Published in final edited form as:

Patient Educ Couns. 2020 February ; 103(2): 350–358. doi:10.1016/j.pec.2019.08.023.

Race Moderates the Effects of Motivational Interviewing on Smoking Cessation Induction

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Delwyn Catley had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors contributed to and have approved the final manuscript.

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Conflict of interest statement

Catley, Goggin, and Resnicow received fees for providing motivational interviewing training. Catley received non-financial support from Pfizer.

Declaration of Interest

The following information may be considered in determining potential conflicts of interest. This manuscript is based on a secondary analysis of Catley, Goggin, Harris, Richter, Williams, Patten, Resnicow, Ellerbeck, Bradley-Ewing, Lee, Moreno and Grobe [1] ([ClinicalTrials.gov](https://clinicaltrials.gov) October 2010), which was supported by National Cancer Institute Grants R01 CA133068. Pfizer provided varenicline (Chantix®) through Investigator-Initiated Research Support (No. WS759405). Catley, Goggin, and Resnicow received fees for providing motivational interviewing training. Catley received non-financial support from Pfizer. The content is solely the responsibility of the authors and does not necessarily represent the official views of NIH or Pfizer.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property. We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript. We understand that the Corresponding Author, Delwyn Catley, is the sole contact for the Editorial process. He is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

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Abstract

Objective: Health disparities necessitate exploration of how race moderates response to smoking cessation treatment. Data from a randomized clinical trial of Motivational Interviewing (MI) for smoking cessation induction were used to explore differential treatment response between African American (AA) vs Non-Black (NB) smokers.

Methods: Adult tobacco smokers (138 AA vs 66 NB) with low desire to quit were randomly assigned to four sessions of MI or health education (HE). Outcomes (e.g., quit attempts) were assessed 3- and 6-months.

Results: There was evidence of a Race by Treatment interaction such that MI was less effective than HE in AA smokers. Mean Cohen's d for the interaction effect was -0.32 (95% CI $[-0.44, -0.20]$). However, the race interaction could be accounted for by controlling for baseline relationship status and communication preference (wants directive approach).

Conclusions: MI may be less effective for smoking cessation induction in AA vs NB smokers when compared to another active and more directive therapy. The differential response between races may be explained by psychosocial variables.

Practice implications: MI may not be an ideal choice for all African American smokers. Patients' relationship status and preference for a directive counseling approach might explain disparities in response to MI treatment.

Keywords

Motivational Interviewing; smoking cessation; race moderation; African American

1. Introduction

Understanding how race is associated with health outcomes is crucial to reducing disparities. This is particularly important in tobacco related behaviors among African Americans (AA) who incur a greater burden from tobacco use than White Americans [1]. Disparities between AA and Whites are not only evident in the health consequences of smoking, but also in cessation outcomes [2, 3]. While a few studies that have directly compared cessation in AAs versus Whites suggest that AA may respond more poorly to interventions [4–6], most studies supporting the efficacy of smoking cessation treatments in AA have only examined treatment efficacy within an AA sample [7–9]. Understanding racial disparities in smoking cessation interventions requires exploration of differential response to treatments across groups within the same study.

One treatment recommended for smoking cessation is Motivational Interviewing (MI), which has empirical support for its efficacy [10, 11] and is recommended by clinical practice guidelines [12]. Although studies have examined whether race moderates response to MI for the treatment of addiction, smoking cessation, and other health-behaviors behaviors [13], there are conflicting rationales and findings.

On the one side, MI may be expected to have greater efficacy in minority populations because of its client-centered focus, which may help transcend culture because it allows individuals to explore their own values and identify their own solutions [14]. There is some empirical support for the idea that MI may be distinctly beneficial in minorities in general [13, 15, 16]. With respect to AA participants specifically, MI's emphasis on collaboration, open communication, and a non-confrontational style may be particularly helpful in avoiding treatment barriers due to racism, power-differential, indirect communication, and mistrust [17]. There is some evidence that MI shows promise as a therapy approach in AA participants across a variety of health related outcomes [9, 18–20].

On the other side, there is evidence that the advantageous interaction between minority status and MI may not apply to AA participants [13]. Along with several null findings within this population [21, 22], some studies using only AA participants have shown other active interventions, such as “counseling as usual” [23] and “health education” [24], may outperform MI. A few studies have examined differential responses to MI of AA versus non-AA participants. One study reported an interaction such that MI for weight loss was less effective in AA vs White women [25] and another study found that AA had poorer perceptions of MI relative to White participants [26]. The variation in response to MI may be related to findings that AA participants have a greater preference for a clinician-directed approach [27] and perceive MI as too patient-centered [28].

To address these conflicting findings regarding the moderating role of AA status, a secondary analysis was conducted of data from a randomized clinical trial on the efficacy of MI at inducing quit attempts in smokers low in motivation to quit [29]. The current report focusses on searching for differential cessation related outcomes between AA versus Non-Black (NB) smokers assigned to either of the two active treatments: MI or health education (HE). Since race alone is not sufficient as a causative moderating variable [30], elucidating pertinent differences that may explain race moderation is essential to refining or tailoring interventions so they are more effective for all smokers [31]. Thus, follow-up analyses attempted to un-pack race effects by searching for treatment and participant characteristics that might account for any observed Race by Treatment interactions.

2. Method

2.1 Design, Participants, & Procedure

Study details for this randomized clinical trial of MI for smoking cessation induction in smokers low in desire to quit have been presented previously [29, 32]. Written informed consent was obtained from all participants. This report only includes the 204 smokers randomly assigned to one of the two active intervention arms of MI versus HE, each consisting of 4 treatment sessions, either in-person or phone, over 18 weeks.¹ Participants

were instructed that the study was examining healthcare communication about smoking and that a desire to quit was not a study requirement. Follow-up assessments were completed at 3 and 6 months.

2.2 Interventions

2.2.1 Motivational Interviewing.—The MI sessions focused on establishing an empathic, collaborative, and autonomy-supportive environment, with a focus on exploring the client's ambivalence about smoking. Tools included open-ended questions, affirmations, and reflections intended to increase “change talk” in support of cessation while avoiding confrontation and diminishing “sustain talk”, with a focus on the discrepancy between the client's health goals versus current smoking behaviors. Information was provided when requested, or judged necessary.

2.2.2 Health Education.—The HE intervention served as an intensity-matched active therapy comparison and incorporated the “5 R's” (i.e., relevant risks of smoking, rewards of cessation, roadblocks to quitting, and repetition) based on the U.S. Clinical Practice Guideline [12]. The HE sessions were scripted to avoid therapy contamination and ensure that HE was distinct from MI. In addition to assessment of smoking history, therapy sessions included education about the risks of smoking, benefits of quitting, and strategies for cessation. Interventionists were trained to maintain an educational focus using an “advice-oriented” style of counseling.

2.2.3 Therapists.—Three female (2 White, 1 African American) master's level counselors with training and experience in MI delivered both interventions to avoid confounding counselor and treatment effects. These interventionists received instruction and supervision until fidelity criteria were met (96 hours for MI and 28.5 for HE).

2.3 Measures

2.3.1 Race & Ethnicity.—Assessment of race and ethnicity consisted of two survey items. The first asked whether the participant identified as Hispanic or Latino (yes/no) and the second asked for indications of race/ethnicity with options of American Indian / Alaska Native, Asian, Black or African American, Native Hawaiian / Other Pacific Islander, White, Other. Participants were allowed to endorse more than one response. Participants who endorsed “Black” or “African American” alone or in combination with other responses were classified as AA in this study ($n=138$) and Non-Black (NB) otherwise ($n=66$).ⁱⁱ

2.3.2 Treatment Characteristics.—Therapeutic alliance was assessed at both follow-ups using the Working Alliance Inventory - 12 item total [33]. Counselor support for the participant's autonomy in choosing to quit smoking was assessed using the Health Care

ⁱ.See Supplemental Materials for additional details.

ⁱⁱThe term Non-Black described the group of participants who did not identify as “Black or African American”, with primary comparisons being relative to those who had any identification as “Black or African American. Only eleven participants (~ 5%) endorsed other race-ethnicity categories besides AA only or White only, four of whom also endorsed Hispanic. Sample size considerations led us to take an inclusive approach toward coding racial status for the primary analyses, with sensitivity analyses to assess the robustness using an alternative definition of racial groups that excluded these 11 participants. See Supplemental Materials for additional details.

Climate Questionnaire [34]. At the final follow-up, participants gave program satisfaction ratings ranging from 1 to 4, with higher ratings indicating greater satisfaction. To assess counselor fidelity to MI, 10% of therapy sessions (37 HE, 38 MI) were randomly selected for scoring using the MI Treatment Integrity Code (MITI) by expert coders blind to treatment condition [35].

2.3.3 Participant Characteristics.—Baseline measures included a range of sociodemographic and smoking history variables. Socioeconomic status consisted of an aggregate of 3 items: income, education, and employment status. Tobacco dependence was assessed with the Severity of Dependence Scale [36] and the Heaviness of Smoking Index [37]. Other characteristics included depressive symptoms -- CES-D [38], Perceived Stress [39], and alcohol use -- AUDIT-C [40]. Communication Preference was assessed by a single item: “When it comes to my smoking, I want an expert to tell me what to do.” Options (1–5) included: 1=Strongly Agree... 3=Neither... 5=Strongly Disagree. These were reverse-scaled so that higher values indicated preference for a more directive approach [41]. Several of the outcome variables were also collected at baseline (e.g., Decisional Balance).

2.3.4 Outcomes.—Primary smoking outcomes included any quit attempt made over 6-month follow-up, self-report abstinence at 6 months, and any cessation medication use (each coded yes/no). Additional cessation related outcomes included aggregate means across both follow-ups for: motivation & confidence to quit [42], Decisional Balance, calculated as the Pros – Cons of Smoking (10 items each), which assesses attitude toward tobacco use [43, 44]; Smoking Temptations (9 item), with reverse scaling such that higher scores indicate reduced temptations to smoke [45]; and autonomous motivation to quit smoking using the Relative Autonomy Index (RAI), calculated as the difference between autonomous, internally motivated reasons and controlled, externally motivated reasons (6 items each). Higher scores indicated greater balance toward being autonomously motivated to stop (or continue not) smoking [46, 47]. Finally, Smoking Risk Perception consisted of 3 items assessing perceptions how beneficial stopping smoking is to one’s overall health with scores ranging from 3 to 21. Higher values indicated perception of greater risk of smoking and gains from cessation [48].ⁱ

2.4 Data Analysis

The first analyses focused on qualitative interactions which might indicate differential response based on a participant’s race [49]. Given the increased likelihood of both false alarms (multiplicity) and misses (low power) in exploratory interaction analyses [50], the focus was on the consistency of moderation effect sizes across primary (i.e., quit attempts) and secondary outcomes (e.g., motivation and confidence to quit) rather than statistical significance. A variety of techniques with common metrics to facilitate examination across continuous and binary outcomes were used [51]. To facilitate comparison with existing reviews of MI, standardized mean differences (Cohen’s *d*) were calculated for MI-HE for each race, with the difference between these effect sizes indicating a magnitude of the interaction, or separation, between AA and NB (*d'*). A generalized estimating equations procedure (GEE, SPSS V12) was used to test interaction effects as this approach accommodates missing data and may provide a more robust method regarding assumptions

about the correlation structure [52]. Based on GEE results, differential response due to race was also assessed using simple slopes analyses [53] where the difference in slopes for AA vs NB represents an alternative metric for the size of the interaction. Outcomes were initially analyzed unadjusted for covariates [54]. Additional sensitivity analyses assessed the robustness of moderation results across various approaches (e.g., controlling for baseline motivation, alternative coding of race comparing those endorsing non-Hispanic Black only versus non-Hispanic White only).ⁱⁱ

Follow-up analyses focused on identifying a set of explanatory variables that might account for the moderating role of race. First, treatment and participant baseline characteristics were assessed for race differences. Subsequently, each outcome was reanalyzed for Race by Treatment interactions controlling for each characteristic and the Characteristic by Treatment interaction. The interaction term was included because it is insufficient to include only the simple main effects when attempting to account for an interaction [55]. Because treatment fidelity was only assessed on a subset of sessions it was not feasible to control for differences in MITI therapy coding in the analyses of Race by Treatment interactions so analysis for this variable was limited to testing for fidelity differences related to race. Finally, the set of variables that appeared to demonstrate explanatory value were included in a GEE regression analysis to see how much of the Race by Treatment interaction could be accounted for by these variables and their interactions with Treatment.

3. Results

3.1 Race by Treatment Interactions on Cessation Outcomes

To examine the size and direction of Race by Treatment interactions, the standardized mean MI-HE differences for AA vs NB smokers were plotted across 9 outcome variables (Figure 1 - left panel) with values over 0 indicating MI performed better than HE. Visual inspection reveals a consistent pattern such that AA responded better with HE and NB responded better with MI. Inspection of unadjusted differences in treatment slopes (HI vs MI) for AA vs NB reveals a similar pattern of interaction (Table 1 - raw or unadjusted rows). Interaction effect sizes (d') ranged from -0.1 to -0.61 with an average of -0.32 (95% CI [-0.44, -0.20]). Noteworthy were two secondary outcomes with the largest effect sizes: Autonomous Motivation ($d' = 0.61$, $p=0.03$) and Smoking Risk Perception ($d'=-0.58$, $p=0.05$).

Focusing on the primary outcome of quit attempts, the same pattern is observed (Figure 2). After controlling for baseline covariates, the MI-HE difference for AA was $d=-0.33$ (95% CI [-0.67, 0.02]), while the MI-HE difference for NB was $d=+0.20$ (95% CI [-0.31, +0.71]). This yielded a Race by Treatment interaction effect of $d'=0.53$ ($p=0.099$) and a standardized difference in slopes of $B=-1.128$ (95% CI [-2.5, 0.2]). In terms of relative risks with HE as the reference, AA had an $RR=0.77$ and NB had an $RR=1.16$. In terms of race, we see evidence of fewer quit attempts in AA vs NB under the MI treatment ($d= -0.37$, $p=0.09$) but not with HE treatment ($d= +0.16$, $p=0.47$).

Follow-up comparisons within only the AA group revealed that HE was better than MI on 3 of the outcomes (Motivation to Quit, $p=0.006$; Autonomous Motivation, $p=0.01$; and Smoking Risk Perception, $p=0.02$). This same pattern in AA was weakly demonstrated for 4

other outcomes (Quit Attempts, Abstinence, Cessation Medication Use, and Decisional Balance, all $p < 0.10$). In contrast, the pattern for NB is mixed with some outcomes suggesting MI was better than HE. Results from sensitivity analyses supported the robustness of these findings across varying analytic conditions (e.g., using alternative coding for race).¹ Thus, subsequent analyses were conducted to explore what variables might explain the Race by Treatment interaction.

3.2 Race Differences in Treatment Characteristics

Overall, examination of treatment characteristics suggested that MI and HE interventions were similarly delivered across AA vs NB.¹ For example, Working Alliance and Autonomy Support was similar across all Race by Treatment groups (all $p > 0.25$). However, there were notable race differences on total therapy contact time, concordance between race of therapist and participant, and program satisfaction. Reanalysis of the Race by Treatment interaction across the range of outcomes controlling for each of these treatment characteristics and its interaction failed to alter any of the original findings. Thus, none of the treatment characteristics demonstrated potential in explaining the primary findings.

Only a subset of sessions were coded for fidelity to MI practice with 24 NB (13 MI, 11 HE) and 51 AA (25 MI, 26 HE) smokers' sessions scored on the MITI. This precluded the ability to control for differences in therapy coding in the analyses of Race by Treatment interactions. Nevertheless, examination of MITI scores confirmed that MI and HE were distinct, and that MI was delivered with high integrity, for both AA and NB participants. Treatment effect sizes ranged from $d = 0.9$ to 1.9 with a mean of 1.34 ($SD = 0.25$) across the MITI measures ($p < 0.001$ for all treatment main effects). Thus, there was a lack of evidence that the original results could be accounted for by differential treatment delivery between AA vs NB.

3.3 Race Differences in Participant Characteristics

Individual differences at baseline between AA vs NB are presented in Table 2. Of the 25 participant characteristics, 18 demonstrated a baseline difference of $d > 0.2$. AA compared to NB had older age, were less likely to be in a relationship, lower socioeconomic status, started smoking at a later age, and were less likely to have used cessation medications (all $p < 0.01$). There were also differences in history of quit attempts (recent and lifetime) and Autonomous Motivation Balance ($p < 0.05$). Several other variables demonstrated baseline race differences where $d > 0.2$ (e.g., Severity of Dependence, Communication Preference). Interaction analyses were re-run pitting each Participant Characteristic by Treatment interaction against the Race by Treatment interaction. Of the 25 baseline variables, only relationship status and Communication Preference appeared to demonstrate potential in being able to explain the Race by Treatment interactions (Table 2), with each demonstrating a 40% or more reduction in interaction effect size (d').

3.4 Accounting for Race Moderation

The Race by Treatment interaction analyses were repeated with the inclusion of both relationship status and Communication Preference and the associated treatment interaction terms (i.e., Relationship Status by Treatment, Communication Preference by Treatment, &

Race by Treatment). As seen in right portion of Figure 1, controlling for these two explanatory variables and their interactions with race resulted in the virtual elimination of the Race by Treatment interaction (i.e., reduced the separation in plots of AA vs NB). None of the Race by Treatment interactions retained significance with the average reduction in the interaction effect $d' = -0.24$ (95% CI $[-0.15, -0.33]$), or an average of a 72% reduction in effect size. Furthermore, the follow-up comparisons within AA of MI vs HE were all non-significant after controlling for these explanatory variables (Table 1 - adjusted rows). Review of the Goodness of Fit indexes in Table 1 reveals that controlling for relationship status and Communication Preference generally resulted in better fitting models (the index goes down for 6 of the 9 outcomes). Thus there was evidence that these two baseline variables might account for the original Race by Treatment interaction findings.

4. Discussion and conclusion

4.1 Discussion

These exploratory analyses provide evidence that race may moderate treatment response for smoking cessation induction. For AA smokers, MI appeared less effective when compared to a more directive therapeutic approach (HE). In contrast, a mixed pattern was observed for NB participants such that MI may be more effective in this population with effect sizes consistent with previous reviews [11]. While the overall pattern is most pertinent, there were some significant findings on other outcomes that warrant speculation. First, MI with AA smokers was counterproductive in changing Autonomous Motivation, which is important because this construct may be a mechanism of MI's efficacy [56]. In contrast, for Smoking Risk Perception, something particularly useful may have happened for AA smokers in Health Education, which is important because health risk concern is a common reason for quitting smoking [57]. Regardless of the exact mechanism, the overall results suggest that MI may be less preferred versus a health education intervention among AA participants.

These findings appear to contradict findings from an early meta-analysis of MI for smoking cessation that suggested MI may be more efficacious in minority samples [16]. This discrepancy may be due to a failure to distinguish between specific minority groups. Previous work found that race-ethnic minority status moderated MI's effects such that MI was effective in reducing alcohol consumption in Hispanic, but not White or African American adolescents [58]. Alternatively, results may vary depending upon the type of comparison condition. MI outperforms less intense interventions across racial groups [13, 59]. In the parent clinical trial, MI outperformed brief advice across all participants, though the 2:2:1 allocation ratio resulted in too few participants being enrolled in that arm to examine interaction effects. Thus, these results do not imply that MI is contraindicated in AA. Rather, MI is less preferred in AA when compared with an equally intense educational intervention.

4.2 Understanding race differences

While results indicate that AA status may moderate response to MI, care should be taken not to assign causality to a person's race or ethnicity [60] nor assume a lack of heterogeneity within a group. Rather, race serves as a proxy for underlying psychosocial variables which

can be used to more precisely identify those who will respond differentially to treatment. Of the numerous variables examined, the only ones that demonstrated an ability to account for Race by Treatment interactions were relationship status (single versus not) and communication preference. Controlling for the interactions of these variables with treatment assignment essentially removed the pattern of differential response associated with race.

The importance of patient preferences regarding the directiveness of counseling is consistent with prior work demonstrating this construct may moderate intervention effects [41, 61] as well as research that suggests African Americans may respond better to therapies that provide more structure and clinical education [24, 62], including cognitive behavioral approaches [63]. These findings are also consistent with evidence that AAs report a preference for a more directive communication style [27, 28], and have better perceptions of treatments that provide information, teach skills, and offer advice [62, 64]. It is less clear why being in a relationship might affect response to MI vs. HE treatment although there is evidence that similar social variables may play an important role in determining clinical outcomes [65–67]. The presence of a partner who provides pressure to quit may lead to greater responsiveness to MI.

4.3 Strengths and limitations

Confidence in these findings is bolstered by the strengths of the parent randomized clinical trial [29] and by the reliable pattern of differential response for AA vs NB participants across multiple cessation related outcome measures as well as across analytic methods. Nevertheless, interpretation of results from these exploratory analyses should be placed in context of several limitations. Participants were older adults lower in socioeconomic status enrolling in a study for “smokers not ready to quit” with interventions delivered by female counselors outside of a medical context. Differential responses may not generalize to other populations or settings for which MI may be particularly effective such as younger patients [68, 69]. The nature of the sample prevented exploration of race-ethnicity beyond the AA versus NB distinctions. The study was not powered to examine person by treatment interactions and sample size differences may contribute to significant treatment *p*-values only in the group with more participants. Along with reduced sensitivity to detect interactions, the exploratory nature of these analyses brings up the issue of multiplicity [70], with the probability of one false alarm close to 40% and two false alarms near 10% [71]. In addition, there was a lack of interaction findings for tobacco abstinence (i.e., successful quitting) which, although secondary in this cessation induction trial, is usually the most important outcome. Finally, exploration of individual characteristics that moderate treatment response is generally correlational in nature. Any positive associations must be tempered by the fact that some other 3rd variable may be responsible for observed relationships. For example, relationship status may be a proxy to some other explanatory variable that is driving moderation results. Thus, caution is warranted as these results are too preliminary to make firm recommendations for general clinical practice guidelines.

4.4 Future research

These findings highlight the need for work that is designed to prospectively test differential therapy response in relation to racial-ethnic characteristics, with adequate samples across

groups. There is also a need to expand the range of measured constructs that might account for why MI is a less preferred treatment option for many AA participants [23, 26, 28]. Therapy process research should explore differential mechanisms of action, as well as identify which aspects of therapy moderate response across racial groups (e.g., more vs less structure). Although we found no differences in results related to the way in which we coded African American status, assessing racial-ethnic characteristics should be consistent with national efforts toward standardization [72], and include other relevant constructs such as acculturation [73] or self-reported ancestry [74]. The use of self-report treatment preferences may prove useful, but future work should draw upon the growing literature on shared decision making and health communication preferences [75–77].

4.5 Conclusions

While not contraindicated, MI may be a less preferred option in AA when other active treatments are available. The differential response to therapy may be explained by other participant characteristics such as preference for a more directive approach. In any case, it is important to move beyond race to identify underlying explanatory variables that could aid the development to the next generation of behavioral therapies, which would not be blind to race-ethnicity but be able to accommodate the variation across patients [78].

4.6 Practice Implications

Failing to account for differential response to various treatments between AA versus Non-Black smokers may contribute to apparent racial disparities in tobacco related outcomes. If we only examined race differences under MI, we see a pattern where AA fared more poorly. However, this pattern of disparity is virtually removed when we examine race differences in HE treatment response. Furthermore, psychosocial variables were able to account for differential race outcomes. Racial disparities and MI outcomes might be improved by matching MI with patients who express a preference for a less directive counseling approach. However, it should not be concluded that variation in preference for structure implies a patient's autonomy should not be supported [79]. In this study there were no race differences in ratings of working alliance and counselor autonomy support for the two treatments. These variables are recognized as important predictors of positive counseling outcomes [80, 81] and did not appear to account for the treatment interaction effects we observed. These findings highlight the possibility of a more personalized form of health services delivery where a patient can be better matched to the therapeutic options available [82].

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

This manuscript is based on a secondary analysis of Catley, Goggin, Harris, Richter, Williams, Patten, Resnicow, Ellerbeck, Bradley-Ewing, Lee, Moreno and Grobe [29] ([ClinicalTrials.gov](https://clinicaltrials.gov) October 2010), which was supported by National Cancer Institute Grants R01 CA133068. Pfizer provided varenicline (Chantix®) through Investigator-Initiated Research Support (No. WS759405). The content is solely the responsibility of the authors and does not

necessarily represent the official views of NIH or Pfizer. We thank Andrea Bradley-Ewing, Kathrene Conway, Mandy Seley, and Niaman Nazir for their support.

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Highlights

- Across many outcomes, participant race interacted with the type of treatment.
- In African Americans, health education outperformed motivational interviewing.
- Race effects were accounted for by relationship status and communication preference.

Fig 1. Effect sizes (d) and standard errors for Motivational Interviewing (MI) – Health Education (HE) difference for African American (AA) vs Non-Black (NB) smokers across 9 outcomes. The separation between plots for AA vs NB represents at Race by Treatment Interaction. Adjusted values take into account the interactions between Treatment and Relationship Status (single vs not) and Preference for Expert Direction.

Fig. 2. African American (AA) versus Non-Black (NB) participants making a quit attempt during cumulative 6 month follow-up (% , SE) with either Motivational Interviewing (MI) or Health Education (HE) treatment. + denotes MI vs HE difference, $p < 0.10$.

Table 1.
Means $\pm$ Standard Deviations and Slopes Analysis for the Race by Treatment Interaction

Outcome Variable	Non Black		African American		Race by Treatment Interaction Effects				
	MI n=31	HE n=29	MI n=66	HE n=68	Goodness of Fit ^d	Effect Size ^b	Slope ^c	95 % CI	p
Quit Attempts									
Raw %	0.69 ±0.48	0.62 ±0.48	0.52 ±0.51	0.67 ±0.48+	254	-0.43	-0.90	-2.20 0.40	0.17
Adjusted %	0.71 ±0.47	0.68 ±0.50	0.57 ±0.72	0.55 ±0.73	242	-0.02	-0.07	-1.53 1.39	0.93
Abstinence									
Raw %	0.07 ±0.27	0.14 ±0.36	0.06 ±0.25	0.17 ±0.38+	135	-0.13	-0.29	-2.44 1.86	0.79
Adjusted %	0.07 ±0.30	0.13 ±0.32	0.08 ±0.29	0.14 ±0.51	139	0.00	0.05	-1.90 2.00	0.96
Medication Use									
Raw %	0.45 ±0.50	0.45 ±0.50	0.18 ±0.38	0.31 ±0.46+	237	-0.29	-0.71	-2.01 0.59	0.28
Adjusted %	0.47 ±0.53	0.46 ±0.54	0.21 ±0.50	0.21 ±0.56	237	-0.02	-0.06	-1.52 1.39	0.93
Motivation to Quit									
Raw Change	3.02 ±2.82	3.71 ±2.80	2.77 ±2.63	4.11 ±2.98**	1540	-0.23	-0.65	-2.36 1.06	0.45
Adjusted Change	3.15 ±2.66	3.75 ±2.98	3.14 ±2.85	3.58 ±4.09	1477	0.06	0.16	-1.69 2.01	0.87
Confidence to Quit									
Raw Change	3.22 ±3.05	2.84 ±3.09	2.58 ±3.09	3.26 ±3.36	1968	-0.33	-1.06	-2.96 0.84	0.27
Adjusted Change	3.34 ±3.36	2.90 ±3.26	2.89 ±3.78	2.53 ±4.63	1904	-0.02	-0.08	-2.06 1.90	0.94
Decisional Balance									
Raw Change	4.08 ±8.75	5.88 ±12.10	5.35 ±9.87	9.18 ±12.79+	24177	-0.18	-2.03	-8.65 4.59	0.55
Adjusted Change	4.65 ±10.35	5.16 ±11.66	6.59 ±12.74	7.34 ±17.24	23629	-0.02	-0.24	-7.11 6.63	0.95
Temptation Smoke									
Raw Change	0.42 ±0.72	0.50 ±1.09	0.36 ±0.70	0.53 ±1.08	169	-0.10	-0.09	-0.65 0.47	0.75
Adjusted Change	0.41 ±0.84	0.50 ±1.14	0.35 ±0.96	0.58 ±1.54	178	-0.15	-0.14	-0.73 0.45	0.64
Relative Autonomy Index									
Raw Change	0.84 ±1.07	0.60 ±1.36	-0.05 ±1.40	0.62 ±1.61**	402	-0.61	-0.90	-1.71 -0.10	0.03
Adjusted Change	0.73 ±1.11	0.56 ±1.39	0.38 ±1.61	0.72 ±1.58	320	-0.35	-0.52	-1.23 0.19	0.15
Sm Risk Perception									

Outcome Variable	Non Black				African American				Race by Treatment Interaction Effects			
	MI n=31	HE n=29	M ±SD		MI n=66	HE n=68	M ±SD		Effect Size ^b	Slope ^c	95 % CI	p
Raw Change	0.88 ±1.57	0.61 ±1.48			0.75 ±1.48		1.41 ±1.75 [*]		-0.58	-0.94	-1.89	0.01
Adjusted Change	0.81 ±1.04	0.94 ±1.25			0.81 ±1.37		1.23 ±1.65		-0.18	-0.29	-1.09	0.51
												0.48

Note: Significant MI vs HE pairwise denoted by + p<0.10

* p<0.05

** p<0.01.

Adjusted values take into account the interactions between Relationship Status, Communication Preference, and Treatment.

^a GIF smaller is better form, quasi likelihood under independence model criterion.

^b Interaction effect = difference between AA vs NB on the standardized mean MI-HE treatment effect (d).

^c Difference in regression coefficient for treatment for AA vs NB.

Table 2.

Participant characteristics by race and impact on accounting for Race by Treatment interaction

Characteristic	Non-Black n=66 M SD	African American n=138 M SD	Race Effect Size, <i>d</i>	Race Sig <i>p</i>	Change in RxT Effect ^a , <i>d'</i> %
Age	43.0 ±11.9	47.4 ±10.3	−0.40	0.01	9%
Gender, % female	40.9 ±49.5	44.2 ±49.8	−0.07	0.66	5%
Relationship status, % in	33.3 ±47.5	10.9 ±31.2	0.58	0.00	−44%
Socioeconomic status (1 to 4) ^b	2.0 ±0.8	1.5 ±0.4	0.81	0.00	9%
Smoking rate, cigs per day	17.2 ±6.0	16.3 ±9.5	0.11	0.47	−5%
Age started smoking	14.9 ±3.8	16.7 ±4.6	−0.39	0.01	−5%
Years spent smoking	28.1 ±13.4	30.7 ±10.9	−0.22	0.14	14%
Smokes within 5 mins, % yes	40.9 ±49.5	50.7 ±50.2	−0.20	0.19	5%
Heavy Smoking Index (0 to 5)	1.8 ±0.8	1.5 ±1.1	0.22	0.14	−5%
Severity of Dependence (0 to 15)	7.3 ±3.0	6.5 ±3.3	0.25	0.10	−14%
Ever made a quit attempt, %yes	77.3 ±42.2	63.0 ±48.4	0.30	0.04	−5%
Ever use quit medications, %yes	37.9 ±48.9	15.2 ±36.0	0.54	0.00	−5%
Quit attempt prior 30 days, %yes	4.5 ±21.0	13.8 ±34.6	−0.30	0.05	0%
Motivation to quit, (0 to 10)	2.0 ±1.8	1.8 ±1.7	0.13	0.39	5%
Decisional Balance (−40 to 40) ^c	−3.8 ±10.3	−1.6 ±11.5	−0.20	0.19	0%
Smoking risk perception (1 to 7)	4.8 ±1.8	4.5 ±1.9	0.15	0.32	23%
Confidence to quit (0 to 10)	2.3 ±2.5	2.8 ±2.8	−0.17	0.26	−1%
Self-Efficacy Temptations (1 to 5)	4.0 ±0.6	3.8 ±0.9	0.25	0.10	0%
Lives with Smokers, %yes	48.5 ±50.4	55.1 ±49.9	−0.13	0.38	0%
Preference for Expert Direction (1 to 5) ^d	2.8 ±1.2	3.1 ±1.3	0.23	0.13	−40%
Relative Autonomy Index RAI (−6 to 6) ^e	1.5 ±1.4	2.0 ±1.5	−0.32	0.03	23%
Health Status (1 to 10) ^f	7.1 ±1.8	7.1 ±1.7	0.03	0.85	19%
Alcohol Screening AUDIT (0 to 11)	2.9 ±2.8	3.5 ±3.0	−0.22	0.14	−14%
Depressive Symptoms CES-D (0 to 50)	15.3 ±10.8	17.4 ±10.0	−0.20	0.17	14%
Perceived Stress (0 to 16)	5.9 ±2.9	6.6 ±3.0	−0.23	0.12	5%
Participating for Quit Assistance, %yes	25.8 ±44.1	24.6 ±43.2	0.03	0.86	9%

^a % change in the Race by Treatment interaction effect size for Quit Attempts after adjustment for characteristic.^b Aggregate based on income, employment, and education.^c Calculated as CONS-PROS (of smoking) so more positive value indicates greater balance to quit smoking.^d Response to single item where 5=prefers expert direction, 3=neutral, & 1=does not want an expert directing them.^e Calculated as Autonomous - Controlled Motivation.^f Aggregate of self-report health ratings and number of sick days in last month.