

Effects of Smoking Cues and Argument Strength of Antismoking Advertisements on Former Smokers' Self-efficacy, Attitude, and Intention to Refrain From Smoking

Sungkyoung Lee, Ph.D.,¹ Joseph N. Cappella, Ph.D.,¹ Caryn Lerman, Ph.D.,² & Andrew A. Strasser, Ph.D.²

¹ Center of Excellence in Cancer Communication Research, Annenberg School for Communication, University of Pennsylvania, Philadelphia, PA

² Transdisciplinary Tobacco Use Research Center, University of Pennsylvania, Philadelphia, PA

Corresponding Author: Sungkyoung Lee, Ph.D., Center of Excellence in Cancer Communication Research, Annenberg School for Communication, University of Pennsylvania, 3620 Walnut St., Philadelphia, PA 19104, USA, Telephone: (215) 746-3404; Fax: (215) 746-3407; E-mail: sklee@asc.upenn.edu

Received February 9, 2012; accepted June 15, 2012

Abstract

Introduction: This study examines the impact of smoking cues employed in antismoking advertisements on former smokers. Previous findings indicate that visual smoking cues in antismoking advertisements with weak antismoking arguments can elicit smoking urges in smokers and undermine message effectiveness. This study extends these observations to former smokers asking whether smoking cues in antismoking advertisements influence former smokers' self-efficacy, attitudes, and intention to refrain from smoking, along with smoking urges and perceived message effectiveness.

Methods: The study was a mixed 2 (smoking cues; present vs. absent) × 2 (argument strength [AS]; high vs. low) design where smoking cue was a between-subject factor and AS was a within-subject factor. Potential participants recruited via online ads were screened in a phone interview for their eligibility. A total of 105 former smokers (aged 21–65) participated in the study, which was conducted in a laboratory setting. Repeated measure ANOVA and MANOVA were used for the analyses.

Results: The results showed that the presence of smoking cues in antismoking ads undermines former smokers' behavioral self-efficacy, attitude, and intention about smoking abstinence, which increased as AS for the ads increased. Former smokers' reports of smoking urge were not affected by smoking cues or AS. However, consistent with previous findings for smokers, the presence of cues weakened perceived message effectiveness of antismoking ads rated by former smokers.

Conclusions: The effect of smoking cues on former smokers' self-efficacy, attitude, and intention to refrain from smoking is problematic. Inclusion of smoking cues in antismoking ads should be undertaken only when accompanied by strong arguments.

Introduction

Cigarette smoking is the number one preventable cause of death in the United States (Centers for Disease Control, 2009). Although considerable effort has been made to prevent smoking and promote cessation among current smokers (Piasecki, 2006; Shiffman, Pillitteri, Burton, & Marino, 2004), the central challenge is devising methods to combat smoking relapse (Piasecki, 2006). Relapse is the modal outcome for even the best smoking interventions (Piasecki, Fiore, McCarthy, & Baker, 2002; Shiffman et al., 1996), and there is no safe point beyond which relapse does not occur (Ockene et al., 2000). One line of research on antismoking appeals has investigated how visual smoking cues and strength of antismoking arguments influence various outcomes, finding unintended negative effects of such cues—specifically that exposure to ads with smoking cues and weak arguments can increase smoking urges in smokers (Kang, Cappella, Strasser, & Lerman, 2009). Relapse must be avoided if smoking cessation programs are to be successful (Warner, 2002). Nevertheless, little is known about how former smokers process smoking cues shown in antismoking ads. Research on the impact of smoking cues on the effectiveness of antismoking ads assessed by those trying to quit or those who have quit is lacking. This study is designed to redress some of these limitations.

doi:10.1093/ntr/nts171

© The Author 2012. Published by Oxford University Press on behalf of the Society for Research on Nicotine and Tobacco. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com

Smoking Cues and AS of Antismoking Advertisements

There is ample evidence that various smoking cues elicit smoking urges in smokers (Hutchison, Niaura, & Swift, 1999; Killen & Fortmann, 1997; Niaura et al., 1988). Urge in turn is associated with smoking relapse (Shadel & Cervone, 2006). The results from previous studies regarding smoking cue effects in antismoking ad processing, also consistently support that such cues, despite their contributions to messages' relevance and realism, can elicit smoking urges (Kang, Cappella, Strasser, et al., 2009; Lee, Cappella, Lerman, & Strasser, 2011). Specifically, smokers, after viewing no-smoking-cue ads, report decreased urges to smoke on a standard 10-item smoking urge measure, but their smoking urges increase after smoking-cue ads with weak antismoking arguments (Kang, Cappella, Strasser, et al., 2009). The smokers also pay more attention to smoking-cue ads compared with no-smoking-cue ads, shown in increased heart rate for smoking-cue condition (Kang, Cappella, Strasser, et al., 2009). In addition, smokers' unfavorable thoughts (i.e., wanting to continue smoking), employed as a proxy for smoking urges, decreased as ads' AS increased in no-smoking-cue ads, but in smoking-cue ads, the unfavorable thoughts remained flat or increased only slightly (Lee et al., 2011).

Smoking cues also influence perceived ad effectiveness—a strong predictor of a message's persuasiveness (Kang, 2007; Lee et al., 2011). One study found that perceived ad effectiveness decreased from no-smoking-cue to smoking-cue ads, but only for those with weak arguments (Kang, 2007). In another study, perceived ad effectiveness in no-smoking-cue condition increased as AS of antismoking ads increased, whereas in smoking-cue condition, the slope of perceived ad effectiveness was depressed, indicating that the presence of smoking cues undermines the message effectiveness (Lee et al., 2011). Similarly, antimarijuana ads with marijuana cues were also rated less favorably by high-risk adolescents than those with no cues (Kang, Cappella, & Fishbein, 2009).

AS, defined as messages' persuasive impact, is a strong and consistent predictor of persuasion (Park, Levine, Westerman, Orfgen, & Foregger, 2007). A message is more likely to be accepted if it produces more positive than negative thoughts or if it leads to relatively little counterarguing. Strong arguments are those that generate predominately positive (i.e., pro-message) thoughts in message recipients and weak arguments are those that generate unfavorable (con-thoughts) thoughts (Park et al., 2007). That is, messages with strong arguments produce less counterarguing than those with weak arguments. Therefore, smoking cues might undermine ad effectiveness by distracting message recipients from ads' antismoking arguments—keeping smoking-related thoughts/memories accessible, eliciting smoking urges, and thereby exhausting cognitive resources to process the arguments.

However, the impact of smoking cues and AS may or may not apply to former smokers in the same way it does to smokers. One study showed former smokers' level of attentional bias being intermediate between that of smokers and nonsmokers (Ehrman et al., 2002). Specifically, smokers' attention was biased toward smoking-related stimuli while that of nonsmokers were significantly less biased toward the stimuli. Former smokers' bias

scores did not differ significantly from either group on pairwise comparisons (Ehrman et al., 2002). Based on the research on attentional bias toward smoking cues, we ask how do smoking cues and the AS of antismoking ads affect former smokers' urges to smoke? Consistent with previous research on smokers, we also predict that smoking cues will undermine antismoking ad effectiveness assessed by former smokers such that smoking-cue ads with weak arguments will be rated as less effective than those in other conditions.

Self-efficacy, Attitude, and Intention about Smoking Abstinence

In an attempt to further the previous findings (Kang, 2007; Kang, Cappella, Strasser, et al., 2009; Lee, et al., 2011), we focus also on former smokers' self-efficacy, attitude, and intention about smoking abstinence. These factors are well-known predictors of actual smoking abstinence behavior (Fishbein & Ajzen, 2010; Mudde, Kok, & Strecher, 1995; Norman, Conner, & Bell, 1999).

Theories of behavior change define self-efficacy as individuals' beliefs about their capabilities to control their own level of functioning or situations that affect their behaviors required to produce desired outcomes (Ajzen, 2002; Shiffman, et al., 2000). Thus, self-efficacy is thought to mediate behavior change along with contextual cues and motivation to achieve a particular outcome and its level is used as a consistent, independent predictor of future behavior. It has been shown that self-efficacy to quit predict quitting and relapse behavior (Etter, Bergman, Humair, & Perneger, 2000; Gwaltney, et al., 2001; Shiffman, et al., 2000) and message's self-efficacy information increase participants' self-efficacy, which results in reduced cigarette consumption (Etter et al., 2000; Shiffman et al., 2000). Various smoking cues have also been shown to lower self-efficacy not to smoke while increasing smoking urges (Niaura et al., 1998). The negative association between urges and self-efficacy has been replicated in later studies (Niaura, Shadel, Britt, & Abrams, 2002; Shadel, Niaura, Goldstein, & Abrams, 2001). We also expect that smoking cues will lower former smokers' self-efficacy about smoking abstinence. Additionally, we expect that smoking cues and AS will influence former smokers' attitude about smoking abstinence. Attitude is defined as a latent disposition or tendency to respond with some degree of favorability or unfavorability to a psychological object (i.e., smoking; Fishbein & Ajzen, 2010). Exposure to smoking cues will not necessarily change the direction of participants' attitudes (i.e., from favorability to unfavorability) but rather might weaken their favorability toward smoking abstinence.

Behavioral intentions, defined as an individual's readiness to perform a behavior (Ajzen, 1991; Fishbein & Ajzen, 2010) are considered as the most immediate and important antecedent of behavior (Ajzen, 2002; Fishbein & Ajzen, 2010). Behavioral performance is primarily determined by the strength of a person's intention to perform the behavior, if the person has the necessary skills and abilities required with no environmental constraints (Ajzen, 1991; Fishbein & Yzer, 2003). The predictive validity of behavioral intentions has been well established (Fishbein & Ajzen, 2010). One meta-analysis of 48 independent studies (Armitage & Conner, 2001) reported a mean intention-behavior correlations of 0.47 across diverse behavior domains (i.e., smoking cessation, condom use, breast self-examination,

use of illicit drugs, etc.), consistent with previous intention-behavior correlations ranging from 0.45 to 0.62 across diverse behavior domains (Notani, 1998; Randall & Wolff, 1994; Sheppard, Hartwick, & Warshaw, 1988). These analyses support the claim that intention to smoke and intention to quit when measured appropriately are significant—if imperfect—predictors of subsequent smoking and quitting behaviors (Fishbein & Ajzen, 2010), and the relationship between former smokers' intentions to refrain and their continued smoking abstinence behaviors. Thus, we predict that smoking cues will likely weaken intention about smoking abstinence when such cues are shown in ads with weak arguments.

Methods

Stimuli and Design

Antismoking ads targeting adults were selected from a large archive focused on the negative health consequences of smoking and the desirability of treatment seeking and quitting smoking. Only ads in English were included. The study was a mixed 2 (smoking cue: present, absent) \times 2 (AS: low, high) design. *Smoking cues* were defined as visual scenes related to smoking behaviors: (a) objects associated with smoking (i.e., cigarettes, ashtrays); (b) indirect smoking behaviors (holding or handling a cigarette); (c) actual smoking behaviors (puffing and inhaling of a cigarette); and (d) no cues. Reliability for the scenes with smoking cues was .82 (Krippendorff's α), and the reliability for the presence (vs. absence) of smoking cues was virtually 100% (Cappella, Bindman, Sanders-Jackson, Forquer, & Brechman, 2009). AS was defined as the smoker's judgments of perceived strength and persuasiveness of the textual arguments extracted from the ads and evaluated in two steps (Zhao, Strasser, Cappella, Lerman, & Fishbein, 2011). AS scores employed in this study come from an independent set of smokers. Smoking cue—a between-subject factor—and AS—a within-subject factor—were crossed creating four conditions: (a) smoking cue with low AS, (b) smoking cue with high AS, (c) no-smoking-cue with low AS, and (d) no-smoking-cue with high AS. The four conditions differ in the presence of smoking cues and the presentation order of AS so that participants in both smoking-cue and no-smoking-cue conditions were exposed to both low and high AS conditions but the presentation order of AS differed—in one, low AS ads came first, in another, high AS ads came first. Each condition had six ads presented randomly.

Measures

The set of outcome measures were answered two times, once after each set of six ads.

Smoking urges were measured by averaging 10 items from standard urge measures (Cox, Tiffany, & Christen, 2001): (a) I have a desire for a cigarette right now; (b) Nothing would be better than smoking a cigarette right now; (c) If it were possible, I probably would smoke right now; (d) I could control things better right now if I could smoke; (e) All I want right now is a cigarette; (f) I have an urge for a cigarette; (g) A cigarette would taste good right now; (h) I would do almost anything for a cigarette right now; (i) Smoking would make me less depressed; and (j) I am going to smoke as soon as possible (1 = *strongly disagree*, 5 = *strongly agree*). Reliability (Cronbach's α) was .873 (baseline), .905 (low AS), and .865 (high AS).

Perceived ad effectiveness was measured by averaging five items: (a) These ads were convincing; (b) These ads said something important to me; (c) Watching these ads helped me feel confident about how to deal with smoking; (d) Overall, how much did you agree or disagree with what these ads said; and (e) The information in these ads about smoking is believable to me (1 = *strongly disagree*, 5 = *strongly agree*). Reliability (Cronbach's α) was .903 (low AS) and .868 (high AS).

Self-efficacy to smoking abstinence was measured by averaging 10 items, a modified version of a situational measure of self-efficacy related to smoking behavior (Cappella, Lerman, Romantan, & Baruh, 2005): how sure you are that you can avoid smoking: (a) completely and permanently in the next 3 months, (b) after a meal, (c) when thinking about a difficult problem, (d) when you are alone, (e) when you are with friends who smoke, (f) when feeling tense or upset, (g) when craving a cigarette, (h) when feeling bored, (i) when driving, and (j) when drinking coffee or alcohol (1 = *not at all sure*, 4 = *completely sure*). Reliability (Cronbach's α) was .930 (low AS) and .926 (high AS).

Attitude toward smoking abstinence was measured by averaging 6 items on 7-point semantic-differential scale: 1 = *bad/good*, 2 = *unenjoyable/enjoyable*, 3 = *unpleasant/pleasant*, 4 = *foolish/wise*, 5 = *difficult/easy*, 6 = *harmful/beneficial* with higher number meaning a more favorable attitude, which has been widely used, yielding valid and reliable estimates (Fishbein & Ajzen, 2010). Reliability (Cronbach's α) was .873 (low AS) and .847 (high AS).

Intention to abstain from smoking was measured by averaging 4 intention items weighted by corresponding confidence items. Intention items ask how likely it is that in the next 3 months, you will refrain from smoking: (a) completely and permanently, (b) when you get lonely, (c) when you are with your friends who smoke, and (d) when someone hands you a cigarette (1 = *definitely will not*, 4 = *definitely will*). Confidence items ask how confident you are in your response (1 = *not at all confident*, 7 = *extremely confident*). This measure of intention weighted by confidence, although not standard, was created and employed to increase variability of response based on the concern that former smokers would be unwilling to admit that their intentions to refrain from smoking were anything other than complete given how long many of them had been without cigarettes. Reliability (Cronbach's α) was .891 (low AS) and .875 (high AS).

Participants

Participants were recruited via online advertisements (i.e., Craigslist). Interested individuals were called to determine whether they could participate. A trained technician conducted screening interviews on the following criteria: (a) aged 21–65, (b) had smoked more than 100 cigarettes in their life time, (c) had smoked on daily basis but quit smoking completely for at least 1 year, and (d) currently not undergoing treatment for smoking cessation. All participants were provided with \$75.00 for participation and transportation. University procedures to protect human participants were strictly followed.

A total of 105 (54 female) former smokers participated in the study. This sample had a mean age of 35 ($SD = 11$), smoked an average of 15 cigarettes/day ($SD = 8.5$) when they were smokers,

with their first cigarette at the average age of 16 ($SD = 2.65$). They reported to have smoked for 12.6 years ($SD = 8.9$, $min = 1$, $max = 39$) and refrained from smoking for 6.5 years ($SD = 7.66$, $min = 1$, $max = 37$), with being slightly nicotine dependent (Fagerström Test for Nicotine Dependence: $M = 3.61$, $SD = 2.05$), and none of them were currently undergoing any treatment for cigarette smoking. The majority were Caucasian ($N = 74$), followed by African American ($N = 26$), Asian ($N = 1$), American-Indian/Native-Alaskan ($N = 1$), and multirace or other ($N = 3$).

Procedure

Participants attended a single, laboratory-based experimental session individually. Upon arrival at the lab, each participant was informed of the study purpose and experimental procedure, signed informed consent, and was seated in comfortable chair, using a desktop computer. Four sensors were placed on the participant for the collection of on-going physiological responses, which will not be discussed further in this article. Each participant was randomly assigned to one of four conditions and was instructed to pay close attention to the antismoking ads because of survey questions relevant to the ads later on. The participant answered demographics, smoking history (including participant's stage of abstinence using former smoker version of contemplation ladder), and (baseline) smoking urges, then watched two sets of 6 ads. After each set of ads, the participant completed outcome measures for smoking urges, perceived ad effectiveness, and self-efficacy, attitude, and intention regarding smoking abstinence. Upon session completion, the participant was debriefed, compensated, and dismissed.

Results

Repeated measure ANOVA procedures were performed to test significant difference in smoking urges and perceived ad effectiveness between smoking-cue conditions, the groups of AS condition, and the smoking cue \times AS interaction.

Smoking Urges

Baseline smoking urges, measured before ad-viewing, were entered as a covariate. The main effect of AS on smoking urges was significant, $F(1, 102) = 4.382$, $p = .039$, and $\eta^2 = .041$. Participants who were exposed to weak argument ads reported higher smoking urges ($M_{adjusted} = 1.207$) compared with those who were exposed to strong argument ads ($M_{adjusted} = 1.144$). However, the main effect of smoking cues and the smoking cue \times AS interaction were not significant ($F_s < 1$).

Perceived Ad Effectiveness

The main effect of smoking cues on perceived ad effectiveness was not significant ($F < 1$). However, the main effect of AS was significant, $F(1, 90) = 22.817$, $p < .001$, and $\eta^2 = .202$. Participants reported greater perceived ad effectiveness to strong argument ads ($M = 4.333$) compared with weak argument ads ($M = 3.918$). The smoking cue \times AS interaction was also significant, $F(1, 90) = 4.495$, $p = .037$, and $\eta^2 = .048$. In both cue conditions, AS influences the changes in perceived ad effectiveness, as shown in Table 1. Specifically, in no-smoking-cue condition, perceived ad effectiveness did not significantly differ as a function of AS, however, in smoking-cue condition, perceived ad effectiveness significantly dropped as AS decreased. This result shows that smoking cues undermine perceived ad effectiveness when arguments are weak.

Self-efficacy, Attitude, and Intention to Refrain from Smoking

Former smokers' smoking abstinence was explored using their self-reported self-efficacy, attitude, and intention to refrain from smoking. These three variables were deemed conceptually related, that is, each measures some aspect of strength of smoking abstinence, and, thus, a smoking cue (2) \times AS (2) MANOVA procedure was employed to test with stage of abstinence being treated as a covariate.

The main effect of smoking cues was not significant on attitude, $F < 1$, approached significance on self-efficacy, $F(1, 102) = 3.622$, $p = .060$, and was significant on intention, $F(1, 102) = 6.905$, $p = .010$, and $\eta^2 = .063$. Participants in smoking-cue condition reported lower self-efficacy ($M_{adjusted} = 3.503$) compared with those in no-smoking-cue condition ($M_{adjusted} = 3.646$). More significantly, participants in smoking-cue condition had lower intention ($M_{adjusted} = 3.064$) compared with those in no-smoking-cue condition ($M_{adjusted} = 3.421$). The main effect of AS and smoking cue \times AS interaction were not significant on any of the three outcome variables (see Table 1).

First Set of Outcomes

A second set of analyses focused only on outcomes after the first set of ads, with stage of abstinence being treated as a covariate. By focusing on the first set of self-reported outcome variables, we avoid the contaminating effects of sensitization. Tables 2 and 3 present these results. There were significant effects of smoking cues on self-efficacy ($F(1, 102) = 4.277$, $p = .041$, $\eta^2 = .040$), attitude ($F(1, 102) = 4.472$, $p = .037$, $\eta^2 = .042$), and intention ($F(1, 102) = 6.131$, $p = .015$, $\eta^2 = .057$), as shown in Table 2. Participants who were exposed to smoking-cue ads

Table 1. Mean and (Standard Error) on Outcome Variables (Scores Aggregated Across Times 1 and 2)

Cue	Argument strength (AS)	Perceived effectiveness	Self-efficacy to refrain ^a	Attitude to refrain ^a	Intention to refrain ^a
Cue	Low	3.796 (.135) ^b	3.471 (.055)	6.495 (.158)	3.010 (.107)
	High	4.396 (.105) ^c	3.535 (.054)	6.514 (.156)	3.117 (.091)
No cue	Low	4.040 (.138) ^d	3.656 (.058)	6.655 (.165)	3.370 (.112)
	High	4.271 (.108) ^e	3.636 (.057)	6.674 (.164)	3.472 (.096)

Notes. ^aAdjusted mean and SE with stage of abstinence being entered as a covariate. ^{b,c}Significant ($p < .001$), ^{d,e}Not significant ($p = .066$).

Table 2. Mean and (Standard Error) for the Cue Effect on Self-efficacy, Attitude, and Intention (Scores From Time 1 Only)

Cue	Self-efficacy to refrain ^a	Attitude to refrain ^a	Intention to refrain ^a
Cue	3.447 (.056) ^b	5.979 (.122) ^d	2.995 (.103) ^f
No cue	3.615 (.059) ^c	6.353 (.128) ^e	3.365 (.108) ^g

Notes. ^aAdjusted mean and SE with stage of abstinence being entered as a covariate. The difference between ^b and ^c is significant ($p = .041$), the difference between ^d and ^e is significant ($p = .037$), and the difference between ^f and ^g is significant ($p = .015$).

reported lower self-efficacy, less favorable attitude, and weaker intention to abstain from smoking compared with those who were exposed to ads with no-smoking-cues.

Table 3 presents the interaction effects of smoking cue \times AS from the first round of outcomes. A two-way interaction between AS and smoking cue was significant on intention ($F(3, 100) = 3.286, p = .024, \eta^2 = .090$). Participants who were exposed to smoking-cue ads with weak arguments had the lowest intention to abstain from smoking, whereas those who were exposed to no-smoking-cue ads with strong arguments had the highest intention. Smoking-cue ads with strong arguments and no-smoking-cue ads with weak arguments were in-between. The effects on self-efficacy and attitude were not statistically significant (Efficacy: $F(3, 100) = 1.866, p = .140$ and Attitude: $F(3, 100) = 1.579, p = .199$) but were in the same direction as the results on intention (Table 3). The presence of smoking cues in antismoking ads undermines message's persuasive intent.

Discussion

The findings of the current study confirm the potential negative influence of smoking cues shown in antismoking advertisements for which AS differs. That is, the use of smoking cues to advance tobacco control efforts can undermine the persuasiveness of antismoking advertisements. Previous findings on smokers' responses are extended to the population of former smokers. The results are generally consistent with those from the previous research (Kang, 2007; Kang, Cappella, Strasser, et al., 2009; Lee et al., 2011), showing smoking cues and argument strength as critical in former smokers' reactions to ads. Certain combinations of these two design factors can negatively influence former smokers' self-efficacy, attitude, and intention to refrain from smoking, undermining their judgments of perceived message effectiveness.

Contrary to our expectations, the impact of smoking cues on former smokers' smoking urges was not statistically significant. However, this null effect may result from several factors. The pattern of means in smoking urges across conditions was similar to that from previous studies targeting smokers. Given that eligible participants in this study had to have refrained from smoking at least 1 year and their average length of abstinence

Table 3. Mean and (Standard Error) for the Cue and Argument Strength as Effect (Scores From Time 1 Only)

Cue	AS	Self-efficacy to refrain ^{a,b}	Attitude to refrain ^{a,c}	Intention to refrain ^{a,d}
Cue	Low	3.395 (.078)	6.032 (.171)	2.834 (.143)
	High	3.501 (.080)	5.924 (.175)	3.165 (.146)
No cue	Low	3.577 (.080)	6.398 (.175)	3.265 (.146)
	High	3.658 (.086)	6.300 (.189)	3.480 (.157)

Notes. ^aAdjusted mean and SE with stage of abstinence being entered as a covariate. ^{b,c}Not significant ($p = .140$ and $p = .199$), ^dSignificant ($p = .024$).

was reported to be longer than 6 years, the nonsignificant impact of cues on smoking urges might reflect the lengthy periods of abstinence with real urges substantially reduced in this sample. Also, the standard questions about smoking urge are quite direct in asking about smoking right now. Former smokers may seek to manage their impressions in the context and not admit enhanced levels of urge—despite anonymity. Given these considerations, the absence of differences in self-reported urge may be due to factors of the specific population of long-lived abstainers or motivations to manage impressions. Subsequent studies should consider more covert measures.

Our results on perceived ad effectiveness are consistent with those from previous studies. Smoking cues in weak antismoking arguments ads undermine message persuasiveness for former smokers' ad processing as was the case for smokers. As we expected, strong antismoking argument ads were rated higher in perceived ad effectiveness compared with ones with weak antismoking arguments. In addition, when antismoking ads include smoking cues and their arguments not to smoke are weak, they were rated as the least effective among four conditions.

We also investigated the impact of smoking cues and AS on self-reported self-efficacy, attitude, and intention about smoking abstinence based on the notion that messages perceived as effective produce greater changes in beliefs, attitudes, intentions, and behaviors compared with messages perceived as weak or less effective (Barrett, Cappella, Fishbein, Yzer, & Ahern, 2009). Our results indicate that smoking-cue ads lower former smokers' self-efficacy and intention to refrain from smoking. Further analyses were performed using data collected after the first set of outcomes only, showed that the negative effects of smoking cues on behavioral self-efficacy, attitude, and intention about smoking abstinence in former smokers were significant. In addition, antismoking ads showing smoking cue in the context of weak antismoking arguments, which were perceived less effective than any other conditions, also led to former smokers' reporting the lowest intention to continue abstinence among all conditions.

Taken together, antismoking ads frequently use visual smoking cues to carry their message of harm and risk (Terry-McElrath et al., 2005). However, the inclusion of such cues can undermine message effectiveness and encourage intentions to smoke when accompanied by weak antismoking arguments. More

importantly, the findings show that the negative impact of smoking cues is significant not only for the current smokers but also for the former smokers. When campaigns target smokers using smoking cues, inadvertent spillover to former smokers can occur despite good intentions. Unless design of antismoking ads are sensitive to the addictive and habitual bases of smoking, unintended negative effects—even boomerang effects—can occur in target population as a function of exposure to such ads (Babrow, Black, & Tiffany, 1990). These results should cause concern to tobacco control campaigns given the high recidivism rate for smoking (88%), even if not precipitous (Brandon, Tiffany, Obremski, & Baker, 1990). Our findings, together with the previous studies, support the idea that smoking cues should be employed in antismoking ads only in the most compelling circumstances—for example, when ad testing indicates that the arguments employed are strong. More comprehensive efforts focusing on antismoking advertisements and behavioral responses to them need to be developed and implemented.

Finally, although we measured behavioral self-efficacy, attitude, and intention to refrain from smoking (or maintain abstinence), we did not measure smoking abstaining behavior directly. We are hoping, in this line of research (cue effect on target populations—current or former smokers), to see a study investigating how smoking cues influence smoking or abstaining behavior.

Funding

This study was supported by funding from National Cancer Institute (P50CA095856).

Declaration of Interests

None declared.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211. doi:10.1016/0749-5978(91)90020-T
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, *32*, 665–683. doi:10.1111/j.1559-1816.2002.tb00236.x
- Armitage, C. J. & Conner, M. (2001). Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social, 40*, 471–499. doi:10.1348/014466601164939
- Babrow, A. S., Black, D. R., & Tiffany, S. T. (1990). Beliefs, attitudes, intentions, and a smoking-cessation programs: A planned behavior analysis of communication campaign development. *Health Communication*, *2*, 145–163. doi:10.1207/s15327027hc0203_2
- Barrett, D. W., Cappella, J. N., Fishbein, M., Yzer, M., & Ahern, R. K. (2009). Measuring the effectiveness of anti-drug Public Service Announcements. In M. B. Hinner (Ed.), *Freiberger Beitrage zur Interkulturellen und Wirtschaftskommunikation: A Forum for General and Intercultural Business Communication*. Frankfurt am Main, Germany: Peter Lang GmbH.
- Brandon, T.H., Tiffany, S. T., Obremski, K.M., & Baker, T.B. (1990). Postcessation cigarette use: The process of relapse. *Addictive Behaviors*, *15*, 105–114. doi:10.1016/0306-4603(90)90013-N
- Cappella, J. N., Bindman, A., Sanders-Jackson, A., Forquer, H., & Brechman, J. (2009). *Summary of coding: Anti-smoking public service announcements*. Philadelphia: Center for Excellence in Cancer Communication Research, Annenberg School for Communication, University of Pennsylvania.
- Cappella, J. N., Lerman, C., Romantan, A., & Baruh, L. (2005). News about genetics and smoking. *Communication Research*, *32*, 478–502. doi:10.1177/0093650205277320
- Centers for Disease Control. (2009). Cigarette smoking among adults and trends in smoking cessation—United States, 2008. *Morbidity and Mortality Weekly Report*, *58*, 1227–1232. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5844a2.htm>
- Cox, L. S., Tiffany, S. T., & Christen, A. G. (2001). Evaluation of the brief questionnaire of smoking urges (QSU-brief) in laboratory and clinical settings. *Nicotine & Tobacco Research*, *3*, 7–16. doi:10.1080/14622200020032051
- Ehrman, R. N., Robbins, S. J., Bromwell, M. A., Lankford, M. E., Monterosso, J. R., & O'Brien, C. P. (2002). Comparing attentional bias to smoking cues in current smokers, former smokers, and non-smokers using a dot-probe task. *Drug and Alcohol Dependence*, *67*, 185–191. doi:10.1016/S0376-8716(02)00065-0
- Etter, J. F., Bergman, M. M., Humair, J. P., & Perneger, T. V. (2000). Development and validation of a scale measuring self-efficacy of current and former smokers. *Addiction*, *95*, 901–913. doi:10.1046/j.1360-0443.2000.9569017.x
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York: Psychology Press.
- Fishbein, M., & Yzer, M. C. (2003). Using theory to design effective health behavior interventions. *Communication Theory*, *13*, 164–183. doi:10.1111/j.1468-2885.2003.tb00287.x
- Gwaltney, C. J., Shiffman, S., Norman, G. J., Pty, J. A., Kassel, J. D., Gnys, M., . . . Balabanis, M. (2001). Does smoking abstinence self-efficacy vary across situations? Identifying context-specificity within the relapse situation efficacy questionnaire. *Journal of Consulting and Clinical Psychology*, *69*, 516–527. doi:10.1037//0022-006.69.3.516
- Hutchison, K. E., Niaura, R., & Swift, R. (1999). Smoking cues decrease prepulse inhibition of the startle response and increase subjective craving in humans. *Experimental and Clinical Psychopharmacology*, *7*, 250–256. doi:10.1037/1064-1297.7.3.250
- Kang, Y. (2007). *The effects of smoking cues in anti-smoking public service announcements on smoking urge, message processing and intention to quit smoking* (Ph.D. dissertation). Retrieved from University of Pennsylvania, Philadelphia.

- Kang, Y., Cappella, J. N., & Fishbein, M. (2009). The effect of marijuana scenes in anti-marijuana public service announcements on adolescents' evaluation of ad effectiveness. *Health Communication, 24*, 483–493. doi:10.1080/10410230903104269
- Kang, Y., Cappella, J. N., Strasser, A. A., & Lerman, C. (2009). The effect of smoking cues in antismoking advertisements on smoking urge and psychophysiological reactions. *Nicotine & Tobacco Research, 11*, 254–261. doi:10.1093/ntr/ntn033
- Killen, J. D. & Fortmann, S. P. (1997). Craving is associated with smoking relapse: findings from three prospective studies. *Experimental and Clinical Psychopharmacology, 5*, 137–142. doi:10.1037/1064-1297.5.2.137
- Lee, S., Cappella, J. N., Lerman, C., & Strasser, A. A. (2011). Smoking cues, argument strength, and perceived effectiveness of antismoking PSAs. *Nicotine & Tobacco Research, 13*, 282–290. doi:10.1093/ntr/ntq255
- Mudde, A. N., Kok, G., & Strecher, V. J. (1995). Self-efficacy as a predictor for the cessation of smoking: Methodological issues and implications for smoking cessation programs. *Psychology & Health, 10*, 353–367. doi:10.1080/08870449508401956
- Niaura, R. S., Rohsenow, D. J., Binkoff, J. A., Monti, P. M., Pedraza, M., & Abrams, D. B. (1988). Relevance of cue reactivity to understanding alcohol and smoking relapse. *Journal of Abnormal Psychology, 97*, 133–152. doi:10.1037/0021-843X.97.2.133
- Niaura, R. S., Shadel, W. G., Abrams, D. B., Monti, P. M., Rohsenow, D. J., & Sirota, A. (1998). Individual differences in cue reactivity among smokers trying to quit: effects of gender and cue type. *Addictive Behaviors, 23*, 209–224. doi:10.1016/S0306-4603(97)00043-9
- Niaura, R. S., Shadel, W. G., Britt, D. M., & Abrams, D. B. (2002). Response to social stress, urge to smoke, and smoking cessation. *Addictive Behaviors, 27*, 241–250. doi:10.1111/j.1360-0443.1991.tb01732.x
- Norman, P., Conner, M., & Bell, R. (1999). The theory of planned behavior and smoking cessation. *Health Psychology, 18*, 89–94. doi:10.1037/0278-6133.18.1.89
- Notani, A. S. (1998). Moderators of perceived behavioral control's predictiveness in the theory of planned behavior: a meta-analysis. *Journal of Consumer Psychology, 7*, 257–271. doi:10.1207/s15327663jcp0703_02
- Ockene, J. K., Emmons, K. M., Mermelstein, R. J., Perkins, K. A., Bonollo, D. S., Voorhees, C. C., & Hollis, J. F. (2000). Relapse and maintenance issues for smoking cessation. *Health Psychology, 19*(Suppl 1), 17–31. doi:10.1037/0278-6133.19.Suppl1.17
- Park, H. S., Levine, T. R., Westerman, C. Y. K., Orfgen, T., & Foregger, S. (2007). The effects of argument quality and involvement type on attitude formation and attitude change: A test of dual-process and social judgment predictions. *Human Communication Research, 33*, 81–102. doi:10.1111/j.1468-2958.2007.00290.x
- Piasecki, T. M. (2006). Relapse to smoking. *Clinical Psychology Review, 26*, 196–215.
- Piasecki, T. M., Fiore, M. C., McCarthy, D. E., & Baker, T. B. (2002). Have we lost our way? The need for dynamic formulations of smoking relapse proneness. *Addiction, 97*, 1093–1108. doi:10.1046/j.1360-0443.2002.00216.x
- Randall, D. M., & Wolff, J. A. (1994). The time interval in the intention-behavior relationship: Meta-analysis. *British Journal of Social Psychology, 33*, 405–418. doi:10.1111/j.2044-8309.1994.tb01037.x
- Shadel, W. G., & Cervone, D. (2006). Evaluating social-cognitive mechanisms that regulate self-efficacy in response to provocative smoking cues: An experimental investigation. *Psychology of Addictive Behaviors, 20*, 91–96. doi:10.1037/0893-164X.20.1.91
- Shadel, W. G., Niaura, R., Goldstein, M. G., & Abrams, D. B. (2001). Cognitive avoidance as a method of coping with a provocative smoking cue: the moderating effect of nicotine dependence. *Journal of Behavioral Medicine, 24*, 169–182. doi:10.1023/A:1010762631464
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Psychology, 15*, 325–343. Retrieved from <http://www.jstor.org/stable/2489467>
- Shiffman, S., Balabanis, M. H., Paty, J. A., Engberg, J., Gwaltney, C. J., Liu, K. S., Paton, S. M. (2000). Dynamic effects of self-efficacy on smoking lapse and relapse. *Health Psychology, 19*, 315–323. doi:10.1037/0278-6133.19.4.315
- Shiffman, S., Gnys, M., Richards, T. J., Paty, J. A., Hickcox, M., & Kassel, J. D. (1996). Temptations to smoke after quitting: A comparison of lapsers and maintainers. *Health Psychology, 15*, 455–461. doi:10.1037/0278-6133.15.6.455
- Shiffman, S., Pillitteri, J. L., Burton, S. L., & Di Marino, M. E. (2004). Smoker and ex-smoker reactions to cigarettes claiming reduced risk. *Tobacco Control, 13*, 78–84. doi:10.1136/tc.2003.005272
- Terry-McElrath, Y., Wakefield, M., Ruel, E., Balch, G. I., Emery, S., Szczytko, G., Clegg-Smith K, et al. (2005). The effects of antismoking advertisement executional characteristics on youth comprehension, appraisal, recall, and engagement. *Journal of Health Communication, 10*, 127–143. doi:10.1080/10810730590915100
- Warner, K. E. (2002). Tobacco harm reduction: Promise and perils. *Nicotine & Tobacco Research, 4*(Suppl. 2), S61–S71. doi:10.1080/1462220021000032825
- Zhao, X., Strasser, A., Cappella, J. N., Lerman, C., & Fishbein, M. (2011). A measure of perceived argument strength: Reliability and validity. *Communication Methods and Measures, 5*(1), 48–75. doi:10.1080/19312458.2010.547822