



Original investigation

Effects of Framing Proximal Benefits of Quitting and Motivation to Quit as a Query on Communications About Tobacco Constituents

Sarah Kowitt MPH¹, Paschal Sheeran PhD², Kristen Jarman MPSH³, Leah M. Ranney PhD, MA⁴, Allison M. Schmidt MPH¹, Li-Ling Huang PhD, MPH³, Adam O. Goldstein MD, MPH^{3,4}

¹Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC; ²Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill, Chapel Hill, NC; ³Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, Chapel Hill, NC; ⁴Department of Family Medicine, University of North Carolina at Chapel Hill, Chapel Hill, NC

Corresponding Author: Sarah Kowitt, MPH, Department of Health Behavior, University of North Carolina, 135 Daeur Drive, 170 Rosenau Hall, CB # 7440, Chapel Hill, NC 27599, USA. Telephone: 704-443-1811; E-mail: kowitt@email.unc.edu

Abstract

Introduction: Little is known on how to communicate messages on tobacco constituents to tobacco users. This study manipulated three elements of a message in the context of a theory-based communication campaign about tobacco constituents: (1) latency of response efficacy (how soon expected health benefits would accrue), (2) self-efficacy (confidence about quitting), and (3) interrogative cue (“Ready to be tobacco-free?”).

Methods: Smokers ($N = 1669$, 55.4% women) were recruited via an online platform, and were randomized to a 3 (Latency of response efficacy) \times 2 (Self-efficacy) \times 2 (Interrogative cue) factorial design. The dependent variables were believability, credibility, perceived effectiveness of the communication message, and action expectancies (likelihood of seeking additional information and help with quitting).

Results: Latency of response efficacy influenced believability, perceived effectiveness, credibility, and action expectancies. In each case, scores were higher when specific health benefits were said to accrue within 1 month, as compared to general health benefits occurring in a few hours. The interrogative cue had a marginal positive effect on perceived effectiveness. The self-efficacy manipulation had no reliable effects, and there were no significant interactions among conditions.

Conclusions: Smokers appear less persuaded by a communication message on constituents where general health benefits accrue immediately (within a few hours) than specific benefits over a longer timeframe (1 month). Additionally, smokers appeared to be more persuaded by messages with an interrogative cue. Such findings may help design more effective communication campaigns on tobacco constituents to smokers.

Implications: This paper describes, for the first time, how components of tobacco constituent messages are perceived. We now know that smokers appear to be less persuaded by communication messages where general health benefits accrue immediately (within a few hours) than specific benefits over a longer timeframe (1 month). Additionally, including an interrogative cue (“Ready to be tobacco free?”) may make messages more effective, whereas the self-efficacy manipulation

designed to increase confidence about quitting had no effect. While messages were universally impactful across smoker subpopulations, everyday smokers and smokers with less trust in the government may be less receptive to communication campaigns.

Introduction

Tobacco use remains the leading cause of preventable death in the United States.¹ Since the 1970s, a variety of communication campaigns have been used to reduce tobacco use. Evidence from systematic reviews, meta-analyses, and evaluation trials has demonstrated the effectiveness of such campaigns in increasing quit attentions, decreasing tobacco prevalence, and changing tobacco-related attitudes and beliefs.²⁻⁴

Several components may make tobacco cessation communication campaigns effective. One is their ability to elicit negative emotions. Previous research suggests that messages emphasizing specific negative health effects of smoking may be more effective in eliciting smoking cessation than messages that focus on other types of appeals or messages emphasizing general health effects of tobacco use.^{3,5-8} Moreover, according to Protection Motivation Theory, messages that elicit negative emotions may be enhanced if individuals understand how to avoid the specified threat.^{7,9,10} In a recent meta-analysis of experimental studies examining these hypotheses, researchers found that interventions that heightened individuals' awareness of threat (ie, "risk appraisal") were able to change participants' intentions and behaviors.¹¹ Moreover, interventions that relied on conveying risk as well as information that allowed individuals to cope with the risks (ie, "coping appraisal") were more successful at changing behavior.¹¹

Enhancing coping appraisal can be accomplished in several ways, including telling people they can perform a specific action (eg, quitting smoking in this case) and by emphasizing benefits that may accrue when a specific action is performed. According to Temporal Self-Regulation Theory, the timeframe in which benefits accrue is important to consider in predicting and explaining behavior change.¹² For instance, among smokers, benefits generally accrue immediately (eg, feelings of pleasure, avoidance of withdrawal symptoms, and social acceptance) while costs gradually accumulate long-term. Reversing the traditional cost-benefit paradigm and emphasizing the immediate and short-term benefits of quitting smoking could help support behavior change by intensifying the proximity of the health risk and making the health risk appear more threatening.^{12,13}

Lastly, empirical evidence suggests that using interrogative cues (asking with questions rather than presenting information in statements) can increase motivation and behavioral impact of messages.^{14,15} Because questions may increase thinking about the topic and enhance intrinsic motivation, they may be more effective than declarative statements. For instance, in a study examining the effects of formulating smoking-related warning messages as questions, smokers who were presented with questions about the harms of smoking waited longer before lighting a cigarette than smokers who were presented with statements.¹⁴

While there is evidence to suggest that general tobacco cessation media campaigns can be effective in tobacco prevention and smoking cessation, relatively few studies have examined how communication campaigns about "tobacco constituents" are best designed or evaluated features of campaigns that affect persuasiveness. One of the provisions of the 2009 Family Smoking Prevention and Tobacco Control Act requires tobacco product manufacturers to report to the Food and Drug Administration (FDA) "harmful or potentially

harmful constituents" in tobacco products.¹⁶ In 2012, the FDA released an abbreviated list of 20 "harmful or potentially harmful constituents,"¹⁶ but future work is needed to communicate this information to the public in a "format that is understandable and not misleading to lay persons."¹⁶ The FDA has also begun to implement tobacco constituent media campaigns¹⁷ but the impact of such campaigns on cessation or prevention outcomes is unknown.

Therefore, in the context of a hypothetical FDA communication campaign about tobacco constituents, our study sought to examine the impact of manipulating elements of the Protection Motivation Theory and Temporal Self-Regulation Theory on message receptivity (believability, credibility, perceived effectiveness, and action expectancies). We hypothesized that messages including a manipulation of latency of response efficacy (how soon expected health benefits would accrue), a manipulation of self-efficacy (confidence about quitting), and an interrogative cue ("Ready to be tobacco-free?") would be more impactful than messages without such components.

Methods

Data Collection

The survey was administered via Amazon Mechanical Turk (MTurk), an online crowdsourcing Internet marketplace where anonymous users complete web-based tasks for small sums of money. MTurk is one of the most widely used crowdsourcing platforms and has been validated as a tool for conducting online survey and behavioral research.¹⁸ In addition to its ability to reach a wide number of diverse, individuals (more than 500 000 in 2011), data are generated quickly and reliably.¹⁹ For our study, we limited inclusion to individuals in the United States over the age of 18 who reported smoking in the past 30 days. Participants first completed informed consent and were then administered screening questions. Participants were given \$3.50 dollars to complete the 20-minute survey. This study was approved by the University of North Carolina at Chapel Hill Institutional Review Board (IRB # 15-1952).

Participants were randomly assigned to receive five different experiments, one of which we report on in this study. To ensure high-quality data, all participants were given three standard attention checks.²⁰ Participants who answered incorrectly to any of the three attention checks ($n = 203$) were excluded from analysis. Our final sample included 1669 current smokers over the age of 18.

Experimental Design

Our experiment occurred in the context of a theory-based print communication campaign to encourage smoking cessation. All participants saw a message that emphasized the harmful effects of constituents found in cigarette smoke, specifically arsenic. Arsenic was chosen as the tobacco constituent based on previous research suggesting that most people (smokers and nonsmokers) have heard of arsenic and that it elicits greater discouragement from smoking than other harmful and potentially harmful constituents.²¹ Thus, all participants saw a health message that read "Cigarette smoke contains arsenic. Arsenic causes lung tumors." This message was combined with an image in the background of a smoky skull and crossbones,

the presence of the FDA logo, and a link to the smokefree.gov website for free help in quitting smoking. An example of the message can be seen in [Figure 1](#).

For the experiment, participants were randomized to a 3 (Latency of response efficacy) \times 2 (Self-efficacy) \times 2 (Interrogative cue) factorial design. The latency of response efficacy included three conditions: two time frames for improvement from quitting smoking—"Within hours of quitting your health improves" and "Within 1 month of quitting you begin to breathe better and cough less"—and a control with nothing. The two conditions for self-efficacy included "You can quit" versus nothing. The two conditions for interrogative cue were: "Ready to be tobacco free?" versus nothing. Participants were therefore randomized to see one of 12 possible conditions. These experimental manipulations were created based on theory and empirical evidence that (1) threatening messages may be more effective when combined with information that conveys how one may cope with risks (which we used to create our latency of response efficacy and self-efficacy conditions);^{7,11} (2) emphasizing short-term benefits of quitting smoking may be more effective than emphasizing long-term

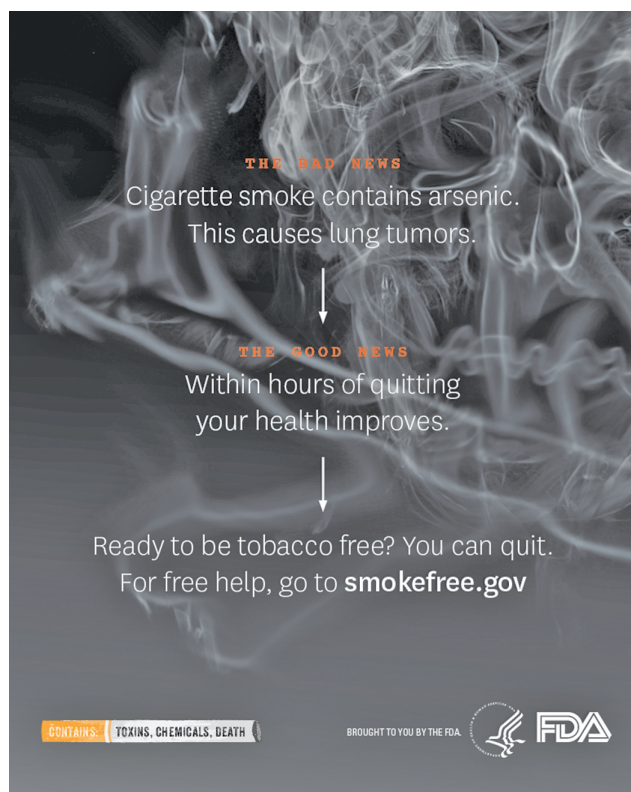


Figure 1. Example of an ad randomly assigned to participants. For the experiment, participants were randomized to a 3 (Latency of response efficacy) \times 2 (Self-efficacy) \times 2 (Interrogative cue) factorial design. The latency of response efficacy included three conditions: two time frames for improvement from quitting smoking—"Within hours of quitting your health improves" and "Within 1 month of quitting you begin to breathe better and cough less"—and a control with nothing. The two conditions for self-efficacy included "You can quit" versus nothing. The two conditions for the interrogative cue were: "Ready to be tobacco free?" versus nothing. All participants saw a health message that read "Cigarette smoke contains arsenic. Arsenic causes lung tumors." This message was combined with an image in the background of a smoky skull and crossbones, the presence of the FDA logo, and a link to the smokefree.gov website for free help in quitting smoking.

benefits (which we used to create our latency of response efficacy condition);¹² and (3) interrogative cues can increase motivation and behavioral impact (which we used to create our interrogative cue condition).^{14,15}

Measures

Background Variables

All participants were asked to self-report information on sex, race, ethnicity, age, and education (see [Table 1](#)). Smoking status was measured with the item "Do you now smoke cigarettes every day, some days, or not at all?" and responses were dichotomized as "every day smokers" and "some days smokers". Participants who responded that they did not smoke cigarettes at all were excluded from the study during the screening process. Because all ads included a FDA logo and trust in government has been shown to be a significant predictor of receptivity to tobacco control efforts,²² we also controlled for trust in government. This variable was measured with the item "how much trust do you have in the federal government" and responses were categorized as "a great deal/a fair amount," "not very much/none at all" or "no opinion."

Outcomes

Outcomes assessed were believability, credibility, perceived effectiveness, and action expectancies. Believability was measured with two items asking participants to choose on a 5-point semantic differential scale whether the messages were believable and convincing.²³ Credibility was measured with three items asking participants to choose on a 5-point semantic scale whether the source of messages were credible (modified from a previous scale²⁴), trustworthy,²⁵ and expert (modified from a previous scale²⁴). Perceived effectiveness was measured with three items asking participants to choose on a 5-point Likert scale the extent to which the messages discouraged them from smoking, seemed unpleasant, and made them concerned about the health effects of smoking.²⁶ Action expectancies were measured with two items; participants rated on a 5-point Likert scales their likelihood of seeking information about chemicals in cigarettes and seeking help to quit smoking. Responses to items were summed for each construct, with higher scores indicating more believability, credibility, effectiveness, and action expectancies.

Data Analysis

SAS version 9.3 was used for analysis.²⁷ Descriptive analyses and cross-tabulations were used to generate percentages of independent and dependent variables. We entered all independent variables (ie, experimental conditions and background variables) simultaneously in four separate one-way analysis of covariance (ANCOVA) models to compare mean differences among the three experimental factors. Results from the ANCOVA models included *F*-values, *p*-values, and effect sizes (semi-partial eta-squared). Additionally, we conducted analyses that included two and three-way interactions of each of three experimental conditions to determine if combinations of the health message components affected perceptions. For all analyses, statistical significance was set at $p < .05$.

Results

Descriptive Statistics

[Table 1](#) includes the percentages and means for all demographic and additional background variables used in our ANCOVA models. Slightly more women (55.4%) than men (44.6%) participated in our

Table 1. Participant Characteristics

Variable	<i>n</i>	% or mean (standard deviation)
Gender		
Male	745	44.64
Female	924	55.36
Age	1669	34.21 (10.69)
Race		
White	1376	82.44
Black or African American	126	7.55
American Indian or Alaska native	19	1.14
Asian	66	3.95
Pacific Islander	4	0.24
Other	78	4.67
Ethnicity		
Latino	192	11.50
Non-Latino	1477	88.50
Education		
Less than high school	21	1.26
High school graduate	214	12.82
Some college	594	35.59
Bachelor or associate degree	696	41.70
Graduate degree	144	8.63
Trust in government		
A great deal or a fair amount	539	32.29
Not very much or not at all	1094	65.55
No opinion	36	2.16
Smoking status		
Every day	943	56.50
Some days	726	43.50

study. Participants were on average 34.2 years old and well educated (50.3% reported a bachelor, associate, graduate, or professional degree). More participants reported smoking every day (56.5%) than some days (43.5%). Trust in government was low with 65.5% of participants reporting not trusting the federal government very much trust or at all.

Table 2 provides mean believability, credibility, perceived effectiveness, and action expectancies for all three experimental manipulations. Across all four outcomes, most constituent messages appeared impactful, with medium to high mean scores, ranging from the lowest score of 2.93 (1.11) to the highest score of 4.18 (0.89). All outcomes were also correlated with one another, with the highest correlation between believability and credibility $r = 0.79, p < .0001$) and the lowest between credibility and action expectancies ($r = 0.34, p < .0001$).

Main Effects and Interactions for Experimental Conditions

We found significant main effects for two of the three experimental conditions in our study, as seen in Table 3. Participants randomized to receive the latency of response efficacy message “within 1 month of quitting you begin to breathe better and cough less” rated the message as more believable (F -value = 16.74, $p < .0001$), credible (F -value = 7.04, $p < .001$), effective (F -value = 7.90, $p = .004$), and actionable (F -value = 5.10, $p = .006$) than participants randomized to receive the general latency of response efficacy message “within hours of quitting your health improves.” Participants randomized to receive the control latency of response efficacy message (ie, no

message) reported the message as more believable (F -value = 16.74, $p < .0001$) and credible (F -value = 7.04, $p < .001$) than individuals randomized to receive the latency of response efficacy message “within hours of quitting your health improves.”

Participants randomized to receive the interrogative cue (“Ready to be tobacco free?”) rated the messages as marginally more effective (F -value = 3.71, $p = .05$) than individuals randomized not to receive the interrogative cue. No other effects for the interrogative cue were observed for believability, credibility, or action expectancies. There were also no observed effects of the self-efficacy cue on any of the measured outcomes, nor statistically significant interactions among the three experimental conditions.

Effect sizes for each of three experimental manipulations on the four outcomes ranged from 0 to 0.02. For each outcome, the largest effect sizes were observed for the latency of response efficacy manipulation. Specifically, the effect sizes for credibility, believability, perceived effectiveness, and action expectancies of the latency of response efficacy manipulation were: $\eta^2 = 0.019$, $\eta^2 = 0.008$, $\eta^2 = 0.008$, and $\eta^2 = 0.006$, respectively.

Effects of Background Variables

Statistically significant differences in perceptions of the messages were found by age, sex, education, race/ethnicity, trust in the government, and smoking status. Most consistently, participants with little or no trust in the federal government reported the messages to be less believable (F -value = 23.00, $p < .0001$), credible (F -value = 35.12, $p < .0001$), effective (F -value = 10.26, $p < .0001$), and actionable (F -value = 13.84, $p < .0001$) than participants with a great deal or fair amount of trust in the federal government. Additionally, everyday smokers reported the messages to be less effective (F -value = 10.33, $p = .0013$), and less actionable (F -value = 14.10, $p < .0001$) than smokers who reported only smoking on some days.

Discussion

In the context of a theory-based communication campaign about tobacco constituents among adult smokers, we found that certain components of the health messages, including the timing and specificity of when health benefits accrue and motivational cues, affected how messages were received. Messages where specific health benefits accrued over a longer timeframe and that included specific health outcomes were more impactful than messages where such benefits accrued immediately and the health outcomes were more general. Inclusion of an interrogative cue marginally increased perceived effectiveness towards tobacco cessation. Overall, no consistent effects of manipulating self-efficacy were seen and no interactions occurred among intervention components. The implications of these findings for future tobacco control efforts are discussed.

Health communication and behavior change theories, including the Health Belief Model⁶ and the Protection Motivation Theory⁷ suggest that threatening messages can motivate behavior change. In support of these theories, we found that in the context of a theory-based communication campaign about tobacco constituents (ie, arsenic), most messages, regardless of condition, were impactful with medium to high mean scores across four different outcomes. These findings suggest that participants were receptive to the messages—all of which included details of the negative health effects of arsenic, a powerful visual, and sponsorship as represented by the FDA logo. The FDA has recently begun incorporating messages about tobacco constituents into their Real Cost campaign. However, there have

Table 2. Mean Scores and Standard Deviations for the Main Effects of the Experimental Factors

Experimental factor	Believability			Credibility			Perceived effectiveness			Action expectancies			
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Latency of response efficacy	General	3.88 (1.12)	4.18 (0.89)	4.05 (0.96)	3.89 (1.03)	4.05 (0.91)	4.02 (0.89)	3.62 (1.10)	3.84 (1.00)	3.69 (1.05)	2.93 (1.22)	3.13 (1.17)	3.00 (1.17)
	Present	4.05 (0.99)	4.01 (1.01)	4.01 (0.93)	4.01 (0.93)	3.97 (0.97)	3.76 (1.02)	3.76 (1.02)	3.68 (1.09)	3.76 (1.02)	3.06 (1.17)	3.06 (1.17)	2.99 (1.21)
Interrogative cue	General	4.07 (0.97)	4.00 (1.03)	4.00 (0.94)	4.00 (0.94)	3.98 (0.96)	3.73 (1.06)	3.73 (1.06)	3.71 (1.05)	3.73 (1.06)	3.02 (1.21)	3.02 (1.21)	3.02 (1.18)
	Present												

been few evaluations of how tobacco communication campaigns with constituents may be received.¹⁷ Our findings suggest that campaigns about tobacco constituents may be effective, but more research should occur on how to maximize important outcomes of such campaigns, such as ad believability, credibility, perceived effectiveness, and action expectancies.

Prior research suggests that the impact of threatening messages may be enhanced by efficacy messages that tell consumers how to avoid or overcome threats or positive, factual information on the benefits of quitting.^{9,11} Our study provides further evidence that one aspect of coping appraisal, latency of response efficacy, may be an important element of message persuasiveness for tobacco communication campaigns that emphasize the negative health effects of constituents. Although our effect sizes were small, messages consistently appeared to be more persuasive when communicating response efficacy that is specific (“you begin to breathe better and cough less”) than general (“your health improves”) and which occurs over a time period that is more believable—months compared to hours or days.

Given that our manipulation of response efficacy included two elements—time and specificity of health benefits—we cannot determine which element made the message (within 1 month of quitting you begin to breathe better and cough less) more persuasive than the message (within hours of quitting your health improves). Previous research on temporal framing indicates that messages emphasizing short-term consequences may be more impactful than messages that emphasize long-term consequences. For instance, in an experiment designed to reduce students’ alcohol use, participants were randomly assigned to read an alcohol prevention message that varied by message frame (gains vs. losses) and temporal context (short vs. long-term consequences). One month later, participants who read about the gain-framed messages emphasizing the short-term consequences of alcohol reported lower alcohol use than participants who read about the gain-framed messages emphasizing long-term consequences.²⁸ Our study included two timeframes (1 month and a few hours) and found that messages informing participants about quitting benefits accruing over 1 month were the most effective. Although this finding contradicts some previous research on the value of emphasizing short-term health consequences, there is no clear definition of what constitutes “short-term,” and it is conceivable that 1 month may also be a short enough timeframe for participants to consider the proximity of the health risk. Regardless, our findings suggest that the timeframe of messages may be an important factor in message receptivity.

Additionally, it is possible that the message (within 1 month of quitting you begin to breathe better and cough less) was more persuasive than the message (within hours of quitting your health improves) because it emphasized specific rather than general benefits of quitting. Research on tobacco warning labels indicates that warnings with “specific” health effects of smoking are likely more effective than those that emphasize “general” risks of tobacco use.⁸ Because more specific messages may enhance perceived likelihood and severity of health effects, they may more effectively target and enhance risk perceptions.⁸ In our study, it is likely that informing participants that their health would improve was less believable, logical, and/or effective than informing them that they would begin to breathe better and cough less by quitting.

Additionally, participants randomized to receive the interrogative cue (“Ready to be tobacco free?”) reported that the ads were marginally more likely to discourage them from smoking, make smoking seem unpleasant, and make them concerned about the health effects of smoking. This finding aligns with previous empirical

Table 3. Effects of the Experimental Factors Manipulated

Experimental factor	(DF _{model} / DF _{error})	Believability			Credibility			Perceived effectiveness			Action expectancies		
		F	p	Effect size	F	p	Effect size	F	p	Effect size	F	p	Effect size
Latency of response efficacy	(19, 1357)	16.74	<.0001	0.019	7.04	<.001	0.008	7.90	.004	0.008	5.10	.006	0.006
Interrogative cue	(19, 1357)	0.92	.34	0.0005	1.03	.31	0.0006	3.71	.05	0.002	2.41	.12	0.001
Self-efficacy cue	(19, 1357)	2.54	.11	0.001	0.29	.59	0.0002	0.03	.86	0.00	0.06	.81	0.00

ANCOVA results controlled for age, sex, race/ethnicity, education, trust in government, and smoking status.

work, which has found that using an interrogative cue can increase message impact.^{14,15} Previous campaigns have also capitalized on similar messages (eg, “Ready to quit chew?”) and observed changes in smoking behavior.²⁹ It is possible that using motivational cues, such as “Ready to be tobacco free?” may be important in constituent messaging where fear appeals are more novel.

Contrary to previous research, we found that manipulating self-efficacy did not change how smokers rated the messages. Self-efficacy is an important component of smoking cessation, and studies have shown smokers with high self-efficacy are more likely to successfully quit smoking and engage in cessation behavior.⁹ Research has also shown that combining self-efficacy text along with fear appeals can enhance the effectiveness of messages.^{9,11} However, our manipulation of self-efficacy with the cue (“you can quit”) produced no statistically significant differences on participants’ reports of the ad’s believability, credibility, perceived effectiveness, or action expectancies. There are several explanations for these findings. First, since the text manipulation of self-efficacy was small, it is possible that the text was not noticeable or large enough to be read by participants. Moreover, since all participants also saw text mentioning a free resource to help them quit (“smokfree.gov”), it is possible that the manipulated self-efficacy text may not have provided additional benefits. Lastly, it is possible that the text that we included was simply not sufficient in manipulating respondents’ feelings of self-efficacy to quit. While previous communication campaigns and tobacco warning labels have manipulated self-efficacy with taglines, such as “you can quit,”^{30,31} future research regarding how to best manipulate self-efficacy in constituent communication campaigns for tobacco prevention and control is warranted.

Lastly, we found that certain subgroups (ie, everyday smokers, those with less trust in the federal government) were less likely to report the constituent messages to be believable, credible, effective, or actionable. Although correlational, these data suggest that different types of individuals are more or less receptive to constituent tobacco communication campaigns, requiring more detailed research to maximize impact.^{21,32}

Limitations

Several limitations should be discussed. First, the ways in which participants viewed the messages (online, using MTurk, undivided attention) differed from how participants may view the messages in real life, for example in magazines or electronic media. Additionally, overall mean scores for each of the four outcomes were high, therefore limiting variability in responses and our ability to detect differences among conditions. Second, effect sizes for the impacts of these manipulations on outcomes were small and all effects were observed in the context of a one-time exposure of the ads. Although some of our manipulations produced consistent outcome differences, in

particular the manipulation of latency of response efficacy, the modest effect sizes suggest that these findings should be replicated and expanded upon in future studies to further inform future campaigns. With repeated exposure over time or exposure through multiple channels, effects may be enhanced. Third, our messages featured health effects of specific constituents (Arsenic causes lung tumors) and our response efficacy manipulation focused on benefits of quitting smoking (within hours your health improves; within 1 month you begin to breath better and cough less); however, the health effects within these messages were not linked to one another (short-term respiratory symptoms and lung tumors). Future message development may focus on connecting cigarette smoke constituents with quit benefits described in messages. Additionally, future research that replicates our findings (especially given the modest effect sizes), examines effects of message components over time, and uses objective measures of message receptivity (eg, eye tracking) may be particularly helpful in distinguishing how new constituent messages are received by individuals.

Conclusions

In the context of a theory-based communication campaign on tobacco constituents, our study found that smokers appear less persuaded by a communication message where general health benefits accrue immediately (within a few hours) than specific benefits over a longer timeframe (1 month). Additionally, smokers appeared to be more persuaded by messages with an interrogative cue. Tobacco communication campaigns on constituents utilizing these elements may be more effective in increasing quit intentions and decreasing tobacco use than those that do not utilize such elements. Future research, especially among at-risk populations, is warranted to determine how communication campaigns about tobacco constituents are best perceived and utilized for cessation by tobacco users.

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Declaration of Interests

None declared.

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