Brief report

E-cigarette Advertising Exposure, Explicit and Implicit Harm Perceptions, and E-cigarette Use Susceptibility Among Nonsmoking Young Adults

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Abstract

Introduction: This study tested whether exposure to e-cigarette advertising increases e-cigarette use susceptibility among nonsmoking young adults by promoting explicit and implicit attitudes toward e-cigarettes as a safer and healthier alternative to combustible cigarettes.

Methods: Young adult current nonsmokers who had never used an e-cigarette ($n = 393$; mean age = 22.1, standard deviation = 3.9; 66% women) were randomly assigned to one of the three conditions that involved viewing real-world, print e-cigarette ads. Two of the three conditions were experimental conditions where ads with different predominant themes (harm reduction [“Health”] versus social enhancement [“Social”] focused) were interspersed among ads of everyday objects. The third condition was the Control condition involving ads of everyday objects only. Participants provided data on explicit (ie, self-reported harm perceptions) and implicit (ie, Implicit Association Test) attitudes toward e-cigarette use and e-cigarette use intentions. Hypotheses were tested using structural equation modeling.

Results: Relative to Control participants, participants in Health and Social conditions were more likely to show higher implicit attitudes toward e-cigarettes as a safer alternative to cigarettes. Only the Social condition, relative to Control, had a significant effect on lower explicit harm perceptions of e-cigarette versus cigarette use. The Social condition had a significant indirect effect on e-cigarette use susceptibility, mediated by explicit harm perceptions.

Conclusions: Social enhancement-themed ads may communicate the reduced harm messages more strongly among young adults so as to affect both explicit and implicit attitudes and, through these, e-cigarette use susceptibility. Regulatory bodies may need to scrutinize reduced harm claims communicated through social enhancement-themed ads.

Implications: The findings imply that implicit and explicit health benefit or reduced harm claims in e-cigarette marketing may be propagated via ads that use social enhancement gimmicks to attract youth and young adults. As the US Food and Drug Administration develops regulations on e-cigarette marketing, informed decisions need to be made that address harm reduction needs of current smokers as well as e-cigarette use onset among nonsmokers. In regard to the latter,

e-cigarette marketing may need to be studied closely to monitor implicit and explicit health benefit claims that are coupled with the use of visual and textual gimmicks in ads that intend to make e-cigarettes more appealing to youth and young adults.

Introduction

E-cigarette use among US youth continues to be higher than cigarette smoking or use of any other tobacco product.¹ However, e-cigarette marketing remains largely unregulated. Past research shows that marketing strongly influences smoking onset among young people.² Nonsmokers may be persuaded to use e-cigarettes because of the belief that e-cigarettes are safe or harmless.^{3,4} The Food and Drug Administration (FDA) Center for Tobacco Products recently deemed e-cigarettes as tobacco products, bringing e-cigarettes within the purview of the Family Smoking Prevention and Tobacco Control Act (FSPTCA). Under the FSPTCA, restrictions may be applied to e-cigarette marketing that targets youth and young adults and represents unsubstantiated reduced harm or health improvement claims. Thus far, no e-cigarette has been approved as a modified risk tobacco product. Although current qualitative studies^{5,6} suggest that e-cigarette marketing content is likely to include implicit and explicit reduced harm claims, the effects of e-cigarette advertising on promoting beliefs and attitudes about e-cigarettes as reduced harm alternatives among youth and young adults are unclear. More specifically, it is unclear whether e-cigarette advertising increases e-cigarette use susceptibility among current nonsmokers by promoting beliefs that e-cigarettes are a safer alternative to cigarettes.

In a previous study,⁷ we demonstrated that exposure to reduced harm-themed e-cigarette ads (ie, Health condition), relative to Control ads, was associated with higher implicit attitudes toward e-cigarettes as a safer cigarette alternative among nonsmoking young adults. Measures of implicit attitudes, such as the Implicit Association Test (IAT),⁸ are designed to assess attitudes or cognitions that are difficult to control, unintentional, outside of awareness, or otherwise implicit in their operation.⁹ Our previous study did not find a difference in implicit attitudes between Health and Social (ie, social enhancement-themed) conditions, which made us conclude that Social ads may contain implicit or explicit reduced harm messages, as well as social content. Further, the study found that the Social condition, but not the Health condition, was associated with increased e-cigarette use susceptibility. The study was not adequately powered to detect differences between conditions on explicit (ie, more conscious) attitudes or to test mediational hypotheses.

The current study is an extension of the previous study in that this study tests whether e-cigarette ad exposure (Health and Social), relative to Control, affects e-cigarette use susceptibility via implicit and explicit attitudes concerning e-cigarettes as a safer alternative to cigarettes. The findings are expected to elucidate the mechanisms of the effects of e-cigarette marketing on young adult current nonsmokers and thereby have implications for the development of regulations on e-cigarettes. We focus on young adults because e-cigarette marketing, similar to other tobacco product marketing, is not likely to directly target minors.¹⁰ Young adults are instead targeted heavily by tobacco product marketing.¹¹ Young adults are close to adolescents in age and are at highest risk for simultaneous use of multiple tobacco products.¹² Hence, e-cigarette marketing research focused on young adults is relevant in its implications for young people in general.

Methods

Participants

Participants ($n = 393$) were from 4- and 2-year colleges on Oahu, Hawaii, who met the inclusion criteria of being 18–29 years old, having never used an e-cigarette, and having smoked less than 100 cigarettes in their lifetime and none in the past year. Table 1 shows the participants' demographic characteristics. Participants were compared on age, gender, ethnic composition, family or household income, and cigarette smoking status across the conditions. No statistically significant difference was found on the variables across the three conditions. Participants who had never smoked a cigarette were classified as “never smokers” and those who had ever smoked any cigarette, even a puff, were classified as “experimenters.” Approximately 42% participants in the sample were experimenters.

Procedures

Participants were randomly assigned to one of the following three conditions where they viewed still ads on a laptop computer: (1) “Health” condition ($n = 137$) in which participants viewed six real-world e-cigarette ads containing health benefit or reduced harm themes, interspersed randomly among 14 filler ads; (2) “Social” condition ($n = 139$) in which participants viewed six real-world e-cigarette ads containing messages promoting e-cigarette use as a means of attaining better social life or self-image, interspersed randomly among 14 filler ads; and (3) “Control” condition ($n = 117$) in which participants viewed 20 real-world ads of everyday items, 14 of which were the same filler ads as the other two conditions. Each ad was shown on screen for 30 seconds.

Ad Selection

E-cigarette ads were collected over a period of 6 months (June–December 2014) from the Internet, including social media sites such as Facebook and Instagram, and young-adult-oriented print

Table 1. Participant Characteristics Across Conditions ($n = 393$)

	Health ($n = 137$)	Social ($n = 139$)	Control ($n = 117$)
Mean age (SD)	21.8 (3.6)	22.3 (4.05)	22.2 (4.07)
Gender			
Men	33%	34%	34%
Women	67%	66%	66%
Ethnicity			
Asian or Pacific Islander	63%	61%	57%
White	37%	39%	43%
Family or household income			
\$0–\$79 999	57%	51%	54%
\$80 000–\$159 999	33%	38%	33%
>\$160 000	10%	11%	13%
Cigarette smoking status			
Never smoker	61%	54%	60%
Experimenter	39%	46%	40%

None of the variables were statistically significantly different between conditions.

magazines:¹³ *Ok!*, *Star Magazine*, *Entertainment Weekly*, *US Weekly*, *Sports Illustrated*, *Men's Journal* and *Rolling Stone*. A total of 40 e-cigarette ads were collected, each of which was pretested. Seven young adults (18–30 years old), of whom three were women and four men, were first asked to carefully look at each ad and quickly write down 5 to 10 messages that they thought the ads were using to attract customers. Next, the same seven young adults were asked to classify each ad into one of the three categories: (1) “Health”: ads that mainly promoted e-cigarettes, implicitly or explicitly, with health benefit or harm reduction claims; (2) “Social”: ads that mainly promoted e-cigarettes, implicitly or explicitly, as products that lead to enhanced social life or self-image; (3) “Neither”: ads that may not be classified as either Health or Social.

The qualitative data provided by the participants during the first task were coded, and each ad was rated by a research staff on Health and Social characteristics for each participant. That is, for each participant, each ad was evaluated on the number of “Health,” “Social,” or “Neither” comments that the ad received. Then, for each participant, the ads were classified as “Health,” “Social,” or “Neither” based on the consistency of rating between first and second tasks. If the ratings were inconsistent, the ad for that participant was classified as “Neither.” Subsequently, comparing data across participants, 12 ads were classified as “Health” and 22 as “Social.” There was a substantial inter-rater reliability (Fleiss’ Kappa = 0.62) across participants. The final ads to be included in the experiment were randomly selected: 6 out of the 12 for the Health condition, and 6 out of the 22 for the Social condition. The final ads represented brands such as Blu, Fin, MarkTen, and Vuse.

Control and filler ads were ads of everyday objects (eg, toothpaste, oil, television, smartphone) selected from the same sources as the e-cigarette ads. Filler ads were 14 ads among which the six experimental ads in the Health and Social conditions were interspersed. Control ads were also ads of everyday objects, but they were carefully matched with the experimental ads in terms of quality, visual appeal, and where relevant, models’ demographic characteristics.

Data Collection

The study involved a one-time laboratory visit. Age and smoking status were verified against government-issued IDs and breath carbon monoxide tests, respectively. Data were collected immediately after participants viewed the ads via laptop computers. Each participant was compensated for their time with a \$30 supermarket gift card.

Measures

Demographics

Demographic measures included single-item indicators of age, gender, family or household annual income, and ethnicity.

Explicit E-cigarette Harm Perceptions

Harm perceptions were assessed using 20 items⁷ (Cronbach’s $\alpha = 0.95$), in terms of self-reported perceptions that e-cigarettes are healthier than cigarettes (eg, “E-cigarettes are less harmful than cigarettes”); that e-cigarettes, compared with cigarettes, expose self and others to lower risks (eg, “E-cigarettes are lower in tar or carbon monoxide than cigarettes”); and that e-cigarettes help quit smoking cigarettes and control smoking addiction (eg, “E-cigarettes are less addictive than cigarettes”). Participants rated each statement on a scale from 1 to 7 (“strongly disagree” to “strongly agree”).

Implicit Attitudes Toward E-cigarettes as a Safer Alternative to Cigarettes

Implicit attitudes were assessed using the IAT,⁸ adapted by us for e-cigarettes and cigarettes.⁸ Consistent with the original IAT, the current IAT was also a dual categorization task in which participants were asked to quickly categorize a word or an image stimulus. Participants saw four types of stimuli: e-cigarette pictures, cigarette pictures, positive words (ie, words signifying good health), and negative words (ie, words signifying poor health). Picture stimuli were eight images of e-cigarettes and eight matching images of cigarettes. Attribute stimuli were eight positive words (eg, healthy, safe, clean, strong) and eight negative (eg, unhealthy, risky, sick, weak). Picture as well as the word stimuli were selected by the investigators. Care was taken to ensure that the e-cigarette and cigarette pictures were readily distinguishable. E-cigarette pictures included two pictures of disposable (“ciga-like”) e-cigarettes, two of eGo style vape pens, two eGo style tank systems, and two mods (eg, larger, rectangular batteries). The disposable e-cigarette pictures either had a glowing, blue tip or showed battery partially inserted into the cartridge.

All stimuli were presented in the center of the black screen. Word stimuli and image labels were presented in green and white letters, respectively. The test involved five steps representing seven blocks of trials, during which the labels of the stimuli assigned to the left (e) and right (i) keys constantly appeared on upper left and right corners of the screen: eg, E-cigarette or Good; Cigarette or Bad.

In the first step, participants performed 20 practice trials (Block 1) by matching positive and negative word stimuli to labels (Good and Bad, respectively). The words appeared in a random order. The second step also involved 20 practice trials (Block 2), but the stimuli presented were pictures of cigarettes and e-cigarettes, which the participants matched to cigarette or e-cigarette labels by pressing the appropriate key. The third step included two blocks, of 20 and 40 trials each (Blocks 3 and 4), during which pictures and words were presented in random order, and participants were asked to categorize them (e: “E-cigarette or Good”, i: “Cigarette or Bad”). The fourth and fifth steps included 20 (Block 5) and 20 and 40 trials (Blocks 6 and 7), respectively, similar to the second and third steps except that the concept combination of E-cigarette or Cigarette pictures and Good or Bad attributes was reversed (eg, e: “Cigarette or Good; i: “E-cigarette or Bad”). Each trial presented the stimulus until the participant pressed the left or right key. The measure was extensively piloted before use in the current study.

E-cigarette Use Susceptibility

Susceptibility was measured in terms of the intentions to use e-cigarettes in the future (four items; see Table 2).^{7,14} Because the distribution of the susceptibility variable was highly skewed, the susceptibility variable was dichotomized as 0 (ie, “Definitely not” response across all four items) versus 1 (one or more of any other response but “Definitely not”).

Data Analysis

Data were analyzed using structural equation modeling (SEM) in *Mplus*.¹⁵ Health, Social, and Control conditions were dummy coded with Control as the reference group. Experimental conditions, demographic variables (ie, age, sex, income, and ethnicity [coded as Asian or Pacific Islander vs Other]), and cigarette smoking status (experimenter vs never-smoker) were specified as exogenous variables. Explicit harm perceptions and implicit attitudes were specified as mediators. E-cigarette use susceptibility was specified as the criterion variable.

All exogenous variables were specified to covary. Both mediator variables covaried. The model was estimated for the fit to the data in two steps. First, the model was estimated with paths from all exogenous variables to the mediators and the criterion variable, and from the mediators to the criterion. Next, the model was re-estimated with only the statistically significant paths ($p < .05$, two-tailed) retained in the model. A supplementary analysis was conducted to determine whether the SEM results differed if the criterion variable, e-cigarette susceptibility, was defined differently; that is, if those who responded “yes, probably” or “yes, definitely” to any e-cigarette use intention items were coded as “1” and any other response was coded as “0.”

Results

Table 2 shows the frequency distribution for responses across the items assessing intentions to use e-cigarette. Approximately 47% of the participants were susceptible to e-cigarette use. Figure 1 shows

the final model, which showed a good fit to the data ($\chi^2 = 21.4$, $df = 16$, $p = .16$; CFI = 0.99; RMSEA = 0.03, 95% CI = 0.01 to 0.06). Being in Health or Social condition, relative to Control, was associated with higher implicit attitudes toward e-cigarettes as a safer alternative to cigarettes. Being in the Social condition, but not Health, was associated with explicit perceptions that e-cigarettes are safer than cigarettes. Being in the Social condition was indirectly associated with increased susceptibility to use e-cigarettes through explicit perceptions that e-cigarettes are less harmful than cigarettes (indirect effect = 0.05 [SE = 0.02]; $p = .04$). Age was inversely associated with e-cigarette use susceptibility ($\beta = -.26$; $p < .001$) whereas having experimented with cigarettes was positively associated with e-cigarette use susceptibility ($\beta = .54$; $p < .001$). The supplementary analysis indicated that coding the susceptibility item differently did not alter the model fit by much ($\chi^2 = 16.6$, $df = 15$, $p = .28$; CFI = 0.99; RMSEA = 0.02, 95% CI = 0.01 to 0.06). However, there was an additional path in this latter model indicating an inverse association

Table 2. Frequency Distribution for E-cigarette Use Intention Items ($n = 393$)

	Definitely not	Probably not	Don't know	Yes, probably	Yes, definitely
Do you think that you will use an e-cigarette soon?	72%	21%	3%	3%	1%
Do you think that you will use an e-cigarette in the next year?	68%	20%	2%	9%	1%
Do you think that in the future you might experiment with e-cigarettes?	64%	23%	2%	9%	1%
If one of your best friends were to offer you a cigarette, would you use it?	56%	23%	2%	15%	3%

Figure 1. The effects of Health and Social conditions (relative to the Control condition) on explicit and implicit attitudes toward e-cigarettes as a safer alternative to cigarettes and e-cigarette use susceptibility. Straight arrows indicate regression paths and the double-headed curved arrow indicates covariance. Only statistically significant paths are shown. Values represent standardized regression coefficients. * $p < .05$, ** $p < .01$, *** $p < .001$. Covariances and residual variances were estimated but are not shown on the figure for clarity. All exogenous variables were specified to covary with each other. Implicit and explicit attitudes were also specified to covary.

between sex (ie, female gender) and e-cigarette use susceptibility (standardized coefficient = $-.13$, $p < .05$).

Discussion

To our knowledge, this is the first study to experimentally demonstrate that exposure to e-cigarette advertising may increase e-cigarette use susceptibility among nonsmoking young adults by promoting attitudes toward e-cigarettes as a safer alternative to cigarettes. A surprising finding was that exposure to Social ads—that is, ads primarily considered to project e-cigarette use as fashionable, socially approved, socially enhancing—had effects on both explicit and implicit attitudes and also on susceptibility via explicit attitudes, but exposure to Health ads had effects on implicit attitudes only. This may be interpreted to suggest that Social ads combine reduced harm messages with social enhancement themes, which are particularly attractive to young adults. In other words, social themes provide an attractive medium for the communication of overt or covert reduced harm messages. Social ads in the current experiment were more likely to feature models, generally attractive younger adults, because of which Social ads may have been more attention grabbing and consequently more efficient in drawing attention to implicit and explicit reduced harm messages.

The finding that ad exposure affects implicit attitudes argues for the need to further apply the dual process model¹⁶ in tobacco product marketing research. The dual process theory posits that information is processed at both conscious and relatively unconscious or implicit levels.¹⁴ We did not find a link between implicit attitudes and susceptibility, which may be because susceptibility, measured in terms of intentions, represents an explicit construct, and implicit attitudes, by definition, meet at least some criteria for processing without awareness or control. Future studies should examine the effects of implicit attitudes as mediators of the effects of e-cigarette ad exposure on young adults' behavior. Implicit attitudes have rarely been studied in the context of public health impact of tobacco marketing. As a result, not much is known about marketing content that affects implicit versus explicit attitudes. Clearly, studying the implicit system more closely is likely to provide additional information relevant to the regulation of tobacco product marketing.

The current findings are significant for development of e-cigarette regulations. The findings advance knowledge from content analysis studies^{6,7}, which have documented that reduced harm or better health claims are widely prevalent in e-cigarette advertising content. This study has empirically shown that such claims are indeed likely to persuade young adult nonsmokers to believe, consciously and relatively unconsciously, that e-cigarettes are safer alternatives to cigarettes. Such persuasive attempts may increase the likelihood of nonsmoking young people's use of e-cigarette, and potentially cigarette, in the future. Thus, as the US FDA develops e-cigarette marketing regulations, informed decisions need to be made that would address the harm reduction needs of smokers as well as protect the health of nonsmokers. In regard to the latter, e-cigarette marketing may especially need to be scrutinized closely to monitor implicit and explicit health benefit claims that are coupled with messages that are appealing to youth and young adults. A limitation of the study is that it did not include behavioral outcomes. However, the study's implications are novel. Although e-cigarettes may be useful in tobacco harm reduction among current smokers, nonsmokers, including never cigarette smokers and former smokers, have little to gain from beginning to use e-cigarettes. This research elucidates the aspects of e-cigarette marketing that may be controlled to protect public health.

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Declaration of Interests

None declared.

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