

Original Investigation

Predictors of smoking reduction among Blacks

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Abstract

Introduction: Blacks who smoke have increased tobacco-related health risks. Cessation decreases the likelihood of many health problems. Smoking reduction may be important in the cessation process and potentially reduce health risks.

Methods: Because little is known about specific predictors of smoking reduction, we investigated factors predicting reduction among Black light smokers enrolled in a 26-week cessation trial. Specifically, we compared (a) reducers (reduced cigarettes per day [cpd] $\geq 50\%$) with nonreducers and (b) reducers with quitters. Baseline demographic, smoking-related, and psychosocial variables were collected, and Week 26 smoking status was assessed.

Results: Among 539 participants, 41.0% ($n = 221$) reduced their smoking, 17.6% ($n = 95$) quit, and 41.4% ($n = 223$) did not reduce their smoking by $\geq 50\%$. In comparison with reducers, nonreducers were more likely to have their first cigarette within 30 min of waking (odds ratio [OR] = 2.4, 95% CI = 1.47–3.93), lower baseline cpd (OR = 0.84, 95% CI = 0.77–0.93), higher baseline cotinine levels (OR = 1.002, 95% CI = 1.000–1.003), lower perceived stress (OR = 0.86, 95% CI = 0.78–0.95), and higher Smoking Consequences Questionnaire (SCQ) negative social impression scores (OR = 1.04, 95% CI = 1.01–1.06), after controlling for treatment arm, gender, and age. Significant predictors of smoking cessation versus reduction included lower baseline cpd (OR = 0.85, 95% CI = 0.75–0.95), higher nicotine dependence (OR = 1.47, 95% CI = 1.09–1.98), lower baseline cotinine levels (OR = 0.996, 95% CI = 0.994–0.998), higher body mass index (OR = 1.05, 95% CI = 1.01–1.08), lower perceived stress (OR = 0.82, 95% CI = 0.72–0.95), and higher SCQ negative social impression scores (OR = 1.05, 95% CI = 1.01–1.08).

Discussion: Distinct predictors are associated with different trajectories of smoking behavior change (i.e., reduction vs. cessation vs. no change).

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Introduction

Cigarette smoking remains one of the leading causes of preventable disease in the United States (U.S. Department of Health and Human Services [USDHHS], 2000). Despite substantial efforts to decrease its prevalence, 18.1% of Americans continue to smoke, with 1.6% of smokers having quit between 2007 and 2008 (Centers for Disease Control and Prevention, 2008). Smoking reduction may be important for a number of reasons. First, reduction may be an important step toward successful cessation (Broms, Korhonen, & Kaprio, 2008; Falba, Jofre-Bonet, Busch, Duchovny, & Sindelar, 2004; Farkas, 1999; Hughes & Carpenter, 2006; Hyland et al., 2005). For example, a 15-year longitudinal study (Broms et al.) found that, among twin pairs discordant for cessation (i.e., one had quit smoking and one had not quit), smoking reduction by at least 25% was associated with increased likelihood of cessation, independent of genetic or family influences.

Second, although the research is inconclusive, smoking reduction may yield improved health outcomes (Pisinger & Godtfredsen, 2007). One study (Bolliger et al., 2002) found that, among 400 participants enrolled in a smoking reduction trial, those reducing their smoking by 50% over 2-year period showed significant improvements in cholesterol/high-density lipoprotein ratios, hemoglobin concentrations, pulse rate, and general health score. Other research has also documented improvements in respiratory symptoms as a result of smoking reduction (Falba et al., 2004; Gilpin & Pierce, 2003; Hatsukami et al., 2002). In addition, smoking reduction was associated with reduced cancer risk in an observational population-based cohort study of 20,000 participants (Godtfredsen, Prescott, & Osler, 2005). Compared with persistent heavy smokers, the adjusted hazard ratio (HR) for lung cancer in those who reduced their smoking from 15 cigarettes/day (cpd) by a minimum of 50% was 0.73 (95% CI = 0.54–0.98) and the HR for quitters (persons who stopped smoking over the

period of the longitudinal follow-up) was 0.50 (95% *CI* = 0.36–0.69). Although the measurable health benefits of smoking reduction without cessation remain questionable (Hatsukami, Hecht, Hennrikus, Joseph, & Pentel, 2003; Hatsukami, Henningfield, & Kotlyar, 2004; Hatsukami et al., 2002; Hecht & Hatsukami, 2005), results from prior work suggest that reduction may reduce disease risk and may be an important goal toward cessation among those who are unwilling or unable to quit.

Whereas a great deal of research has targeted predictors of cessation, less is known about predictors of reduction. Although the findings are inconsistent, predictors of smoking cessation among adult smokers have included male gender (Dale et al., 2001; Ferguson et al., 2003; Wetter et al., 1999), older age (Grandes, Cortada, Arrazola, & Laka, 2003; MacKenzie, Pereira, & Mehler, 2004), higher educational level (Nides et al., 1995), smoking characteristics (i.e., nicotine dependence, duration of smoking, previous quit attempts, level of smoking, baseline cotinine; Dale et al.; Ferguson et al.; Grandes et al.; K. J. Harris et al., 2004; Nides et al.), motivation and confidence to quit (Borrelli & Mermelstein, 1998; K. J. Harris et al.; MacKenzie et al.), less negative affect (Ferguson et al.; K. J. Harris et al.), and less alcohol use (Bobo, Lando, Walker, & McIlvain, 1996; Morgenstern, Labouvie, McCrady, Kahler, & Frey, 1997).

The majority of prior research examining predictors of reduction has included sociodemographic and smoking behavior variables but has neglected the inclusion of psychosocial variables as potential predictors (Falba et al., 2004; Farkas, 1999; Godtfredsen, Prescott, Osler, & Vestbo, 2001; McDermott, Dobson, & Owen, 2008; Meyer, Rumpf, Schumann, Hapke, & John, 2003). Some commonly identified predictors of smoking reduction include higher baseline smoking levels (Godtfredsen et al., 2001; Joseph, Bliss, Zhao, & Lando, 2005; McDermott et al.), being man (Joseph et al.), being younger (Joseph et al.), impaired lung functioning (Godtfredsen et al., 2001), a history of chronic obstructive pulmonary disease (Joseph et al.), and a greater number of heart disease diagnoses (Joseph et al.). Furthermore, no prior research has compared reducers with those who quit and with those who do not reduce to determine the distinct characteristics of reducers. Thus, research is needed to detail factors, particularly psychosocial characteristics associated with smoking reduction and how those who reduce their smoking levels differ from those who quit smoking or those who do not significantly reduce their smoking.

Moreover, limited research is available regarding smoking reduction among light smokers. While the prevalence of cigarette smoking has decreased over the past few decades, the proportion of “light smokers” is growing. This is particularly evident among certain subpopulations in the United States, such as teens, young adults, women, and ethnic minority groups (Kandel & Chen, 2000; Okuyemi et al., 2002). In defining “light smokers,” national surveys have previously used a cutoff of <15 cpd (USDHHS, 1998). This definition may be appropriate among Whites, who smoke on average about 17 cpd (Schoenborn, Adams, Barnes, Vickerie, & Schiller, 2004); however, a cutoff of 15 cpd may be inappropriate when applied to other populations, such as Blacks, who smoke on average 12 cpd (Schoenborn et al.). Thus, a cutoff of 10 cpd may be more appropriate for Black smokers (Okuyemi et al.) and was used for the parent study.

Some argue that light smoking is a transitional state leading to heavier smoking or cessation (Evans, Gilpin, Pierce, Burns, & Al, 1992; Okuyemi et al., 2002; Zhu, Sun, Hawkins, Pierce, & Cummins, 2003), while others maintain that light smoking is a stable pattern of low consumption that is maintained for a long period of time (Hughes, Cummings, & Hyland, 1999; Okuyemi et al.; Owen, Kent, Wakefield, & Roberts, 1995). Of note, light smokers suffer from significant smoking-related morbidity and mortality compared with never-smokers (Garfinkel & Stellman, 1988; Jimenez-Ruiz, Kunze, & Fagerström, 1998). Thus, smoking cessation and potentially reduction among light smokers are critical.

Approximately 50% of Blacks are light smokers; however, Blacks experience a disproportionate share of tobacco-related morbidity and mortality (R. E. Harris, Zang, Anderson, & Wynder, 1993). Although the reasons for the health disparities are not entirely clear, several smoking-related differences may possibly contribute to the excess smoking-related morbidity experienced by Blacks. For instance, Blacks tend to prefer high-tar/nicotine and mentholated cigarettes (Kabat, Morabia, & Wynder, 1991), inhale more deeply (Clark, Gautam, & Gerson, 1996), have a slow rate of nicotine metabolism (Clark et al.), have higher serum cotinine levels per cigarette smoked (Benowitz, 1996; Caraballo et al., 1998), and have greater difficulty quitting smoking compared with other ethnic groups (Royce, Hymowitz, Corbett, Hartwell, & Orlandi, 1993). These characteristics may possibly contribute to the excess smoking-related morbidity experienced by Blacks. Thus, identifying factors associated with smoking reduction among this high-risk group is particularly important. Moreover, these distinctions in smoking behavior and physiological characteristics may also make the predictors of cessation and reduction unique to this population.

Given the importance of smoking reduction and the limited research investigating light smoking among Blacks, the present study aims to identify demographic, smoking-related, and psychosocial predictors of smoking reduction among a cohort of Black light smokers by comparing participants who reduced their smoking by at least 50% with those who did not reduce by this definition and with those who quit smoking. Prior research (Nollen et al., 2006) targeting this cohort identified several baseline predictors of cessation, including being man, being older, higher income, lower cotinine levels, and higher body mass index (BMI). We examine these same potential predictors to determine which factors specifically predict cessation versus reduction and reduction versus no reduction. Doing so may provide insights about the subgroup of smokers who did not quit smoking but did reduce their smoking among this sample. We hypothesize that, although there will be some variables demonstrating a linear trend from quitting to reducing to not reducing, such as baseline level of cigarette consumption, there will be factors unique to reducers. For example, reducers may anticipate or experience specific consequences of smoking that distinguish them from quitters and from nonreducers.

Methods

The parent study was a placebo-controlled randomized trial of 755 Black light smokers (≤ 10 cpd) enrolled at a community health center over a period of 16 months. A 2×2 factorial design was used, and participants were randomly assigned to

receive placebo or active nicotine gum and health education (HE) or motivational interviewing (MI). Recruitment methods, study methodology, and outcomes of the trial are detailed elsewhere (Ahluwalia et al., 2006). The trial procedures were approved and monitored by the University of Kansas Medical Center's Human Subjects Committee.

Eligible individuals self-identified as either "African American or Black" were at least 18 years of age, smoked 10 or fewer cpd for at least 6 months prior to enrollment, smoked on at least 25 of the last 30 days, were interested in quitting in the next 2 weeks, spoke English, and had a stable home address and working telephone. Participants were randomized between March 2003 and June 2004. The last 6-month follow-up session was completed in January 2005. After excluding participants with missing data ($n = 92$) and those lost to follow-up at 6 months ($n = 122$), the current investigation included 541 of the original 755 participants. The goal of the intervention was cessation; thus, reduction was not a targeted outcome or necessarily deemed a successful outcome.

Measures

All questionnaire items were read to, or along with, the participants by a trained research assistant. Baseline measures assessed demographic information (e.g., age, gender, education) and smoking behaviors (e.g., cigarettes smoked per day, years of smoking). Nicotine dependence was assessed using a single question from the Fagerström Nicotine Dependence Scale; specifically, we asked whether the participant smoked a cigarette within 30 min of waking (Fagerström & Schneider, 1989). We also included the Nicotine Dependence Syndrome Scale (NDSS; Shiffman, Waters, & Hickcox, 2004). Additional variables were assessed to document health risks (e.g., BMI, days of alcohol use in the past 30 days) and psychosocial variables (see Table 1).

Psychosocial measures included single items designed to assess motivation and confidence to quit smoking on a 10-point continuum ranging from *not at all motivated/confident* to *extremely motivated/confident* (Resnicow, Soler, Braithwaite, Ahluwalia, & Butler, 2000; Rollnick, Butler, & Scott, 1997). The four-item version of the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983) was used to assess perceived stress, and the 10-item Center for Epidemiological Studies Depression Scale (Radloff, 1977) was used to assess depressive symptoms. The Treatment Self-Regulation Questionnaire (Ryan & Connell, 1989) was used to assess autonomous regulation, controlled regulation, and amotivation. Self-efficacy related to internal and external stimuli was assessed using the 12-item Self-Efficacy Questionnaire (Etter, Bergman, Humair, & Perneger, 2000). A brief Smoking Consequences Questionnaire-Adult (Jeffries et al., 2004) was used to assess smoking-related expectancies. The scale includes the following subscales: negative affect regulation (four items), stimulation/state enhancement (three items), health risk concern (four items), taste/sensorimotor enhancement (three items), social facilitation (four items), weight control (three items), negative physical feelings (three items), boredom reduction (three items), and negative social impression (three items). Each item is scored between 0 and 10 points; thus, the subscale scores range from 0 to 30 or 40, depending on the number of items included in each subscale.

Change in smoking—Reduction, cessation, and no reduction

In order to evaluate baseline predictors of reduction versus no reduction and cessation, a three-category smoking status outcome variable was derived from the Week 26 questionnaire. That is, "reducers" included participants who reduced their smoking by at least 50% cpd from baseline to Week 26 but did not quit smoking. This level of reduction has been used previously in research and has been linked to reduced health risks (e.g., Bolliger et al., 2002). "Nonreducers" included participants who increased or did not reduce their smoking by at least 50% from baseline to Week 26 and "quitters" included participants with salivary cotinine-verified self-reported cessation at Week 26 (i.e., salivary cotinine of ≤ 20 ng/ml; Society for Research on Nicotine and Tobacco Subcommittee on Biochemical Verification, 2002). Those who self-reported abstinence at follow-up but were not cotinine verified were excluded from these analyses. Further, only those participants with complete data at baseline and Week 26 were included in the analyses.

Data analysis and statistical consideration

Baseline demographic, smoking-related, and psychosocial variables were summarized using descriptive statistics. Results were expressed as mean (*SD*) for continuous variables and frequency (percentage) for categorical variables. Analysis of variance for continuous variables and chi-squared tests for categorical variables were used to compare the baseline characteristics across groups of participants who engaged in smoking reduction, cessation, and no reduction. We also conducted *t* tests and chi-square tests comparing the aforementioned variables between reducers and nonreducers and between reducers and quitters.

The association between baseline characteristics and smoking status change was examined using multinomial logistic regression, with reduction being the reference group for the model, no reduction being coded as 1, and cessation being coded as 2. Gender, age, and treatment condition (i.e., active or placebo nicotine gum and HE or MI counseling) were entered in Step 1. In Step 2, backwards stepwise conditional entry was used, entering all factors with $p < .10$ and retaining only those variables that contributed to the model at a significance level of $p < .05$.

Results

Of the 541 Black light smokers included in these analyses, 365 (67.7%) were woman with an average age of 45.7 years ($SD = 10.5$; see Table 1). The majority (56.5%) had a household income of less than \$1,800 per month. Average smoking level was 7.5 cpd ($SD = 2.4$) with 80.6% smoking menthol cigarettes.

Overall, 41.0% ($n = 221$) reduced their smoking, 17.6% ($n = 95$) quit, and 41.4% ($n = 223$) did not reduce their smoking. Among reducers, the average reduction was 5.83 cpd ($SD = 2.06$).

Bivariate analyses

Bivariate analyses comparing nonreducers, reducers, and quitters are shown in Table 1. Direct comparisons of reducers with nonreducers and reducers with quitters are discussed below.

Table 1. Association of baseline demographic, smoking-related, and psychosocial variables to smoking cessation, reduction, and nonreduction at Week 26 among Black light smokers

Variable	All (N = 539)	No reduction (N = 223)	Reduction (N = 221)	Cessation (N = 95)	p
	N (%) or M (SD)	N (%) or M (SD)	N (%) or M (SD)	N (%) or M (SD)	
Treatment variables					
Nicotine gum (%)	277 (51.4)	118 (52.9)	106 (48.0)	53 (55.8)	.37
MI (%)	273 (50.6)	126 (56.5)	115 (52.0)	32 (33.7)	.001
Demographic variables					
Age in years (SD)	45.7 (10.5)	44.8 (10.6)	45.8 (10.1)	47.6 (11.0)	.10
Female (%)	365 (67.7)	165 (74.0)	149 (67.4)	51 (53.7)	.002
Education <HS (%)	87 (16.1)	36 (16.1)	37 (16.7)	14 (14.7)	.91
Income <\$1,800/month (%)	298 (56.5)	131 (59.5)	126 (58.6)	41 (44.6)	.04
Married/living with partner (%)	198 (36.8)	77 (34.7)	79 (35.7)	42 (44.2)	.25
Baseline smoking-related variables					
cpd in past 30 days (SD)	7.5 (2.4)	7.5 (2.3)	7.9 (2.2)	6.8 (2.7)	.001
Cigarette within 30 min of waking (%)	362 (67.3)	177 (79.4)	135 (61.4)	50 (52.6)	<.001
Nicotine dependence (SD)	-1.0 (1.00)	-0.9 (0.9)	-1.1 (1.0)	-1.0 (1.0)	.07
Cotinine level, ng/ml (SD)	243.2 (158.3)	279.6 (156.2)	244.2 (159.5)	155.7 (124.0)	<.001
Years smoked (SD)	24.9 (11.8)	24.1 (11.8)	25.1 (11.7)	26.3 (12.4)	.28
Smoke menthol cigarettes (%)	433 (80.6)	187 (83.9)	177 (80.8)	69 (72.6)	.07
Other smokers in the home (%)	207 (38.4)	81 (36.3)	96 (43.4)	30 (31.6)	.09
24-hr quit attempts past year (SD)	3.2 (6.5)	2.9 (7.8)	3.3 (5.0)	3.4 (6.5)	.81
Psychosocial variables (SD)					
Days used alcohol past month	4.9 (7.6)	5.3 (8.0)	4.9 (7.6)	3.9 (6.8)	.31
BMI	30.9 (8.3)	30.5 (8.3)	30.3 (7.9)	33.1 (8.9)	.01
Motivation	9.1 (1.6)	9.2 (1.6)	9.0 (1.7)	9.1 (1.6)	.66
Confidence	7.0 (2.6)	6.7 (2.6)	7.1 (2.6)	7.6 (2.3)	.02
Perceived stress	8.7 (2.1)	8.5 (2.1)	9.0 (2.1)	8.6 (2.1)	.03
Depressive symptoms	3.5 (2.6)	3.6 (2.5)	3.5 (2.6)	3.3 (2.5)	.55
Autonomous support	98.2 (11.2)	97.6 (12.2)	98.0 (11.9)	100.0 (5.4)	.22
Self-efficacy—internal	15.4 (5.4)	15.1 (5.6)	15.7 (5.3)	15.7 (5.2)	.51
Self-efficacy—external	14.0 (6.2)	13.6 (6.1)	14.2 (6.4)	14.5 (6.1)	.47
Autonomous regulation	39.9 (3.3)	40.1 (3.1)	39.5 (3.7)	40.1 (2.8)	.20
Controlled regulation	21.0 (10.0)	21.3 (10.1)	20.5 (9.6)	21.4 (10.5)	.59
Amotivation	6.1 (3.7)	6.3 (3.7)	5.8 (3.5)	5.9 (3.9)	.28
SCQ—negative affect regulation	25.2 (11.3)	26.0 (11.3)	24.4 (11.6)	25.2 (10.6)	.29
SCQ—stimulation/state enhancement	9.3 (8.4)	9.8 (8.4)	8.4 (8.4)	10.1 (8.5)	.14
SCQ—health risk	38.6 (3.8)	38.7 (3.7)	38.3 (4.1)	39.0 (3.1)	.31
SCQ—taste/sensorimotor enhancement	17.3 (9.2)	17.3 (9.4)	17.6 (9.0)	16.7 (9.2)	.77
SCQ—social facilitation	10.2 (9.5)	10.0 (9.2)	9.7 (9.7)	11.5 (9.8)	.32
SCQ—weight control	11.6 (10.3)	12.0 (10.4)	11.0 (10.2)	11.8 (10.1)	.58
SCQ—negative physical feelings	8.9 (8.2)	9.2 (8.2)	8.7 (8.6)	8.7 (7.4)	.77
SCQ—boredom reduction	16.1 (9.1)	16.3 (9.2)	15.7 (8.9)	16.4 (9.4)	.68
SCQ—negative social impression	13.9 (9.0)	14.7 (9.1)	12.3 (8.8)	15.4 (8.9)	.004

Note. BMI = body mass index; cpd = cigarettes per day; MI = motivational interviewing; SCQ = Smoking Consequences Questionnaire; HS = High School.

No reduction versus reduction

Bivariate analyses comparing reducers with nonreducers indicated that nonreducers were more likely to smoke within the first 30 min of waking ($p < .001$), had higher nicotine dependence as per the NDSS ($p = .02$), had higher baseline cotinine levels ($p = .02$), and had higher SCQ scores on negative social impression ($p = .005$).

($p = .002$), were less likely to be woman ($p = .02$), had higher income levels ($p = .02$), smoked less cpd at baseline ($p < .001$), had lower cotinine levels ($p < .001$), were less likely to have other smokers in the home ($p = .03$), had higher average BMI ($p = .006$), and had higher SCQ scores on negative social impression ($p = .005$).

Cessation versus reduction

Bivariate analyses comparing reducers with quitters indicated that quitters were less likely to be in the MI treatment condition

Multivariate analyses

Multinomial logistic regression was used to examine the association between baseline characteristics and smoking status

change. The final multinomial logistic model is detailed in Table 2. Comparing the final model with the Step 1 model that includes treatment condition (pharmacotherapy and MI), gender, and age, the likelihood ratio chi-square test statistics were 151.3 with 16 *df* ($p < .001$), suggesting significant improvement of goodness of fit.

No reduction versus reduction

In comparison with reducers, nonreducers were more likely to smoke their first cigarette within 30 min of waking (odds ratio [OR] = 2.4, 95% CI = 1.47–3.93, $p = .001$), have lower baseline smoking levels (OR = 0.84, 95% CI = 0.77–0.93, $p = .001$), have higher baseline cotinine levels (OR = 1.002, 95% CI = 1.000–1.003, $p = .02$), report less stress (OR = 0.86, 95% CI = 0.78–0.95, $p = .004$), and endorse higher SCQ scores on negative social impression (OR = 1.04, 95% CI = 1.01–1.06, $p = .004$), after controlling for treatment arm, gender, and age.

Cessation versus reduction

Significant predictors of smoking cessation versus reduction included enrollment in the HE treatment condition (OR = 0.39, 95% CI = 0.22–0.68, $p = .001$), older age (OR = 1.98, 95% CI = 1.13–3.48, $p = .02$), male gender (OR = 1.03, 95% CI = 1.00–1.06, $p = .03$), lower baseline smoking level (cpd; OR = 0.85, 95% CI = 0.75–0.95, $p = .006$), higher nicotine dependence (OR = 1.47, 95% CI = 1.09–1.98, $p = .006$), lower baseline cotinine levels (OR = 0.996, 95% CI = 0.994–0.998, $p < .001$), higher BMI (OR = 1.05, 95% CI = 1.01–1.08, $p = .007$), lower levels of stress at baseline (OR = 0.82, 95% CI = 0.72–0.95, $p = .007$), and higher SCQ scores on negative social impression (OR = 1.05, 95% CI = 1.01–1.08, $p = .006$).

Discussion

To our knowledge, this is the first study to examine differences among smokers enrolled in a cessation trial who reduced their level of smoking in comparison with those who quit smoking and those who did not reduce their smoking. Moreover, this research focuses on Black light smokers, a priority population given the higher rates of smoking, and their increased risk for smoking-related health problems. Thus, this paper contributes novel information about a critical public health issue.

First, in regard to smoking-related characteristics, we found that having lower baseline cotinine levels and lower baseline smoking rates were associated with being more likely to quit smoking than to reduce smoking, which is reasonable and in line with the findings of Nollen et al. (2006). However, higher nicotine dependence was associated with being quitter rather than a reducer, which seems contradictory and deserves further examination. Having higher baseline smoking levels predicted reduction in smoking rather than no reduction. One potential reason for this finding is that reduction may be easier to achieve if an individual smokes more at baseline versus if an individual smokes less. Despite reducers having higher baseline levels of smoking than nonreducers, they also had lower nicotine dependence and lower baseline cotinine levels than nonreducers. The reason for these somewhat contradictory findings is unclear. Perhaps the lower cotinine levels indicated depth of inhalation or use of menthol cigarettes among nonreducers, which have been shown to have an

association with higher cotinine levels (Mustonen, Spencer, Hoskinson, Sachs, & Garvey, 2005). Although using menthol cigarettes did not significantly contribute to the multivariate model, more nonreducers used menthol cigarettes than did reducers, as indicated by the bivariate analyses. One review (Ahijevych & Garrett, 2004) indicated that menthol increases drug absorption and that smoking menthol cigarettes increases carbon monoxide levels at a greater rate than non-menthol cigarettes. Moreover, although there are conflicting reports on the effects of menthol on smoking topography, menthol may increase depth of inhalation, puff volume, and puff frequency, which has implications for cotinine levels and addiction (Ahijevych, Gillespie, Demirci, & Jagadeesh, 1996; Djordjevic et al., 2002). In addition, menthol smokers smoke their first cigarette earlier in the day than non-menthol smokers, indicating greater nicotine dependence (Ahijevych & Garrett). The current findings also suggest that nonreducers, despite smoking fewer cpd at baseline, may be more physiologically dependent (Chen, Blevins-Primeau, Dellinger, Muscat, & Lazarus, 2007).

In terms of psychosocial variables, two major factors were significant predictors of cessation and lack of reduction in comparison with reduction—perceived stress and expected negative social impressions of smoking. In terms of stress, lower levels of stress were related to greater likelihood of not reducing smoking or quitting in comparison with reducing smoking, which is difficult to interpret. Prior work demonstrating that smoking cessation was associated with less negative affect (Ferguson et al., 2003; K. J. Harris et al., 2004) coupled with literature documenting distress tolerance as a predictor of ability to refrain from smoking (Brown, Lejuez, Kahler, & Strong, 2002) supports the finding that less perceived stress was associated with successful cessation. However, lower baseline stress predicting no reduction versus reduction seems counterintuitive. Negative social impressions of smoking also did not demonstrate the anticipated trajectory; rather, those who were concerned about smoking-related negative social impressions were more likely to quit smoking or not reduce their smoking rather than reduce their smoking. Prior work has found that more negative expectancies and fewer positive expectancies related to smoking are related to greater readiness to quit smoking (Pulvers et al., 2004). Thus, it is reasonable that greater expected negative social impressions of smoking predicting cessation versus reduction. Again, the fact that nonreducers had greater concern about negative social impressions in comparison with reducers is counterintuitive. Overall, how anticipated consequences of smoking and experience of stress may differentially predict reduction and cessation should be further examined.

In addition, higher BMI was associated with cessation versus reduction. Similarly, Nollen et al. (2006) found that higher baseline BMI was related to quitting smoking. Perhaps concern about weight gain as a result of quitting smoking is less significant among those who have higher BMI. Weight gain concern has been found to predict continued smoking versus cessation (Meyers et al., 1997) and attrition from smoking programs (Copeland, Martin, Geiselman, Rash, & Kendzor, 2006). Further research is needed to understand the dynamics of BMI, weight concern, and smoking trajectories.

Another interesting finding was that those assigned to the MI arm of the randomized clinical trial were more likely to reduce their smoking rather than quit, but no relationship was

Table 2. Multinomial logistic regression model for predicting Week 26 no reduction and cessation versus smoking reduction (excluding quitters) among Black light smokers

Variable	No reduction			Cessation		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Psychosocial intervention						
HE	Ref	—	—	Ref	—	—
MI	1.31	0.88–2.00	.19	0.39	0.22–0.68	.001
Pharmacotherapy intervention						
Placebo	Ref	—	—	Ref	—	—
Drug	1.26	0.84–1.89	.26	1.33	0.78–2.33	.29
Demographic variables						
Age (years)	0.99	0.97–1.01	.42	1.98	1.13–3.48	.02
Gender						
Male	Ref	—	—	Ref	—	—
Female	1.19	0.75–1.85	.46	0.97	0.94–1.00	.03
Smoking and health variables						
Cigarettes within 30 min of waking						
No	Ref	—	—	Ref	—	—
Yes	2.40	1.47–3.93	.001	0.86	0.47–1.58	.62
cpd	0.84	0.77–0.93	.001	0.85	0.75–0.95	.006
Nicotine dependence	1.16	0.93–1.45	.20	1.47	1.09–1.98	.01
Cotinine	1.002	1.000–1.003	.02	0.996	0.994–0.998	<.001
BMI	1.01	0.99–1.04	.36	1.05	1.01–1.08	.007
Confidence to quit	0.94	0.87–1.02	.15	1.07	0.96–1.21	.23
Perceived stress	0.86	0.78–0.95	.004	0.82	0.72–0.95	.007
SCQ—negative social impression	1.04	1.01–1.06	.003	1.05	1.01–1.08	.006

Note. BMI = body mass index; cpd = cigarettes per day; HE = health education; MI = motivational interviewing; OR = odds ratio; SCQ = Smoking Consequences Questionnaire.

found between reducers and nonreducers. It is unclear why this difference existed between reducers and quitters. The parent study (Ahluwalia et al., 2006) found that HE was more effective in achieving cessation than MI, counter to the hypotheses of the study. One primary reason offered was that participants enrolled in the parent trial were already highly motivated to quit (scored 9/10). The early generation of MI provided in this trial was designed to increase intrinsic motivation but did little to provide problem solving guidance toward cessation. Therefore, the MI delivered may not have been sufficient to assist participants with the behavioral actions needed to achieve cessation. MI now encourages the provision of a behavioral action plan and the provision of direct assistance once motivation is achieved (Miller & Rose, 2009). Thus, it may also be that HE is more effective for providing people who are motivated to quit with practical suggestions to aid in cessation.

In addition, our results regarding sociodemographics are consistent with some prior research. For example, women were more likely to reduce than to quit, which is in line with previous research documenting more successful cessation among men (Bjornson et al., 1995; Wetter et al., 1999). However, a significant relationship was not found when reducers were compared with nonreducers. This is in contrast to other research that found that men were more likely to reduce their smoking than women (Joseph et al., 2005). Among our sample of Black light smokers, it appears that women were less successful at quitting smoking but not at reducing their smoking level. Also, being

older was associated with a greater likelihood of quitting smoking rather than reducing smoking level.

Limitations

Some important limitations to this study do exist. First, this sample of Blacks smoking an average of 10 cpd or less was drawn from a Midwest inner-city clinic. Thus, these findings may not generalize to all Black light smokers. Second, although biochemical verification was used to validate smoking status at baseline and follow-up, assessments of cpd smoked at baseline and Week 26 were based on self-report. This is an important issue because we defined a “reducer” as anyone who reduced their smoking by at least 50%. Thus, we cannot be certain that participants accurately reported their cigarettes smoked per day. Additionally, we excluded participants who reported cessation but were not cotinine verified. Thus, we cannot be certain about the outcome of those that we excluded. Related to this issue of cotinine verification, we did not assess cotinine levels at follow-up among participants who did not report cessation. Future research should include assessments of cotinine among all participants. Furthermore, the relatively large sample size and the comparisons among three groups in this study may have caused some spurious findings. Additionally, it is unclear why characteristics that were significant factors in the bivariate analyses did not contribute significantly to the multivariate model. It may be that some factors were related to one another, and thus, accounting for one variable in the model diminished the significance of another. Ultimately, this study is an initial step in understanding the unique nature of those who

reduce their smoking. Future research may build from these findings.

Conclusions

The present study identified factors differentiating smoking reduction versus cessation and reduction versus no reduction. The impact of original smoking level and cotinine level deserve further examination, as our results indicate that they are not synonymous in terms of predicting reduction versus cessation versus no reduction. Expectancies, motivation, and confidence also differentially predict these different smoking behavior change patterns. Thus, attending to psychosocial variables is important in helping people reach their smoking goals whether they include reducing their smoking or quitting.

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Declaration of Interests

None declared.

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