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Diminished Effect of Smoking Intensity on African American and Latino Smokers' Tobacco Risk Perception

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Abstract

Background: According to the Minorities' Diminished Returns (MDRs), highly educated African American (AA) and Latino people remain at high risk of tobacco use. One hypothesis suggests that this high risk of tobacco use stems from AA and Latino people remaining unrealistically optimistic, resulting in the risks of tobacco use being discounted.

Aims: To better understand the role of cognitive bias as a mechanism behind the high risk of smoking in highly educated minorities, we studied ethnic variation in the association between smoking intensity and perceiving oneself as a smoker among young American adult established current smokers.

Methods: In this cross-sectional study, we used baseline data of 2,475 young adults (18-24 years) who were current established smokers. The data came from the Population Assessment of Tobacco and Health (PATH; 2013) study, a nationally representative survey in the US. The independent variable was smoking intensity. The dependent variable was not perceiving oneself as a smoker (probably due to optimistic cognitive bias and discounting the risk). Age, gender, and education were the covariates. Ethnicity was the moderator. Logistic regressions were used to analyze the data.

Results: From the total number of 2,475 current smokers, 2106 (85.1%) perceived themselves as a smoker, and 369 (14.9%) smokers perceived themselves as a non-smoker. A high level of smoking intensity was associated with lower odds of not perceiving oneself as a smoker. Two significant interactions were found between Latino and AA ethnicity and smoking intensity, suggesting that the effect of smoking intensity on perceiving oneself as a smoker is weaker in AAs than Whites and Latinos than non-Latinos.

Conclusions: While tobacco use intensity is associated with a lower likelihood of optimistic cognitive bias and not perceiving the self as a smoker, Latino and AA young adults who smoke many cigarettes a day are more likely than their non-Latino White counterparts with the same smoking risk not to perceive themselves as a smoker. This finding suggests a psychological discounting of risk among AA and Latino smokers. Such cognitive bias may help them avoid cognitive dissonance and reduce their own perceived risk of cancer and other fatal conditions from smoking. A cognitive bias may increase the smoking burden of AA and Latino young adults through discounting smoking risk.

Introduction

In the US, considerable ethnic disparities exist in the burden of tobacco use¹. A combination of several disadvantages such as low acceptability, low trust, and low access to cessation programs¹ has increased African American (AA) and Latino individuals' vulnerability to tobacco-related burden². As a result, despite having a lower prevalence of tobacco use than non-Latino Whites, AA and Latino individuals experience a higher rate of undesired tobacco-related diseases and mortality¹.

Although education and resources protect individuals against the risk for tobacco use³, this effect is unequal across ethnic groups⁴⁻⁷. As ethnicity and education overlap⁸, researchers have traditionally attributed some of the ethnic disparities in the burden of tobacco use to educational inequalities⁸. This has become increasingly important as every year, the effect of education on smoking in the US has become stronger^{9,10}. Education shows, however, a diminished protective effect in reducing the prevalence of tobacco use in Latinos and AAs⁴⁻⁷, resulting in higher than expected tobacco use of middle-class AAs and Latinos⁴⁻⁷. As a result, there has been a recent increase in the attempts to understand the mechanisms that can help us understand why we see high tobacco-related risk in middle-class AAs and Latinos.

Understanding the interplay between education and smoking may have significant implications for the allocation of resources. If education is responsible for ethnic disparities, then eliminating ethnic inequalities would require the elimination of educational and achievement gaps across ethnic groups. However, if tobacco disparities sustain among highly educated AAs and Latinos, then the solution to tobacco disparities should go beyond education policies and other contributing factors that result in tobacco disparities across ethnic groups. For example, some solutions may be assisting ethnic minorities to quit, increase their access to smoking cessation programs and aids, and banning predatory marketing in their communities. Other requirements would be tobacco policies such as more restrictive tobacco marketing policies and tobacco taxation or anti-smoking laws. Tobacco education campaigns would also be required.

A growing body of research has recently shown that not all of the ethnic differences in tobacco use are exclusively due to lower SES in AA and Latino than non-Latino White people⁵. As described by the Minorities' Diminished Returns (MDRs)¹¹, we observe "*higher than expected*" tobacco use in highly educated, and high SES AAs⁴ and Latinos^{5,4}. For example, in contrast to highly educated, high income, and employed non-Latino Whites, highly educated, high income, and employed AA and Latino people remain at risk of e-cig use⁶ cigarette smoking^{5,7}, and Hookah use. These findings illustrate a greater than expected tobacco use for both traditional and newer forms of tobacco products⁵. These MDRs can be defined as weaker protective effects of education, employment, income, and SES in general, on health behaviors such as tobacco use of racial and ethnic minorities than majority groups. As these findings are robust, researchers have shifted gear from describing such a phenomenon to understanding the social, psychological, and cognitive mechanism for high tobacco use of high SES AAs and Latinos.

Although high tobacco use is repeatedly shown to be common in high SES (e.g., highly educated) Latinos and AAs⁴⁻⁷, no previous studies have ever tested the role of

cognitive biases in this regard. A recent study showed that tobacco harm knowledge is still lower in highly educated AAs and Latinos¹². Other studies proposed that smoking is also more common in the workplace and home where AAs and Latinos work and live¹³. In another setting, a study showed that AAs have a lower perceived risk of cancer than Whites, which raised the flag that they may use cognitive discounting to avoid stress and worries about cancer. This is also supported by the literature, which shows cancer and other fatal conditions generate more fear in AAs than Whites. Thus, cognitive biases that reduce the perceived risk of cancer, such as not perceiving oneself as a smoker (among smokers), should be studied in ethnic minorities.

Aims

This study explored ethnic differences in the association between smoking intensity and a specific type of unrealistic optimist cognitive bias, perception of the self not as a smoker, in a national sample of young American adult smokers. As all the participants were current established smokers, they should all regard self as a smoker. However, some individuals may discount this risk, and not see self as a smoker. We had two hypotheses: 1) an inverse association between smoking intensity on the cognitive bias (not perceiving the self as a smoker), and 2) weaker association between smoking intensity on a cognitive bias (not perceiving the self as a smoker) in Latino and AA than Non-Latino and White young adult smokers.

Materials and Methods

Design and settings

For this cross-sectional study, we analyzed the wave 1 data of the Population Assessment of Tobacco and Health (PATH, 2013-2014) study¹⁴. Jointly funded by the NIH and the FDA, the PATH study is the state-of-the-art epidemiological study of tobacco use in the US¹⁴.

Sampling, Sample, and Analytical Sample

The PATH young-adult sample was a random sample of non-institutionalized, American civilians, between 18 and 24-years old. The sampling strategy used a multi-stage sampling design—composed of a four-stage probability sampling¹⁴. Of 32,242 participants of the PATH Adults, only 2,475 were young adults, were current established smokers, and had reported their perception of themselves as a smoker/non-smoker. Thus, our analytical sample was 2,475 young adult established current smokers.

Study variables

The study variables included ethnicity, age, gender, education, smoking intensity, and cognitive bias (not perceiving oneself as a smoker). All variables were measured at an individual level.

Ethnicity (Moderator): Ethnicity (the moderator) was self-identified and operationalized as two dichotomous variables: AAs versus Whites and Latinos versus Non-Latinos.

Educational attainment: Educational attainment was a six-level variable: 1) Less than High School, 2) GED, 3) High school graduate, 4) Some college (no degree) or associates degree, 5) Bachelor's degree, and 6) Advanced degree. This variable was a continuous variable ranging from 1 to 6.

Cognitive bias (not perceiving oneself as a smoker): We used a single-item measure to evaluate the cognitive bias of perceiving oneself as, not a smoker. This variable was a dichotomous measure coded 1 for individuals who did not perceive themselves as a smoker and 0 for those who perceived themselves as a smoker. We call lack of perception a bias because every individual in this study was a smoker.

Smoking Intensity: Participants reported the number of cigarettes they smoked today, yesterday, and the day before. This variable was treated as a continuous measure and also a categorical variable (for sensitivity analysis).

Confounders: Region and gender were the covariates. Region was a four-level categorical variable: Northeast, Midwest, South, and West (Reference Category). Gender was a dichotomous variable (male 1, female 0).

Statistical Analysis

For analysis of the PATH data, we used SPSS 23.0 (IBM Corporation, Armonk, NY, US). Weights were applied for descriptive purposes. For multivariable modeling, three logistic regression models were fitted to the data. In all these models, smoking intensity was the independent variable

and not perceiving oneself as a smoker was the outcome. Model 1 did not have any interaction terms. Model 2 included the AA by smoking interaction term. Model 3 included the Latino ethnicity by smoking intensity interaction term. We ran models in the pooled sample without interaction terms between Latino and AA ethnicities and educational attainment and smoking intensity. Our interaction terms were two multiplicative terms: Latinos x smoking intensity and AAs x smoking intensity. Ethnicity was coded as 0/1, and smoking intensity varied between 0 to 200. Thus, the interaction terms were 0 for all non-Latinos and Whites but varied between 0 to 200 for Latinos and AAs. Odds Ratio (OR), B, standard error (SE), 95% confidence intervals (CI), and p values were reported.

Ethics

All PATH adult participants signed informed consent. The Westat Institutional Review Board (IRB) approved the PATH study protocol. Data collection, storage, and analysis were all done anonymously. As we used fully de-identified publicly available data, our analysis was exempt from a full IRB review.

Results

Descriptive statistics

This study included 2,475 young adults who were established, current smokers. From this number, most were Non-Latino ($n = 2031$, 82.5%) and Whites ($n = 1839$, 74.3%). 2106 (85.1%) smokers perceived themselves-as a smoker and 369 (14.9%) smokers perceived themselves as a non-smoker. Table 1 describes the study variables in the pooled sample and based on perceiving the self as a non-smoker (Table 1).

Table 1. Summary of the descriptive statistics overall sample ($n = 2475$).

	All ($n = 2475$)		Perceive oneself as a Smoker ($n = 2106$)		Does Not Perceive oneself as a Smoker ($n = 369$)	
	N	%	N	%	N	%
African American (AA)						
No	1839	74.3	1552	73.7	287	89.7
Yes	299	12.1	266	12.6	33	10.3
Latino						
No	2031	82.5	1752	83.2	279	75.6
Yes	431	17.5	341	16.2	90	24.4
Gender						
Women	1051	42.5	916	43.5	135	36.6
Men	1424	57.5	1190	56.5	234	63.4
Region						
Northeast	359	14.5	306	14.5	53	14.4
Midwest	635	25.7	552	26.2	83	22.5
South	984	39.8	840	39.9	144	39.0
West	497	20.1	408	19.4	89	24.1
	Mean	SD	Mean	SD	Mean	SD
Educational Attainment (1-6)	3.02	1.16	2.94	1.15	3.50	1.07
Smoking Intensity (0-200)	5.17	8.26	5.78	8.70	1.74	3.56

Multivariable models

Table 2 presents the results of bivariate correlations (unadjusted). Smoking intensity was inversely correlated with not perceiving the self as a smoker (Table 2).

Multivariable models

Table 3 presents the results of three logistic regression models in the overall sample with smoking intensity as the independent variable and cognitive bias (not perceiving oneself as a smoker) as the dependent variable. *Model 1* showed a negative association between smoking intensity and not perceiving oneself as a smoker, while all covariates, including age, gender, and education, were adjusted.

Based on *Model 2*, however, a significant interaction was found between AA ethnicity and smoking intensity on the cognitive bias of not perceiving oneself as a smoker, suggesting that the negative effect of smoking intensity on not perceiving oneself as a smoker is significantly weaker in AAs than Whites.

Based on *Model 3*, a significant interaction was found between Latino ethnicity and smoking intensity on the cognitive bias of not perceiving oneself as a smoker, suggesting that the negative effect of smoking intensity on not perceiving oneself as a smoker is significantly weaker in Latinos than non-Latinos (Table 3).

Discussion

Although high tobacco intensity was inversely associated with the cognitive bias of not perceiving oneself as a smoker, this association was weaker for Latinos and AAs than Non-Latinos and White adults.

The findings suggest that smoking more cigarettes better increases the self's perception as a smoker for Non-Latinos and White adults than Latinos and AAs. In other terms, Latino and AA frequent smokers, compared to frequent smoker Whites and non-Latinos, are more likely to have a cognitive bias that reduces anxiety and worries. This finding explains (from many potential explanations) why AAs and Latinos (including highly educated people) tend to smoke more than what we expect because of their educational attainment and other SES indicators⁵.

Table 2. Bivariate Correlations in the pooled sample

	1	2	3	4	5
1 Race		-.052*	-.055*	-.052*	-.044*
2 Latino			-.082**	-.047*	.076**
3 Education Years				-0.033	.171**
4 Smoke n					-.174**
5 Cognitive Bias					

Light color represents weak and dark color represents strong correlations.

Green color represent negative and orange/red color represents strong correlations.

The result, in line with the literature on MDRs on tobacco use of AAs and Latinos. Education shows, however, a diminished protective effect in reducing the prevalence of tobacco use in Latinos and AAs^{4,7}, resulting in higher than expected tobacco use of middle-class AAs and Latinos^{4,7}.

Education is a major contributor to health literacy, which includes knowledge regarding tobacco harm¹⁵. We, however, would not observe strong protection of education on tobacco use or perceived risk of tobacco for individuals who receive low-quality education. There is no question that education is delivered with a lower quality for AAs and Latinos¹⁶. Thus, cognitive biases may be why high SES AAs and Latinos remain at risk of tobacco use and tobacco-related chronic diseases.

Table 3. Regression model of not perceiving self as a smoker in the pooled sample (n = 2475).

	B	SE	OR	95% CI		P
Model 1						
African Americans (AAs)	0.45	0.21	1.57	1.05	2.36	.030
Latinos	0.28	0.17	1.32	0.94	1.84	.105
Gender (Men)	0.41	0.14	1.50	1.15	1.96	.003
Region (Compared to West)						.486
Northeast	-0.34	0.23	0.71	0.45	1.13	.147
Midwest	-0.11	0.20	0.89	0.60	1.33	.575
South	-0.05	0.18	0.95	0.67	1.36	.794
Educational Attainment (1-6)	0.39	0.07	1.47	1.29	1.67	< .001
Smoking Intensity	-0.40	0.04	0.67	0.63	0.72	< .001
Constant	-2.37	0.35	0.09			< .001
Model 2						
African Americans (AAs)	1.33	0.30	3.79	2.12	6.75	< .001
Latinos	0.25	0.17	1.29	0.92	1.81	.139
Gender (Men)	0.40	0.14	1.49	1.13	1.95	.004
Region (Compared to West)						.452
Northeast	-0.36	0.24	0.70	0.44	1.11	.126
Midwest	-0.12	0.21	0.89	0.60	1.33	.573
South	-0.06	0.18	0.94	0.66	1.34	.738
Educational Attainment (1-6)	0.38	0.07	1.46	1.28	1.66	< .001
Smoking Intensity	-0.46	0.04	0.63	0.58	0.69	< .001
Smoking Intensity * African Americans (AAs)	0.37	0.08	1.45	1.25	1.68	< .001
Constant	-3.07	0.39	0.05			< .001
Model 3						
African Americans (AAs)	0.46	0.21	1.58	1.05	2.37	.028
Latinos	-0.03	0.24	0.97	0.61	1.54	.893
Gender (Men)	0.41	0.14	1.51	1.16	1.97	.003
Region (Compared to West)						.450
Northeast	-0.36	0.23	0.70	0.44	1.10	.124
Midwest	-0.12	0.20	0.88	0.59	1.32	.544
South	-0.06	0.18	0.94	0.66	1.34	.728
Educational Attainment (1-6)	0.38	0.06	1.46	1.29	1.66	< .001
Smoking Intensity	-0.43	0.04	0.65	0.60	0.71	< .001
Smoking Intensity * Latinos	0.16	0.08	1.17	1.00	1.37	.050
Constant	-2.27	0.35	0.10			< .001

CI: Confidence Interval; b: Regression Coefficient; SE: Standard Error; OR: Odds Ratio

The results are similar to the previous research showing that despite a high risk of getting cancer, Latinos and AAs have a lower perception of risk¹⁷. Such a gap suggests room for intervention, as cognitive aspects of risk, are manipulatable and can be enhanced through programs and media campaigns. Media campaigns have the potential to compensate for the lower than expected risk of smoking in AAs and Latinos who continue to smoke cigarettes even despite their educational attainment⁵.

Another explanation of this finding is media and advertisement that may differently reach and target AAs, Latinos, and Whites. On top of these, AAs and Latinos are targeted by some predatory marketing practices of the tobacco industry¹⁸. Such predatory practices may influence the attitude of risk associated with tobacco use. The tobacco industry may use advertisements to manipulate ethnic groups' knowledge and attitudes about using tobacco and associated risk¹⁹. Thus, we argue that cognitive biases such as not perceiving the self as a smoker may be a mechanism that increases the risk of tobacco use of AAs and Latinos across educational levels⁵. In the presence of MDRs of educational attainment⁵, however, we may observe the disproportionately low perception of oneself as a smoker in highly educated Latino and AA individuals relative to Whites. This may be because educational attainment has a smaller effect on improving Latinos and AAs' life conditions than Whites. As a result, despite their high educational attainment, currently smoking Latino and AA individuals continue to perceive themselves as not being a smoker, which is supposed to reduce tobacco use⁵.

The results reported here may propose a mechanism that explains why racial and ethnic tobacco use disparities sustain across all SES and class lines. Previous research has proposed a wide range of social processes that explain MDRs, including high stress, worse jobs, lower education quality, and worse neighborhoods. This study, however, proposes cognitive bias as one reason tobacco use remains high across all SES levels of racial and ethnic minorities. Such bias may be why perceived risk remains low despite actual risk being high.

As a result of the smaller educational attainment effect for ethnic minority groups²⁰, the relative ethnic gap in tobacco use widens, rather than narrows, at higher levels of education levels⁵. Similar MDRs are shown for a wide range of conditions and health problems beyond tobacco use. For example, MDRs are shown for anxiety, depression, suicide, distress, obesity, chronic disease, poor diet, and mortality⁵.

At least some of the racial and ethnic disparities in tobacco burden are not merely due to individuals' high-risk behaviors but structural factors and processes that increase people's vulnerabilities. One of the structural factors for racial and ethnic minority tobacco use is exposure to

predatory tobacco marketing practices²¹. Compared to non-Latino White people, AA and Latino people are more likely to be exposed to retail displays, point-of-sale advertising, coupons, and discounts, which all influence tobacco-related attitudes and perceived risk¹⁸. Vulnerable communities are a target for tobacco advertisements, coupons, and sales²². While coupons offer discounts in communities of color¹⁸, the residents of such neighborhoods may be at an increased risk of tobacco use¹⁸.

Future Research

Research may also explore the role of structural factors such as quality of schooling, health literacy, fear of being diagnosed with cancer, perceived risk of cancer, and thinking styles under the influence of ethnicity, SES, and intersections. We need to study the cognitive biases and their sources based on the intersections of ethnicity, place, and class.

Implications

The results are not without policy and public health implications. The results suggest that enhancing a smoker's ability to perceive themselves as a smoker is a required strategy to reduce the racial and ethnic tobacco disparities that are not due to risk factors or low SES but MDRs²³. The results reported here may offer a solution to reducing the high vulnerability of ethnic groups to tobacco. We argue that tobacco campaigns tailored to ethnic minorities may be needed as a strategy to reduce the tobacco use disparities. Educating ethnic minorities will help people develop a more realistic view of tobacco. Such change may prevent some of the tobacco disparities observed in high SES Latino and AA communities. Reducing disparities has been a strategic goal for the FDA and the National Institutes of Health (NIH).

Limitations

This study is not without limitations. First and foremost, our results suggest correlation and association, not causation and effect. The study used an imbalanced sample size across groups with a considerably lower sample size in ethnic minority groups. To avoid differential statistical power by ethnicity, we only ran our models in each ethnic group. We only included educational attainment and other SES indicators such as poverty status, income, wealth, employment, and area-level SES were absent. Future research should go beyond describing MDRs and seek to identify the mechanisms behind such disparities.

Conclusion

AA and Latino young adult smokers experience weaker effects of cigarette use intensity on cognitive biases such as not perceiving themselves as a smoker, despite being a smoker. While, in general, individuals who smoke more

cigarettes perceive themselves as a smoker, this effect is weaker for AA and Latino young adult who smoke many cigarettes. That means, some young adult AA and Latino frequent smokers do not see themselves as a smoker. This finding suggests that unrealistic optimism, cognitive bias, and discounting tobacco risk may have a role in explaining why ethnic minorities use tobacco across educational levels.

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Author Contributions

SA conceptualized the study, analyzed the data, prepared the first draft of the paper, and acquired the funding. He also approved the final draft.

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