is to ask the individual what he or she is most interested or motivated to change. The presumption is that high intrinsic motivation to change even a relatively benign behavior would be more likely to be successful, thus generating self-efficacy, motivation, and commitment to change more important behaviors in the future. Motivation to change may be the result of health- or non–health-related factors. The distinction between this approach and a purely epidemiological approach is that the factors considered to be important are derived from the individual, not from the health establishment. Intrinsic motivation is viewed in many conceptual models of behavior change as an important first step of behavior change (Bandura, 1977; Rollnick, Butler, & Scott, 1997).

Likewise, for practitioners, it may be important to assess individuals' motivation to change across health behaviors in order to identify areas they are interested in and potentially more confident in their ability to make meaningful changes. This may serve to enhance intrinsic motivation if they are indeed successful and potentially fuel enhances in motivation and confidence in changing other health behaviors. Along these lines, it is important for practitioners to acknowledge that successfully improving one health behavior may set the stage for other changes; thus, health care providers should foster continued improvements as an individual begins to demonstrate success in one behavior.

Limitations

Some important limitations to this study do exist. First, assessments of smoking level, FV intake, and walking for exercise at baseline and Week 26 were based on self-report. Related to this, we excluded participants who self-reported cessation at 6 months but were not cotinine verified. Thus, we cannot be certain about what actually occurred with those who were excluded nor can we be certain that participants included in the analyses accurately reported their smoking levels. In addition, this sample of Blacks smoking an average of 10 cigarettes per day or less was drawn from a Midwest inner city in the United States. Thus, these findings may not generalize to all Black light smokers. Finally, the use of a smoking abstinence self-efficacy measure may have precluded the identification of change in self-efficacy on a more global level, which may have hindered the ability to detect these more global changes that may have influenced FV intake and exercise.

Conclusions

This study suggests that addressing a single health risk behavior may prompt research participants to engage in other positive health behavior changes. Thus, this may argue for developing interventions that target multiple health risk behaviors to capitalize on participant openness to improve their health behavior patterns. In practice, this suggests that health care providers may want to assess changes in other health behaviors when individuals make noticeable changes in one area.

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Table 1

Participant Characteristics

Variable	*N* (%) or Mean (*SD*)
Treatment variables	
Pharmacotherapy	
Placebo	262 (48.6)
Gum	277 (51.4)
Intervention	
Health education	266 (49.4)
Motivational interviewing	273 (50.6)
Demographic variables	
Age, years (*SD*)	45.73 (10.50)
Female (%)	365 (67.7)
Education <high school (%)	87 (16.1)
Income <$1,800/month (%)	298 (55.3)
Married/living with partner (%)	198 (36.7)
Smoking abstinence self-efficacy	
Intrinsic (*SD*)	15.43 (5.39)
Extrinsic (*SD*)	13.99 (6.21)
Health behavior variables	
Baseline fruit and vegetable intake (*SD*)	2.04 (1.67)
Baseline walking for exercise (%)	193 (44.4)

Note. Percentages may not be proportionate to *N* = 539 because of missing data.

Table 2

Ordinary Least Squares Model Associating Changes in Smoking Behavior With Fruit and Vegetable Intake at Week 26 Among Black Light Smokers

Variable	Coefficient	95% Confidence Interval	*p*
Baseline fruit and vegetable intake	.45	[0.36, 0.54]	<.001
Change in smoking			
Did not reduce or quit	Reference	—	—
Reduced	.47	[0.11, 0.82]	.02
Quit	.73	[0.27, 1.20]	.003

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Table 3

Binary Logistic Regression Model Associating Changes in Smoking Behavior With Walking for Exercise at Week 26 Among Black Light Smokers

Variable	Odds Ratio	95% Confidence Interval	*p*
Baseline walking for exercise			
No	Reference	—	—
Yes	3.91	[2.52, 6.06]	.01
Change in smoking			
Did not reduce or quit	Reference	—	—
Reduced	1.82	[1.08, 3.07]	<.001
Quit	3.76	[1.86, 7.60]	<.001