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Effects of E-cigarette Advertising Message Form and Cues on Cessation Intention: An Exploratory Study

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Abstract

A common message in e-cigarette advertising is that e-cigarettes can be used anywhere. E-cigarette advertisements often express this message implicitly (e.g., “Whenever, wherever”) alongside images of e-cigarettes that physically resemble combustible cigarettes. These implicit messages and “cigalike” images may cross-cue combustible cigarette smoking cognitions and behavior. This exploratory study was a 2 (message form: implicit or explicit e-cigarette use anywhere message) by 2 (presence or absence of e-cigarette cue) experiment with U.S. adult smokers (n = 2,201). Participants were randomized to view e-cigarette advertisements that varied by study condition. Three combustible cigarette outcomes were investigated: smoking cessation intention, smoking urges, and immediate smoking behavior. Mediation analysis was also performed to investigate mechanisms of the message form effect through descriptive and normative beliefs about smoking. Compared to its explicit counterpart, the implicit e-cigarette use anywhere message evoked greater smoking urges. Participants exposed to the implicit message also perceived cigarette smoking to be more prevalent and, in turn, reported greater cessation intention. There was no evidence of e-cigarette cue or message form × cue interaction effects. Implicit e-cigarette use anywhere messages may create a predisposition towards smoking compared to their explicitly written counterparts, but whether this effect undermines cessation deserves further attention.

Keywords

electronic cigarettes; smokers; cues; marketing; adults

Dual use of combustible cigarettes and e-cigarettes is common, with 58.8% of e-cigarette users reporting smoking combustible cigarettes as well (Centers for Disease Control and Prevention, 2016b). Dual use could, on the one hand, be a temporary phenomenon in which

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smokers use e-cigarettes to reduce smoking and eventually quit. Although the effectiveness of e-cigarettes in tobacco cessation remains in question (El Dib et al., 2017), cigarette smokers commonly cite quitting smoking as a reason for e-cigarette use (Adriaens, Van Gucht, & Baeyens, 2017; Caraballo, Shafer, Patel, Davis, & McAfee, 2017). On the other hand, dual use could represent smokers using e-cigarettes as a supplement to rather than substitute for combustible cigarettes. Smokers report using e-cigarettes in places and situations where they cannot smoke combustible cigarettes (Adriaens et al., 2017; Pokhrel, Herzog, Muranaka, Regmi, & Fagan, 2015). Given the physical resemblance between leading e-cigarette brands and combustible cigarettes (Hsu, Sun, & Zhu, 2018), such behavior could renormalize cigarette smoking, discouraging smoking cessation and undermining the effectiveness of smoke-free policies (World Health Organization, 2014).

One factor that may influence dual use and its impact on smoking cessation is e-cigarette advertising. A prominent theme in e-cigarette advertising is that e-cigarettes can be used anywhere, particularly in situations when one cannot smoke (Grana & Ling, 2014; Willis, Haught, & Morris II, 2017). Messages like this may lead smokers to substitute e-cigarettes for cigarettes on a situational basis rather than exclusively (Grana & Ling, 2014; Singh et al., 2016) and, ultimately, deter quitting. The way in which e-cigarette ads communicate this “e-cigarette use anywhere” message is noteworthy, as the message is often implied rather than explicitly stated and accompanied by visuals. Examples from e-cigarette ads include “Whenever, wherever” (with pictures of e-cigarettes resembling cigarettes and a restaurant, a traditionally non-smoking venue) (Fin) and “Where and when you want” (with pictures of a cigarette-like e-cigarette and non-smoking sign) (Green Smoke) (Stanford School of Medicine, n.d.).

Since e-cigarette use anywhere messages are advertising claims, we would expect e-cigarette ads displaying them to encourage e-cigarette use regardless of whether the messages are implicitly or explicitly stated. However, we wanted to explore whether they could also affect combustible cigarette use, particularly when implicitly stated. To our knowledge, no studies have investigated the impact of message form on outcomes not specific to the behavior advocated in the message (e.g., combustible cigarette use for an e-cigarette ad message). Nevertheless, research suggests people interpret advertising claims broadly, generalizing beyond information explicitly included in the advertisement (Andrews, Netemeyer, & Burton, 1998; Russo, Metcalf, & Stephens, 1981). Implicitly stated claims may be especially vulnerable to such extrapolation since they are ambiguous and require readers to make inferences to understand their meaning. Compared to explicitly stated messages, they may also be more susceptible to biased processing. In other words, how they are interpreted may be influenced by priming and cues (Chaiken & Maheswaran, 1994; Chen & Chaiken, 1999; Higgins & Bargh, 1987).

Priming and cues could lead smokers to interpret an implicit e-cigarette use anywhere message in a way that encourages smoking. For decades tobacco advertising and public relations activities have linked themes of freedom and social acceptability to smoking to increase its appeal (Cardador, Hazan, & Glantz, 1995; Cortese, Lewis, & Ling, 2009; Landman, Cortese, & Glantz, 2008; National Cancer Institute, 2008). An implicit e-cigarette use anywhere message could activate these associations, which have been long primed in

smokers. That is, relative to its explicit counterpart (i.e., “Use Evermist E-Cigs anywhere you want.”), a message like “Anytime, anywhere.” could be more likely to stimulate thoughts about combustible cigarettes and their social acceptability and, thus, encourage cigarette smoking. We hypothesized that an implicit e-cigarette use anywhere message would undermine quitting more than the explicit version:

> H1: Participants exposed to the implicit e-cigarette use anywhere message will report lower quit smoking intention than those exposed to the explicit e-cigarette use anywhere message.

In addition to priming, e-cigarette cues may lead smokers to interpret e-cigarette use anywhere messages in a pro-smoking way. Experimental studies suggest ad messages can influence both beliefs about product attributes they mention and beliefs about related but unmentioned attributes (Yi, 1990a, 1990b). Effects on related, unmentioned attributes may increase when visual cues suggest the presence of these attributes because the cues increase their salience and accessibility (Yi, 1990a, 1990b). Although e-cigarettes are distinct from combustible cigarettes, they could increase the salience and accessibility of combustible cigarette-related thoughts, since some e-cigarette models (“cigalikes”) are strikingly similar to combustible cigarettes. Moreover, the aerosol they emit can resemble cigarette smoke. We predicted e-cigarette images would enhance the effect of an implicit e-cigarette use anywhere message on smoking cessation:

> H2: The effect of message form will be moderated by e-cigarette cue presence such that in the presence of the cue, the implicit e-cigarette use anywhere message will have a greater effect on quit smoking intention than in the absence of the cue.

We additionally investigated whether e-cigarette images independently of e-cigarette use anywhere messages influence smoking cessation outcomes. Evidence of cross-cueing effects of e-cigarette images on combustible cigarette outcomes among smokers is mixed. Television or video ads containing cigalikes stimulated cigarette smoking desire and urges (Kim, Lee, Shafer, Nonnemaker, & Makarenko, 2015; King et al., 2016) and had a marginally significant effect on smoking behavior (Maloney & Cappella, 2016). Smokers exposed to ads containing cigalikes were more likely to smoke during the study than those exposed to ads without the images (Maloney & Cappella, 2016). However, there was no evidence of effects on quitting-related self-efficacy, attitudes, or intentions (Maloney & Cappella, 2016). A study of print ads containing cigalikes also found no evidence of effects on cessation intentions nor smoking urges or behavior (Jo, Golden, Noar, Rini, & Ribisl, 2018). Given that more studies have linked cigalike images to pro-smoking outcomes than not, we hypothesized:

> H3: Participants exposed to the e-cigarette cue (i.e., image of a cigalike) will report lower quit smoking intention than participants not exposed to the e-cigarette cue.

We investigated mechanisms of the message form effect through normative beliefs about smoking. As previously noted, an implicit e-cigarette use anywhere message like “Anytime, anywhere.” may activate associations between freedom, social acceptability, and cigarette smoking, which have been primed by tobacco industry communications. Such a message may also elicit thoughts about the physical environment, signaling that one can smoke

anywhere. Venues allowing smoking communicate that smoking is prevalent (descriptive normative beliefs) and approved (injunctive normative beliefs) (Mead, Rimal, Ferrence, & Cohen, 2014). We hypothesized that the implicit message, by making information about such environments accessible, would trigger descriptive and injunctive normative beliefs supportive of smoking. Beliefs that cigarette smoking is socially approved and prevalent may, in turn, be associated with reduced quit intention, as people perceive less normative pressure to quit smoking (Bryant, Bonevski, Paul, O'Brien, & Oakes, 2011). We hypothesized:

> H4, H5: The implicit e-cigarette use anywhere message will be associated with descriptive and injunctive normative beliefs that are more supportive of smoking. More supportive descriptive and injunctive normative beliefs will be associated with lower quit intention.

Since an e-cigarette cue may enhance these indirect effects by making thoughts about combustible cigarettes and the social acceptability of smoking more accessible as well, we further predicted:

> H6, H7: The indirect effects of message form through descriptive and injunctive normative beliefs about smoking will be moderated by e-cigarette cue presence such that in the presence of the cue, effects will be greater than in the absence of the cue.

Although cessation intention was our primary outcome, we also investigated two secondary outcomes: smoking urges and smoking behavior during the study.

Method

In November 2015, we conducted a between-subjects factorial experiment through Amazon Mechanical Turk (MTurk). Through the platform, we recruited a convenience sample of 2,201 adult cigarette smokers, which approximated our target sample size of 2,260. Power calculations assumed power of 0.80, alpha of 0.05, quit intention variance of 1.80 (Klein, Zajac, & Monin, 2009), and quit intention effect size of 0.11, a pooled estimate based on studies of anti-smoking messages and e-cigarette cues (Lee, Cappella, Lerman, & Strasser, 2013; Maloney & Cappella, 2016; Strasser et al., 2009). Users with a 90% or higher approval rate of past MTurk tasks and accounts registered in the U.S. were asked to provide informed consent and screened for their ability to comprehend English and their being an established current smoker (i.e., smoking 100+ cigarettes in their entire lifetime and currently smoking every day or some days). We directed eligible users to a Qualtrics survey.

Participants answered questions about their demographics, nicotine dependence, smoking recency, and e-cigarette advertising exposure. They were then told they would be shown e-cigarette ads and randomly assigned in equal numbers to one of eight conditions, four of which are the focus of this study. Study conditions combined one of the two messages (implicit or explicit e-cigarette use anywhere message) with or without the e-cigarette cue. In each condition, participants viewed four ads representing variations of the study condition. Each ad appeared on the computer screen for ten seconds, and the order of the ads was randomly determined for each participant. After exposure to all four ads, participants

answered outcome measures and additional questions about their tobacco use and demographics and received a $2.00 USD incentive. Outcome measures were only assessed post-manipulation to avoid potential priming and sensitization effects due to pre-manipulation assessment. Figure 1 outlines the process for creating the analytic sample. The University of North Carolina at Chapel Hill Institutional Review Board approved the study.

Stimuli Development

We selected two MarkTen ads and two Fin ads for use in the study. The full-page, color ads appeared in U.S. consumer publications at least once from July 2010 through December 2014. The ads were selected because they supported the two message conditions and because the e-cigarette images could be removed without comprising the integrity of the ad. We worked with a graphic designer to manipulate the ads, using Adobe Photoshop, to fit the four study conditions. Stimuli are available upon request.

The manipulated factors were message form and e-cigarette cue presence. Message form conditions included “Anytime, anywhere.” (implicit) and “Use Evermist E-Cigs anywhere you want.” (explicit). The messages were based on messages used in actual e-cigarette ads (e.g., Blu). However, the explicit message was edited slightly for length and to clarify that the behavior being promoted was e-cigarette use – not cigarette smoking. To avoid confounding manipulation effects with e-cigarette branding effects, we also substituted brand names in the original ad messages with a fictitious brand name (i.e., Evermist E-Cigs) used in a previous study (Pepper, Emery, Ribisl, Southwell, & Brewer, 2014). The four ads presented a cigalike in various contexts: in a bar, in a restaurant, used by a person indoors, and used by a person outdoors. These cigalike images served as cues in the e-cigarette cue conditions. In the no-cue conditions, these images were digitally removed.

Quality Assurance

To minimize potential biases that online survey takers may introduce, we implemented several measures. First, we masked the study’s purpose and screening criteria with a broad, non-specific study description and by asking questions unrelated to eligibility (e.g., preferred cigarette brand) during eligibility screening. Second, we prevented the same participant from completing the survey multiple times by selecting the “prevent ballot box stuffing” option on Qualtrics and using TurkCheck (Blanchard, n.d.). Third, we included three attention checks in the questionnaire. Over 91% of the sample correctly answered all three attention check questions. Moreover, our results did not change if we excluded participants failing one or more attention checks. Thus, we retained cases, regardless of their attention check failure rate. Fourth, we asked participants to rate their effort in completing the survey. Responses from the five participants who reported no effort were dropped from analysis. Lastly, we analyzed responses for patterns that could indicate a participant that actively contaminated the data (Mason & Suri, 2012). Duplicate Turker IDs represented about 5% of participants assessed for eligibility. Data for these IDs were removed.

Measures

Primary outcome.—Quit smoking intention was assessed using three items: “How [interested are you in quitting smoking, much do you plan to quit smoking, likely are you to

quit smoking] regular cigarettes in the next 6 months?" (1 = "not at all interested" to 5 = "extremely interested") (Klein et al., 2009). Scores were averaged to create a composite score (α = 0.90).

Mediating variables.—Mediators of the relationship between message form and quit smoking intention included descriptive and injunctive normative beliefs about smoking: "What percentage of U.S. adults do you think smoke regular cigarettes at least once a week?" (0–100%) and "How would you describe most people's opinion of smoking regular cigarettes?" (1 = "very negative" to 7 = "very positive") (Population Assessment of Tobacco and Health (PATH) Study (NIDA), 2013; Wakefield, Germain, Durkin, & Henriksen, 2006; Wilkinson & Abraham, 2004).

Secondary outcomes.—Secondary outcomes included smoking urges and smoking behavior. We measured smoking urges using the 10-item Questionnaire of Smoking Urges (Cox, Tiffany, & Christen, 2001). Items were rated on a five-point scale with higher scores indicating higher urges (α = 0.93). Following previous research, items mentioning a "cigarette" were changed to "regular cigarette" to emphasize that urges related to combustible cigarettes – not e-cigarettes – were being assessed (Maloney & Cappella, 2016). We assessed smoking behavior with "Have you smoked a regular cigarette at any point while filling out this survey, even just one puff?" (0 = "no," 1 = "yes") (Maloney & Cappella, 2016).

Other variables.—Prior to stimuli exposure, we measured current cigarette use, nicotine dependence, smoking recency, and e-cigarette advertising exposure. Current cigarette use was assessed with two ordinal measures: number of cigarettes smoked over a lifetime and how often participants smoked (National Center for Health Statistics). We assessed nicotine dependence with the heaviness of smoking index, which sums two ordinal measures: cigarettes smoked per day and time to first cigarette of the day (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989; Hyland et al., 2006). Smoking recency was measured with "When did you last smoke a cigarette?" (0 = "within the past hour" to 4 = "more than a month ago") (Maloney & Cappella, 2016). We measured e-cigarette advertising exposure with the dichotomous "In the past 30 days, have you seen or heard any advertisements for e-cigarettes?"

Post-stimuli exposure we assessed past year quit attempt: "In the past 12 months, have you tried to quit smoking regular cigarettes?" (0 = "no," 1 = "yes") (Population Assessment of Tobacco and Health (PATH) Study (NIDA), 2013). We additionally measured e-cigarette ever use: "Have you ever used an e-cigarette, even just one time in your entire life?" (0 = "no," 1 = "yes") (Pepper, Emery, Ribisl, Rini, & Brewer, 2015). Those reporting e-cigarette ever use were asked about their current e-cigarette use: How often do you use e-cigarettes? (0 = "not at all" to 3 = "every day") (Amato, Boyle, & Levy, 2016). Participants reporting never using an e-cigarette in their life were automatically coded as "not at all" for current e-cigarette use.

Demographic characteristics included gender, age, education, and race/ethnicity. Household income, number of household members, and U.S. state were also assessed and compared

against the 2015 U.S. federal poverty guidelines to determine whether participants fell above or below the guidelines (U.S. Department of Health & Human Services, 2015).

Data Analysis

We used Stata/IC 12.1 and SPSS 24 to conduct intent-to-treat analyses and listwise deletion to handle our small (<1% of randomized cases) proportion of missing data. We calculated descriptive statistics by condition and used chi-square tests for categorical variables and ANOVA for continuous variables to determine if random assignment resulted in equivalent groups on demographic and tobacco use characteristics. Study groups did not differ on these variables.

We performed a two-way ANOVA to investigate the main and interaction effects of message form and e-cigarette cue presence on cessation intention and smoking urges. We used logistic regression to investigate effects on smoking behavior, using the explicit message and no-cue conditions as reference groups. PROCESS v2.16 was used to conduct mediation analyses (Hayes, 2013). We estimated direct and indirect effects of message form on quit intention in a parallel multiple mediator model, controlling for e-cigarette cue presence. To investigate moderated mediation, we included e-cigarette cue presence as a moderator in this model rather than a control (Hayes, 2015). Percentile-based bootstrap confidence intervals were calculated for indirect effects using 10,000 bootstrap samples.

In post-hoc analyses, we performed a two-way ANCOVA, controlling for current use of e-cigarettes. We initially did not control for any covariates because random assignment should have prevented systematic differences in covariate means, and covariates that we considered (age, education, nicotine dependence) violated ANCOVA assumptions (Keppel & Wickens, 2004). However, to increase the precision of our results and because it did not violate ANCOVA assumptions, we controlled for current e-cigarette use post-hoc.

Results

Demographic and tobacco use characteristics are presented in Tables 1 and 2 (n = 2,201). More than half of the respondents had a college degree or higher (54.9%), and most participants reported exposure to e-cigarette ads in the past month (73.9%). Almost 90% of participants reported smoking 200+ cigarettes during their lifetime and about 69% reported smoking every day. Ever use of e-cigarettes was high (71.9%), but less than 25% reported e-cigarette use some days or every day.

Dependent Variables

Quit smoking intention.—There were no significant main effects of message form, $F(1, 2,188) = 2.20$, $p = .138$, $\eta^2 = .001$, or e-cigarette cue presence, $F(1, 2,188) = 0.05$, $p = .818$, $\eta^2 = .000$, on quit smoking intention. The message form × e-cigarette cue interaction was also not significant, $F(1, 2,187) = 2.57$, $p = .109$, $\eta^2 = .001$.

Smoking urge.—Message form had a significant main effect on smoking urge, $F(1, 2,190) = 5.66$, $p = .018$, $\eta^2 = .003$. The implicit message was associated with greater smoking urge than the explicit message ($M_{implicit} = 3.11$, $SD = 0.89$ versus $M_{explicit} = 3.03$, $SD = 0.85$).

There was neither evidence of a main effect for the e-cigarette cue, $F(1, 2{,}190) = 0.06$, $p = .804$, $\eta^2 = .000$, nor a message form × e-cigarette cue interaction, $F(1, 2{,}189) = 2.35$, $p = .126$, $\eta^2 = .001$.

Smoking during study.—Message form and e-cigarette cue presence did not have significant main or interaction effects on smoking during the study. The 95% confidence intervals for the odds ratios of the explicit message, cue, and message form × e-cigarette cue interactions included 1.00 (all ps ≥ .118).

Mediation Analyses

In a parallel multiple mediator model, the direct effect of message form on quit intention was not significant ($c' = -0.081$, $p = .102$, 95%CI = −0.178, 0.016) (Figure 2). Participants in the two message conditions, on average, did not differ in quit intention after controlling for group differences in descriptive and injunctive normative beliefs about smoking. However, there was an indirect effect of message form on quit intention through descriptive normative beliefs about smoking ($a_1 * b_1 = 0.007$, 95%CI = 0.001, 0.017). Participants who received the implicit message estimated smoking prevalence to be 1.78 units higher ($a_1 = 1.776$, $p = .019$, 95%CI = 0.291, 3.261) than those receiving the explicit message. Higher estimated smoking prevalence was associated with higher quit intention ($b_1 = 0.004$, $p = .004$, 95%CI = 0.001, 0.007), although the magnitude of this effect was very small. There was no evidence of a significant indirect effect of message form through injunctive norms ($a_2 * b_2 = -0.001$, 95%CI = −0.015, 0.014).

Moderated mediation analysis revealed a non-significant index of moderated mediation for descriptive and injunctive norms (point estimate$_{\text{descriptive}} = 0.009$, 95%CI = −0.003, 0.026; point estimate$_{\text{injunctive}} = -0.005$, 95%CI = −0.035, 0.024). The indirect effects of message form on cessation intention through descriptive and injunctive normative beliefs about smoking were not moderated by e-cigarette cue presence.

Post-hoc Analyses

There were no changes to our results when including e-cigarette current use as a covariate in post-hoc analyses. Message form continued to have a significant main effect on smoking urge, $F(1, 2{,}178) = 6.51$, $p = .011$, $\eta^2 = .003$. In a parallel multiple mediator model, there remained an indirect effect of message form on quit intention through descriptive normative beliefs about smoking ($a_1 * b_1 = 0.007$, 95%CI = 0.001, 0.017). Participants who received the implicit message estimated smoking prevalence to be 1.75 units higher ($a_1 = 1.753$, $p = .021$, 95%CI = 0.267, 3.238) than those receiving the explicit message. Higher estimated smoking prevalence was associated with higher quit intention ($b_1 = 0.004$, $p = .004$, 95%CI = 0.001, 0.007). There were no other significant effects.

Discussion

We investigated the persuasive effects of message form and e-cigarette cue presence in e-cigarette print ads with e-cigarette use anywhere message content. Our results on message form were mixed. Contrary to our first hypothesis, message form did not significantly affect

quit smoking intention. It also did not affect our secondary outcome of smoking behavior. It did, however, significantly influence smoking urges, with the implicit message stimulating greater urges than the explicit message.

We found limited evidence for our mediation hypotheses. Message form had an indirect effect on quit smoking intention through descriptive normative beliefs about smoking but not through injunctive normative beliefs. People exposed to the implicit message perceived smoking to be more prevalent than those exposed to the explicit message, and greater perceived smoking prevalence, in turn, was associated with greater quit intention.

Though we hypothesized the implicit message to enhance participants' perceptions of the prevalence of cigarette smoking, we did not expect greater perceived prevalence to be associated with greater cessation intention. One possible explanation is that the implicit message increased the accessibility of information about smoking in general. As information about smoking becomes more salient, people may be more likely both to think about how prevalent it is and to think about quitting. Since smoking is largely stigmatized (Evans-Polce, Castaldelli-Maia, Schomerus, & Evans-Lacko, 2015) and the majority of U.S. cigarette smokers (68%) report wanting to quit (Centers for Disease Control and Prevention, 2017), quitting may be commonly associated with smoking for many smokers.

A related explanation is that the relationship between perceived smoking prevalence and cessation intention may have been confounded by beliefs that e-cigarettes aid cessation. Quitting smoking is a common reason for e-cigarette use (Adriaens et al., 2017; Caraballo et al., 2017), and though this study focused on smoking outcomes, the implicit message may have influenced cognitions related to both combustible cigarettes and e-cigarettes. The message was, after all, an e-cigarette advertising message.

Implicit messages may be more effective than their explicit counterparts in stimulating readers to make positive inferences about the advertised product (e-cigarettes in the current study) (Kardes, 1988). In the present study, the implicit message may have more effectively stimulated participants to think about e-cigarettes and consider using them to quit smoking. If this belief was associated with perceived smoking prevalence, it could be responsible for the positive relationship between perceived smoking prevalence and quit intention. The implicit message's pro-e-cigarette use effect through quitting-related beliefs could have weakened its pro-smoking effect through perceived smoking prevalence. Such an explanation is, of course, speculative.

Another possible explanation is that the explicit messages contained what participants perceived as stronger arguments about vaping, and that such arguments suppressed smoking urge (Sanders-Jackson, Schleicher, Fortmann, & Henriksen, 2015; Sanders-Jackson, Tan, & Yie, 2018). This is also plausible given that stronger arguments are more likely to have impact in the context of anti-smoking messages (Lee, Cappella, Lerman, & Strasser, 2011; Lee et al., 2013). Future research should attempt to parse out the effects of implicit vs. explicit e-cigarette use anywhere messages on pro-e-cigarette use and pro-combustible cigarette use outcomes.

Though the effects of message form observed in this study were limited and small in magnitude, they remain striking, given the subtle manipulation and brief exposure. Small effects, such as those observed for the implicit message in the current study, could have sizeable real world impacts if such a message is communicated across brands and media channels, as has traditionally occurred with cigarette advertising (National Cancer Institute, 2008).

Survey questions about psychological measures may also be limited in assessing the effects of such a subtle manipulation. Particularly for questions about a socially stigmatized behavior like smoking, participant responses might be susceptible to social desirability bias, which could obscure differences between message conditions. Future studies of ad effects could consider using implicit measures, which assess the strength of relationships between concepts and attributes in memory without relying on participants' self-assessment (Fazio & Olson, 2003). For example, the Implicit Association Test (IAT) and an implicit measure of affective response have been used to investigate the effects of e-cigarette ads on nonsmokers' attitudes towards e-cigarettes (Pokhrel et al., 2016). While there were no group differences in implicit attitudes, e-cigarette ads focused on social enhancement were more effective than health-focused ads in eliciting favorable affective responses (Pokhrel et al., 2016). Results also suggested that implicit and explicit (i.e., traditional questions about psychological measures) measures offer unique yet complementary information about cognitive processes (Pokhrel et al., 2016). While the science on the predictive validity of the IAT and other implicit measures continues to develop (Greenwald, Poehlman, Uhlmann, & Banaji, 2009; Nosek, Greenwald, & Banaji, 2007), these measures offer ways of investigating ad effects that may not be easily captured by explicit self report.

Contrary to our expectations, e-cigarette cue presence was not associated with quit smoking intention, smoking urges, or smoking during the study. Moreover, it did not moderate message form effects on these outcomes nor did it moderate the indirect effects of message form on quit intention through normative beliefs about smoking. The lack of e-cigarette cue effects on cessation intention is in line with other research (Jo et al., 2018; Maloney & Cappella, 2016). However, the finding that the cue did not influence smoking urges or smoking during the study contrasts with findings from some other studies (King et al., 2016; Maloney & Cappella, 2016). The fact that other studies included a more engaging and stimulating (i.e., video vs. print) e-cigarette cue manipulation and longer exposure than our study might account for the difference (King et al., 2016; Maloney & Cappella, 2016). King et al. (2016) also conducted their study in a laboratory setting, which could have intensified cue effects. Research on combustible cigarette cues suggests that the format in which cues are presented (e.g., in vivo versus video) stimulates different effects (Niaura et al., 1998; Shadel, Niaura, & Abrams, 2001). Notably, a study involving e-cigarette cues in print ads, like the current study, did not find effects on smoking urges or behavior (Jo et al., 2018).

Another reason for the discrepancy in cue effects could be differences in the participant population. Our study included those who smoked at least 100 cigarettes in their lifetime and currently smoked every day or some days (Centers for Disease Control and Prevention, 2016a). The effects on smoking urge found by King (2016) and Maloney and Cappella

(2016), meanwhile, were specific to daily smokers. Daily smokers may be more sensitive to cue effects than someday smokers, given their increased nicotine dependence.

Lastly, increased awareness of e-cigarettes and perceptions that they could be used as a cessation aid might account for the discrepancy in cue effects. Awareness of e-cigarettes has risen rapidly since 2010 (King, Patel, Nguyen, & Dube, 2015). If smokers associate e-cigarettes with cessation more than they did in past years, cue effects on smoking-related outcomes found in previous studies may have dissipated.

Limitations

There were several limitations to this study. First, since we did not have a control group that was not exposed to any message, we cannot be sure that the implicit message increased smoking urge rather than the explicit message decreasing smoking urge. We would note though that including an unexposed control group could have introduced drawbacks as well. Since advertisements generally contain text and images, an ad without text could have puzzled participants and, consequently, biased results. Second, our questions about normative beliefs were related to smoking – not quitting. Fishbein and Ajzen (1975) noted that the ability of normative beliefs to predict behavioral intention depends on how closely linked the two factors are in terms of specificity of the behavior. Focusing our questions about normative beliefs on quitting instead of smoking might have resulted in greater indirect effects of message form through descriptive and injunctive beliefs. Third, we assessed only one implicit message variation and thus cannot generalize our results to other variations in message form in the e-cigarette advertising environment. Studies implementing additional variations in message form are critical to understanding how this ad feature can be used for persuasive purposes. Similarly, since this study involved exposure to ad stimuli through an online survey, it is unclear whether our effects will translate to the real world where people are subtly exposed to e-cigarette ad messages and cues on an ongoing basis. Future studies should consider testing e-cigarette ads in more naturalistic environments. Fourth, the lack of message form and e-cigarette cue effects on cessation intention could have been due, in part, to the fact that we informed participants they would be shown e-cigarette advertisements. This instruction might have had the unintended consequence of diluting potential effects on smoking-related outcomes. Fifth, our sample, though large and diverse, was a convenience sample and therefore not representative of U.S. smokers.

Conclusion

We investigated whether ads featuring e-cigarette anywhere messages and e-cigarette cues undermine cessation, and our results were mixed. From a public health perspective, the lack of e-cigarette cue effects on study outcomes is encouraging. The cue did not appear to deter cessation or, in fact, influence smoking at all. However, the effects of message form were less reassuring. A subtle manipulation of message syntax influenced smoking urges and indirect effects on cessation intention. Given scarce literature on the effects of e-cigarette ad features on smoking cessation and its antecedents, we need future studies to replicate our findings and investigate the robustness and generalizability of our results. Including implicit measures may also advance understanding of how e-cigarette ads operate.

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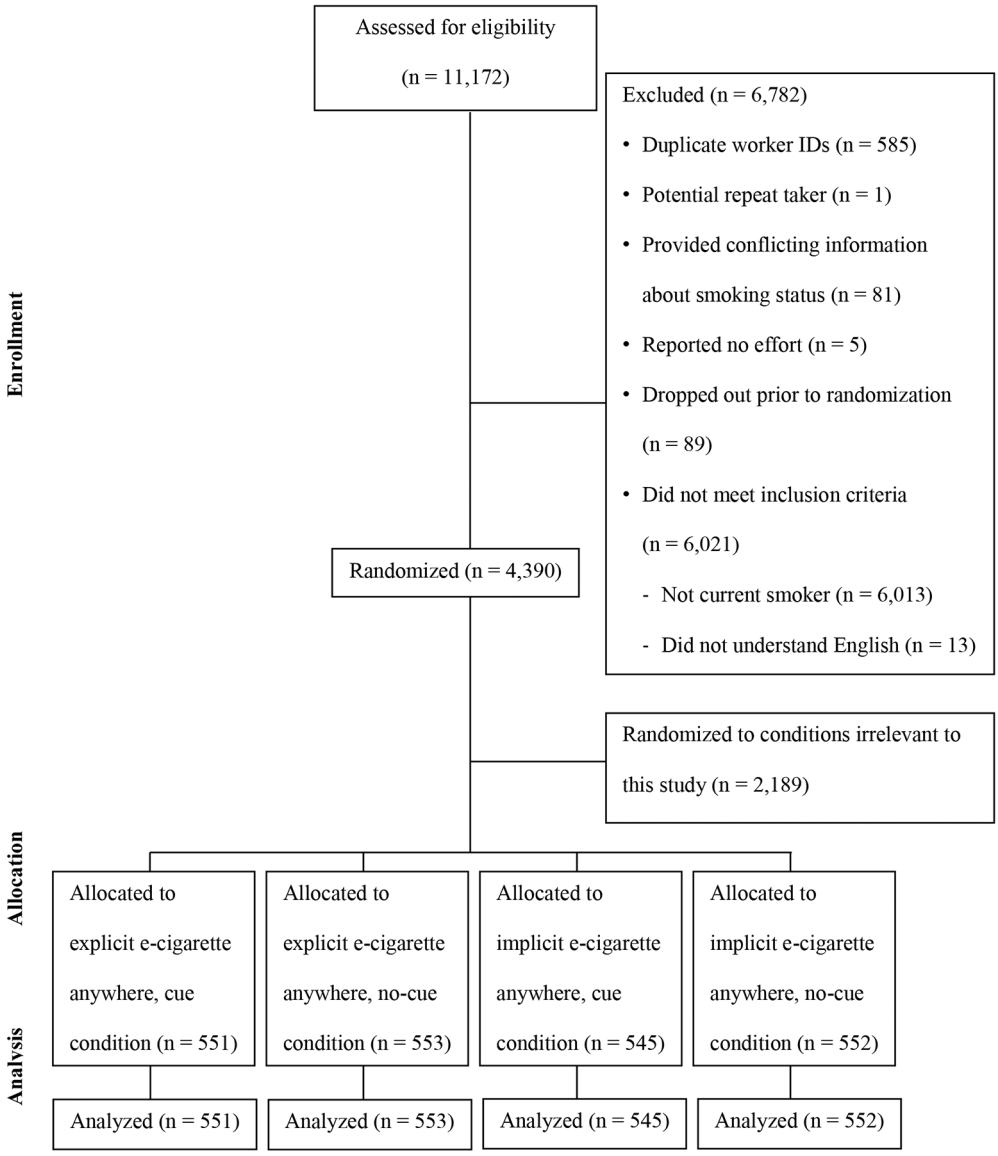

Figure 1.
Participant flowchart following Consolidated Standards of Reporting Trials guidelines.

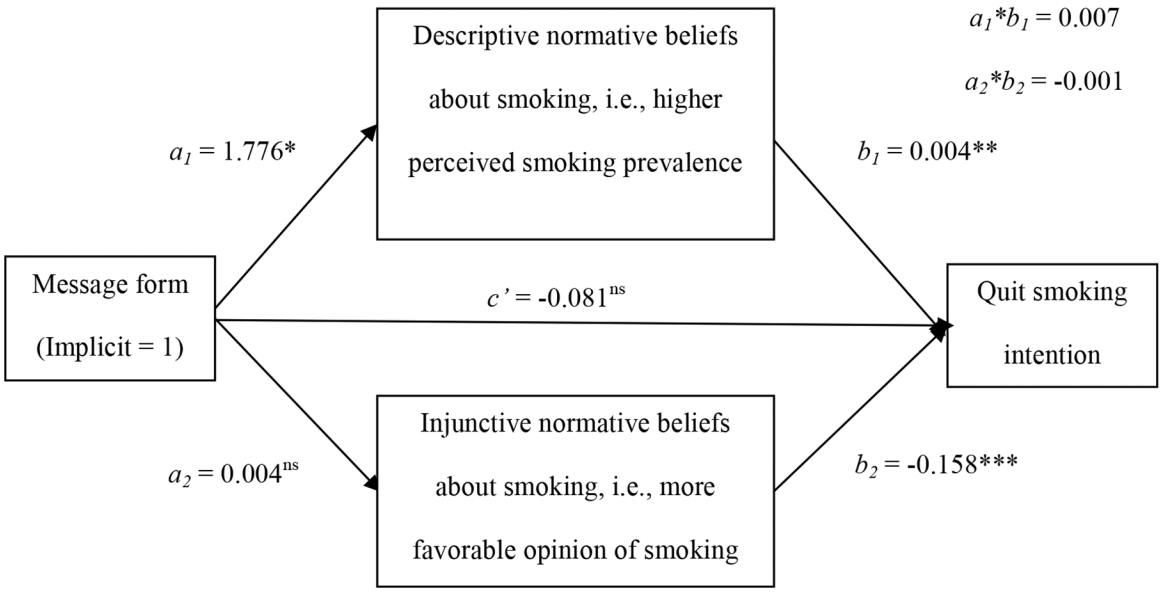

Figure 2.

Parallel multiple mediator model estimating direct and indirect effects of message form on quit intention, controlling for e-cigarette cue presence. *a* paths quantify the difference between group means on each mediator. *b* paths represent the difference in cessation intention between two cases that were assigned to the same experimental condition but that differ on the mediators by one unit. *c'* quantifies the direct effect of message form on quit intention. *a*b* values represent indirect effects of message form on quit intention through each mediator.

**p* < .05, ***p* < .01, ****p* < .001, ns = non-significant.

Table 1

Demographic Characteristics by Experimental Condition and Overall (n = 2,201)

Respondent	Explicit, cue n = 550	Explicit, no cue n = 549	Implicit, cue n = 541	Implicit, no cue n = 550	Total n = 2,201	*P*
Gender (%)						0.126
Male	45.4	45.4	51.4	44.4	46.6	
Female	54.6	54.6	48.4	55.6	53.3	
Other	0.0	0.0	0.2	0.0	0.1	
Age (%)						0.175
18 to 24 years old	15.8	15.4	15.8	13.2	15.0	
25 to 29 years old	27.0	25.1	28.8	30.4	27.9	
30 to 44 years old	44.1	45.6	38.2	39.0	41.7	
45 to 59 years old	10.3	11.6	14.5	14.7	12.8	
60 years old+	2.7	2.4	2.8	2.7	2.6	
Education (%)						0.075
Less than HS	1.1	0.7	0.9	1.1	1.0	
HS or equivalent	8.0	12.1	13.7	14.4	12.0	
Some college	34.0	30.8	33.8	29.8	32.1	
College degree+	56.9	56.3	51.6	54.7	54.9	
Race (%)						0.596
Non-Hisp, white	79.0	75.1	78.3	76.7	77.3	
Non-Hisp, black	6.3	6.1	6.0	6.5	6.2	
Non-Hisp, other/multi-race	5.9	10.0	7.9	8.9	8.2	
Hisp	8.8	8.7	7.9	8.0	8.3	
Below FPG (%)	13.7	13.8	12.3	12.5	13.1	0.835

Note. HS = high school, Non-Hisp = Non-Hispanic, Hisp = Hispanic, FPG = federal poverty guidelines.

Table 2

Tobacco Use Characteristics by Experimental Condition and Overall (n = 2,201)

Respondent	Explicit, cue n = 550	Explicit, no cue n = 549	Implicit, cue n = 541	Implicit, no cue n = 550	Total n = 2,201	*p*
Seen/heard e-cig ads past mo (%)	73.0	73.2	77.3	72.1	73.9	0.215
Last smoked a cig (%)						0.800
>1 mo ago	2.0	3.1	2.8	0.9	2.2	
>1 week to 1 mo ago	4.2	4.0	4.0	4.0	4.0	
>24 hours to 1 week ago	10.3	10.3	9.9	10.1	10.2	
>1 hour to 24 hours ago	31.6	32.2	31.0	31.3	31.5	
Within the past hour	51.9	50.5	52.3	53.6	52.1	
Cessation attempt past yr (%)	56.2	55.0	57.5	51.5	55.0	0.229
Lifetime cigs smoked (%)						0.120
100 to 150	5.8	6.3	4.6	6.9	5.9	
151 to 200	2.7	5.8	3.9	4.9	4.3	
201+	91.5	87.9	91.6	88.2	89.8	
How often smoke cigs (%)						0.451
Some days	33.2	32.0	28.8	31.3	31.4	
Every day	66.8	68.0	71.2	68.7	68.7	
Nicotine dependence (*M, SD*)[a]	2.2(1.5)	2.2(1.5)	2.3(1.6)	2.2(1.6)	2.2(1.5)	0.242
Ever used e-cig (%)	73.8	69.8	71.5	72.4	71.9	0.520
How often use e-cigs (%)[b]						0.148
Not at all	17.5	14.4	12.2	18.1	15.6	
Rarely	61.8	61.3	64.0	55.3	60.6	
Some days	15.0	17.5	15.8	19.9	17.1	
Every day	5.7	6.8	8.0	6.8	6.8	

Note. e-cig = e-cigarette, mo = month, cig = cigarette, yr = year.

[a]Range: low(0) - high(6).

[b]Among e-cigarette ever users (n = 1,572).