



Original investigation

# Exposure to Point-of-Sale Marketing of Cigarettes and E-Cigarettes as Predictors of Smoking Cessation Behaviors

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## Abstract

**Introduction:** Cue-reactivity theory suggests that smoking-related visual cues such as point-of-sale (POS) marketing (eg, advertising, product displays) may undermine cessation attempts by causing an increase in nicotine cravings among users. This study examined the relationship between recall of exposure to POS marketing and subsequent cessation behaviors among young adult cigarette smokers.

**Methods:** Participants included 813, 18–29 year old ( $m = 21.1$ ,  $SD = 2.70$ ), current cigarette smokers attending 24 Texas colleges. Multivariable logistic regression models examined the impact of baseline self-reported exposure to cigarette and e-cigarette advertising and product displays, on using e-cigarettes for cessation and successful cigarette cessation at 6-month follow-up. Two-way interactions between product-specific advertising and between product-specific displays were examined to determine if the marketing of one product strengthened the cue reactivity of the other. Baseline covariates included sociodemographic factors, past quit attempts, intentions to quit smoking, and nicotine dependence.

**Results:** Exposure to e-cigarette displays was associated with lower odds of cigarette smoking cessation, controlling for covariates and conventional cigarette display exposure. E-cigarette advertising was positively associated with the use of e-cigarettes for cigarette cessation among participants exposed to low (ie, at least 1 SD below the mean) levels of cigarette advertising. Cigarette advertising was associated with the use of e-cigarettes for cigarette cessation only among those exposed to low levels of e-cigarette advertising. Exposure to cigarette displays was not associated with either outcome.

**Conclusion:** Smoking-related cues at POS may undermine successful cigarette cessation. Exposure to product displays decrease odds of cessation. Advertising exposure increased odds for using e-cigarettes for cessation attempts, but may have guided smokers towards an unproven cessation aid.

**Implications:** By examining the interaction of conventional cigarette and e-cigarette marketing exposure, this study adds a unique insight into the impact of retail tobacco marketing on cigarette smoking cessation behavior among young adults. These findings suggest that policies that balance encouraging cigarette smoking cessation while limiting marketing strategies should be considered, such as POS product displays, that may undermine successful cessation attempts.

## Introduction

Tobacco use is the leading cause of preventable death in the United States, with more than 480 000 deaths attributable to cigarette smoking annually.<sup>1</sup> Although preventing tobacco use remains a top public health priority, smoking cessation is a core component of comprehensive tobacco control<sup>2</sup> and has been shown to reduce tobacco-related mortality.<sup>3</sup> An estimated 85% of unaided cessation attempts (ie, “cold turkey”) fail and studies show a consistent trend in cessation behaviors among adult smokers: most want to quit, many attempt cessation, few successfully quit, and fewer use evidence-based cessation treatments.<sup>4</sup> Although much is known about the addictive properties of nicotine<sup>5</sup> and the role of nicotine dependence on smoking cessation,<sup>6,7</sup> less is known about environmental factors that contribute to smoking cessation attempts and relapse.

Theories of cue reactivity indicate that smoking-related cues may increase smoking relapse and contribute to failed cessation attempts.<sup>8–10</sup> Specifically, those addicted to nicotine experience subjective (eg, cravings) and automatic (eg, increased heart rate) responses in the presence of smoking-related images.<sup>11–13</sup> Cue reactivity (ie, subjective and automatic responses) is exacerbated during nicotine deprivation or withdrawal,<sup>12</sup> signifying an increased vulnerability to smoking-related images among those attempting smoking cessation, which increases the risk of smoking relapse during cessation attempts. As such, it is vital to understand how exposure to smoking-related images affects smoking behaviors.

Sources of smoking-related visual stimuli include point-of-sale (POS) marketing, such as tobacco advertising and product displays. Tobacco advertising includes product signage (eg, product posters), branded items (eg, counter mats, shelving displays), and price discount promotions on the interior of a retail store.<sup>14</sup> Product displays include stocking, shelving, displaying, and merchandising brands in the retail setting.<sup>14</sup> The purpose of tobacco marketing is to attract attention, increase consumer interest, and cue action to the purchase and use of the products being marketed and displayed.<sup>15,16</sup> Tobacco product displays are specifically designed to evoke an impulse purchase<sup>16,17</sup> according to tobacco industry documents. Exposure to cigarette marketing is a cue to smoke cigarettes, increases cravings to smoke, and increases impulse purchases among those considering or attempting cigarette smoking cessation.<sup>18–21</sup> Exposure to POS tobacco marketing may ultimately undermine the efforts of current cigarette smokers actively attempting cessation.<sup>22</sup> Although the impact of cigarette retail marketing on nicotine cravings and cessation behavior is well studied, the impact of e-cigarette POS marketing on cessation behaviors and outcomes remains unknown.

Many e-cigarette marketing themes utilize smoking-related visual stimuli intended to highlight how e-cigarette use mimics cigarette smoking, social experiences, and overall satisfaction.<sup>23,24</sup> Although few studies have been conducted on the impact of e-cigarette marketing on cue reactivity, one experimental study of former adult smokers found that those exposed to e-cigarette advertisements were more likely to be reminded of cigarette smoking, have a desire to smoke cigarettes, and were less likely to be confident that they could abstain from cigarette smoking compared with those not exposed.<sup>25</sup> A second experimental study found visual depictions of e-cigarette use in advertisements (ie, exhaled aerosols) increased urges to smoke cigarettes among current and former cigarette smokers.<sup>26</sup> These findings suggest that smoking-related visual stimuli in e-cigarette marketing may stimulate subjective and automatic responses among current and former cigarette smokers similar to those of smoking-related visual stimuli in cigarette marketing. Further research is

needed to determine if exposure to e-cigarette marketing is an impediment to cigarette smoking cessation and abstinence.

E-cigarettes are marketed heavily as healthier alternatives to conventional cigarettes<sup>27</sup> and as cigarette smoking cessation devices.<sup>28,29</sup> In essence, these devices are branded as a substitute for conventional cigarettes,<sup>28,29</sup> providing a similar user experience<sup>23,24</sup> without negative health ramifications.<sup>27</sup> The combination of health claims and smoking-related imagery used to market e-cigarettes is alarming given one study that found that 49.7% of current cigarette smokers would turn to the internet or product packaging to access information about e-cigarettes before a healthcare professional.<sup>30</sup> Given the first choice of source for information on e-cigarettes and the messages used by these sources, it is not surprising that e-cigarette use has grown substantially since 2011<sup>31</sup> and that the use of e-cigarettes for smoking cessation is a common practice,<sup>32,33</sup> particularly among young adults.<sup>34,35</sup>

The combination of smoking-related visual stimuli and modified health claims (eg, healthier alternative; smoking cessation) used to market e-cigarettes raises concerns about the role this marketing plays in smoking cessation behaviors as well as the use of e-cigarettes to quit smoking conventional cigarettes. However, existing research examining the impact of POS marketing has largely focused on conventional cigarettes. Given that cigarette and e-cigarette marketing are both present in the retail setting, it is important to examine if exposure to one type of product marketing affects the role of the other type of product marketing on cessation behaviors. It is plausible, for example, that the presence of one type of marketing may further strengthen the cue reactivity of another type of product, given the similarities of the marketing imagery. The interaction of these forms of marketing could ultimately undermine cigarette smoking cessation behaviors.

## Study Aims and Hypotheses

Young adults (eg, 18–29) have the greatest prevalence of e-cigarette use<sup>31</sup> and frequently report the use of these devices for smoking cessation;<sup>34,35</sup> thus, this population is of particular interest to researchers and health professionals. The purpose of this study is to examine the association of POS marketing, specifically advertising and product displays, on young adult cigarette smoking cessation behaviors. Cessation behaviors include use of e-cigarettes for cigarette smoking cessation “or reduction,” which is a commonly cited reason for e-cigarette use among young adults.<sup>34,35</sup> Specifically, this research examines how cigarette POS advertising exposure, e-cigarette POS advertising exposure, and the interaction of exposure to advertising of these products affects cigarette smoking cessation behaviors among a cohort of young adults. This research also examines how cigarette product displays, e-cigarette product displays, and the interaction of the two affect cigarette smoking cessation behaviors. Although other studies have examined retail marketing exposure (eg, advertising, product displays) and tobacco use behaviors,<sup>13,18–22,36</sup> this research substantially adds to the literature by examining the interaction of cigarette and e-cigarette advertising and displays with cigarette cessation behaviors.

Guided by the cue reactivity theory, we hypothesize that among cigarette smokers, baseline exposure to cigarette as well as e-cigarette “POS advertising” will be associated with reduced odds of cigarette smoking abstinence at 6-month follow-up. Similarly, we hypothesize that baseline exposure to cigarette as well as e-cigarette “product displays” will be associated with reduced odds of cigarette

smoking abstinence at 6-month follow-up. We further hypothesize that both e-cigarette POS advertising and product displays at baseline will predict greater use of e-cigarettes for cigarette smoking cessation/reduction, given the messages used to market these products. However, we hypothesize that there will be a significant interaction between cigarette and e-cigarette marketing exposure, such that the presence of e-cigarette marketing will exacerbate the impact of cigarette marketing, resulting in decreased cigarette smoking abstinence and use of e-cigarettes for cessation/reduction.

## Methods

### Study Design and Recruitment

This study examines data collected from 813 students attending 24, 2- and 4-year Texas colleges as part of the Marketing and Promotions across Colleges in Texas Project (Project M-PACT), a rapid response surveillance study. Colleges were located in five counties surrounding the four largest cities in Texas: Austin, Dallas/Fort Worth, Houston, and San Antonio. Baseline data were collected from November 2014 to February 2015 for 5482 Texas college students and again approximately 6 months later, May–June 2015; the response rate for this follow-up was 79% ( $n = 4326$ ). Eligibility criteria for participation in Project M-PACT included being 18–29 years old and being a full- or part-time, degree or certificate seeking undergraduate student attending a 2- or 4-year college/university.

Participants were recruited via email to participate in an online survey. Informed consent was given by students that wished to participate in the study and deemed eligible. A \$10 e-gift card was given to each participant upon completion of each survey at baseline and 6-month follow-up. Additionally, all participants that completed the survey were entered into a drawing to win one of twenty \$50 e-gift cards. A total of 13714 students were eligible to participate in the study and 5482 of them (40%) provided consent and completed the survey. Study design and procedures are detailed elsewhere.<sup>37</sup>

### Study Sample

As this study examined cigarette cessation/abstinence behaviors, only participants reporting current cigarette smoking at baseline (ie, used in the past 30-days) were eligible ( $n = 1161$ ). Our study focused on past 30-day use, rather than a self-reported daily or frequent use, due to the age of our sample, and the limited number of daily users. Specifically, young adults have a greater prevalence of light/infrequent cigarette smoking.<sup>38</sup> As such, our study is more focused on young adults across all stages of cigarette use, rather than solely daily users. Although a total of 1161 young adults were eligible, 345 cigarette smokers had missing data at 6-month follow-up and three had incomplete baseline data. These 348 cigarette smokers were, thus, removed from the analysis. The final sample size was 813.

## Measures

### Cigarette Smoking Behaviors

The first outcome variable was cigarette smoking abstinence at 6-month follow-up. Participants were considered abstainers if they reported no cigarette smoking in the past 30-days (coded as 1). The second outcome variable was the use of e-cigarettes for cigarette cessation/reduction in the past 30-days at 6-month follow-up. Participants were first asked: “During the past 30 days, have you used any ENDS product (ie, an e-cigarette, vape pen, or e-hookah), even one or two puffs, as intended (ie, with nicotine cartridges and/

or e-liquid/e-juice)?” Participants that reported “yes” were asked why they used these products. Reasons for using e-cigarettes were assessed by asking “I use ENDS products as intended because...” with 17 possible reasons listed. Respondents were allowed to check all reasons that applied. Only those who reported e-cigarette use because “I am trying to quit or cut down on smoking regular cigarettes” were considered to have used e-cigarettes for cigarette smoking cessation/reduction (coded as 1).

### Point-of-Sale Marketing

Two aspects of POS marketing were assessed: exposure to advertising and exposure to product displays. Recall of exposure to POS advertising and product displays was assessed for conventional cigarettes and e-cigarettes at baseline. For POS advertising, participants were asked “when you visited the stores above [gas stations/convenience/corner stores, grocery stores, drug stores, liquor stores and vape/head shop], how often did you see signs marketing [cigarettes] [e-cigarettes]?” For product displays, participants were asked “when you visited the stores above, how often did you see the following products on display? [cigarettes] [e-cigarettes].” Possible responses for all four questions were “never/not that I remember” (coded as 0), “some of the time” (coded as 1), “a lot of the time” (coded as 2), and “every time” (coded as 3).

### Covariates

Several sociodemographic covariates were included in these analyses and were assessed at baseline. Sex was a binary variable with males coded as 0 and females coded as 1. Due to sample size, race/ethnicity was recoded into three mutually exclusive categories: non-Hispanic white (referent group), Hispanic/Latino, and “other,” which included African-American, Asian-American, American-Indian/Alaska Native, Native Hawaiian or other Pacific Islander, or any other race/ethnicity. The institution type was dichotomized into 2-year colleges (referent group) and 4-year colleges. Ages ranged from 18 to 29 years old.

Past cigarette quit attempts and intentions to quit cigarette smoking were assessed at baseline and included as covariates. Participants were asked: “During the past 12 months, how many times have you stopped smoking cigarettes for one day or longer in an attempt to quit?” Those that reported 1 or more days were considered to have a cessation attempt history (coded as 1). Intention to quit cigarette smoking was assessed by the question “Do you want to completely stop smoking cigarettes right now?” Respondents that answered “yes” were coded as 1. Similarly, the use of e-cigarettes for cigarette cessation/reduction (described above) at baseline was used as a covariate in all models.

Measures of nicotine addiction and other combustible tobacco use were assessed at baseline and used as covariates. Participants were asked “How soon after you wake up do you typically smoke your first cigarette of the day?” Participants that reported smoking within the first 30 min of waking<sup>39</sup> were coded as 1. Past 30-day use of another combustible tobacco product was included as a covariate. Individuals that reported current use of hookah and/or cigar products were coded as 1.

### Attrition Analyses

Chi-square and *t*-test analyses were conducted to determine whether participants with complete data who were included in the present study ( $n = 813$ ) differed from those who were removed because of

incomplete data ( $n = 348$ ) on all baseline variables. Results indicated that complete cases were more likely to have reported a quit attempt in the past 12 months [ $X^2(1, n = 1161) = 7.58, p = .006$ ], but less likely to have reported intentions to quit smoking [ $X^2(1, n = 1161) = 7.97, p = .005$ ]. There were no differences in other baseline variables between the two groups.

### Statistical Analyses

Multivariable, multilevel logistic regression models were conducted to examine the associations between baseline recall of exposure to the following marketing variables: e-cigarette advertising, cigarette advertising, e-cigarette product displays, and cigarette product displays and two cessation behaviors at 6-month follow-up (cigarette smoking abstinence, use of e-cigarettes for cigarette cessation). To examine POS advertising exposure, we first analyzed the relationship between e-cigarette advertising exposure at baseline and each outcome variable at 6-month follow-up, controlling for all covariates. Second, we analyzed cigarette advertising exposure at baseline and each of the outcome variables at 6-month follow-up, controlling for all covariates. These first two analyses are considered as Step 1a (e-cigarettes, only) and 1b (cigarettes, only). We then entered baseline exposure to e-cigarette and cigarette advertising simultaneously to examine the unique contribution of product-specific advertising exposure for each outcome, while controlling for the other form of marketing as well as all covariates (Step 2).

To expand on these analyses, we examined the two-way interaction between e-cigarette advertising and cigarette advertising (Step 3) utilizing methods outlined by Aiken and West (1991).<sup>40</sup> Specifically, two-way interactions were computed as the product of two predictor variables for POS exposure (e-cigarettes  $\times$  conventional cigarettes) and product displays (e-cigarettes  $\times$  conventional cigarettes), depending on the model. If a two-way interaction was statistically significant involving the POS exposure variables, it was probed by examining the association between POS exposure of one product (eg, e-cigarettes) and the 6-month outcome at low (1 standard deviation below the mean) and high (1 standard deviation above the mean) levels of POS exposure of the other product (eg, conventional cigarettes). Identical procedures were followed if a two-way interaction was significant involving the product display variables. All analyses were conducted using Stata 14.0 (College Station, TX). All models adjusted for school clustering using a random effect for school.

## RESULTS

### Descriptive Statistics

Participants were 813 past 30-day cigarette smokers attending 24 Texas colleges and universities aged 18–29 years old (mean age: 21.1; SD: 2.7). The sample was 52.5% female, 41.3% non-Hispanic white, 34.2% Hispanic/Latino, and 24.5% “other.” At baseline, 56.0% of participants reported making a quit attempt in the past 12-months, 42.4% reported intentions to quit cigarette smoking, 14.2% reported use of e-cigarettes for cigarette smoking cessation/reduction, and 8.5% reported cigarette smoking within 30 min of waking. Almost half (48.8%) reported baseline past-30-day use of hookah and/or cigar products (Table 1). At 6-month follow-up, 12.3% of participants reported using an e-cigarette for cigarette cessation/reduction and 33.3% reported cigarette smoking abstinence.

Overall, 80.6% of participants reported exposure to e-cigarette advertising and 78.1% reported exposure to cigarette advertising

**Table 1.** Descriptive Statistics of the Full Sample ( $n = 813$ )

	Baseline cigarette smokers ( $n = 813$ )
<i>Cigarette smoking status</i>	
Everyday	18.6%
Some days	59.5%
Infrequent <sup>a</sup>	21.9%
<i>Cigarettes smoked per day</i>	
Number (SD)	3.2 (3.7)
<i>Lifetime smoking</i>	
100+ cigarettes smoked	61.8%
Less than 100 smoked	38.2%
Age (mean; SD)	21.1 (2.7)
<i>Race</i>	
Non-Hispanic white	41.3%
Hispanic/Latino	34.2%
Other <sup>b</sup>	24.5%
<i>Sex</i>	
Female	52.5%
<i>Institution type</i>	
Four year college/university	91.4%
<i>Nicotine dependence<sup>c</sup></i>	
Yes	8.5%
<i>Past cigarette quit attempt</i>	
Yes	56.0%
<i>Intention to quit cigarette smoking</i>	
Yes	42.4%
<i>Past 30-day hookah use</i>	
Yes	35.9%
<i>Past 30-day cigar use</i>	
Yes	25.3%
<i>Wave 1 e-cigarette use<sup>d</sup></i>	
Yes	14.2%

<sup>a</sup>“Infrequent” users were those that reported use in the past 30-days but did not report cigarette smoking “everyday” or “some days”.

<sup>b</sup>“Other” is African-American, Asian-American, American-Indian/Alaska Native, Native Hawaiian or other Pacific Islander, or any other race/ethnicity.

<sup>c</sup>Those that reported smoking first cigarette within first 30 min of waking.

<sup>d</sup>Those that reported using e-cigarettes for cessation/reduction at Wave 1.

at the POS. Similarly, 85.1% reported exposure to e-cigarette product displays and 94.9% reported exposure to cigarette product displays. Detailed distribution of all marketing exposures is available in Table 2.

### POS Marketing Exposure and Cigarette Smoking Behavior

Baseline exposure to advertising of e-cigarettes or conventional cigarettes was not associated with a change at 6-month follow-up in cigarette smoking behavior (eg, abstinence; Table 3); and there was no observed interaction between these exposures. However, exposure to e-cigarette product displays was negatively associated with cigarette smoking abstinence at 6-month follow-up (Table 4). With each increase in exposure to e-cigarette product displays, the odds of cigarette smoking abstinence decreased by 0.73, adjusting for covariates. Baseline exposure to conventional cigarette product displays was also negatively associated with cigarette smoking abstinence. With each increase in exposure to cigarette product displays, odds of cigarette smoking abstinence decreased by 0.77, when adjusting for covariates.

To investigate the unique contribution of each type of marketing, e-cigarette and conventional cigarette product display exposure,



on smoking cessation, both were included in the same model. This analysis found that baseline exposure to e-cigarette product displays was uniquely associated with a decrease in abstinence at 6 months. Specifically, for each increase in exposure to e-cigarette product displays, odds of cigarette smoking abstinence decreased by 0.77,

**Table 2.** Self-Reported Exposure to Conventional Cigarette and Electronic Cigarette Point-of-Sale Marketing and Product Displays ( $n = 813$ )

	Baseline cigarette smokers ( $n = 813$ )
<i>Cigarette advertising</i>	
Never	21.9%
Some of the time	32.8%
A lot of the time	25.5%
Every time	19.8%
<i>E-cigarette advertising</i>	
Never	19.4%
Some of the time	37.7%
A lot of the time	30.1%
Every time	12.7%
<i>Cigarette product displays</i>	
Never	5.0%
Some of the time	14.9%
A lot of the time	32.2%
Every time	47.9%
<i>E-cigarette product displays</i>	
Never	14.9%
Some of the time	31.7%
A lot of the time	30.5%
Every time	22.8%

**Table 3.** Point-of-Sale (POS) Advertising Exposure and Cigarette Smoking Behaviors Among Young Adult Texas College/University Students ( $n = 813$ )

	Cigarette smoking abstinence <sup>a</sup>	Used e-cigarettes for cessation/reduction <sup>a</sup>
	AOR (95% CI)	AOR (95% CI)
<i>Step 1a (individual relationship)</i>		
E-cigarette advertising	0.85 (0.72–1.01)	1.46** (1.10–1.94)
AIC <sup>b</sup>	1000.32	1002.43
<i>Step 1b (individual relationship)</i>		
Cigarette advertising	0.92 (0.79–1.07)	1.24 (0.97–1.59)
AIC <sup>b</sup>	456.81	460.90
<i>Step 2 (over and above)</i>		
E-cigarette advertising	0.86 (0.71–1.05)	1.41* (1.02–1.96)
Cigarette advertising	0.98 (0.82–1.16)	1.06 (0.80–1.41)
AIC <sup>b</sup>	1002.26	458.64
<i>Step 3 (interactions)</i>		
E-cigarette ads × cigarette ads	1.13 (0.98–1.31)	0.72* (0.55–0.94)
Likelihood ratio test ( $\chi^2$ )	6.10	13.42*

<sup>a</sup>Models control for age, sex, race, institution type, nicotine dependence, current hookah or cigar use, quit history, and desire to quit and previous use of e-cigarettes to quit or reduce cigarette smoking. Models accommodate the clustering of students within the 24 colleges.

<sup>b</sup>AIC = Akaike Information Criterion

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

controlling for covariates and cigarette product display exposure. There was no unique contribution of exposure to conventional cigarette product displays on cigarette smoking abstinence after controlling for exposure to e-cigarette product displays. Further, no interaction between e-cigarette product displays and conventional cigarette product displays was observed.

### POS Marketing Exposure and Use of E-Cigarettes for Cigarette Cessation

Baseline e-cigarette POS advertising exposure was associated with the use of e-cigarettes for cigarette smoking cessation/reduction at 6-month follow-up (Table 3). With each unit increase in e-cigarette advertising exposure, odds of using an e-cigarette for cigarette smoking cessation/reduction increased by 1.46, adjusting for covariates. When controlling for cigarette advertising exposure (along with baseline covariates), e-cigarette advertising exposure was uniquely associated with the use of e-cigarettes for cigarette smoking cessation/reduction at 6-month follow-up (AOR: 1.41).

As seen in Table 3, there was a significant interaction between advertising exposure for e-cigarettes and conventional cigarettes on the use of e-cigarettes for cigarette smoking cessation. Examining the two-way interaction indicated that e-cigarette advertising exposure was associated with the use of e-cigarettes for cigarette smoking cessation/reduction among participants exposed to low levels (ie, 1 SD below the mean) of cigarette advertising (AOR: 2.14; 95% CI = 1.31 to 3.49), but not those exposed to high levels (1 SD above the mean) of cigarette advertising (AOR: 1.13; 95% CI = 0.80 to 1.62). Alternatively, cigarette advertising exposure was associated with the use of e-cigarettes for cigarette smoking cessation/reduction among those exposed to low levels of e-cigarette advertising exposure (AOR: 1.76; 95% CI = 1.05 to 2.95), but not those exposed to high levels of e-cigarette advertising (AOR: 0.97; 95% CI = 0.74 to 1.28).

**Table 4.** Product Display Exposure and Cigarette Smoking Behaviors Among Young Adult Texas College/University Students ( $n = 813$ )

	Cigarette smoking abstinence <sup>a</sup>	Used e-cigarettes for cessation/reduction <sup>a</sup>
	AOR (95% CI)	AOR (95% CI)
<i>Step 1a (individual relationship)</i>		
E-cigarette display	0.73*** (0.62–0.86)	1.25 (0.95–1.64)
AIC <sup>b</sup>	988.66	457.98
<i>Step 1b (individual relationship)</i>		
Cigarette display	0.77** (0.65–0.91)	1.44** (1.04–2.01)
AIC <sup>b</sup>	994.71	455.00
<i>Step 2 (over and above)</i>		
E-cigarette display	0.77** (0.64–0.93)	1.09 (0.80–1.48)
Cigarette Display	0.89 (0.73–1.08)	1.38 (0.95–2.00)
AIC <sup>b</sup>	989.28	456.73
<i>Step 3 (interactions)</i>		
E-cigarette display × cigarette display	1.17 (0.97–1.42)	0.70 (0.47–1.03)
Likelihood ratio test ( $\chi^2$ )	19.11	9.01

<sup>a</sup>Models control for age, sex, race, institution type, nicotine dependence, current hookah use, current cigar use, quit history, and desire to quit and previous use of e-cigarettes to quit or reduce cigarette smoking.

<sup>b</sup>AIC = Akaike Information Criterion

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Exposure to cigarette product displays was associated with the use of e-cigarettes for cigarette smoking cessation/reduction at 6-month follow-up (Table 4). With each unit increase in cigarette product display exposure, odds of using an e-cigarette for cigarette smoking cessation/reduction increased by 1.44, adjusting for covariates. However, this relationship was no longer significant when adjusting for exposure to e-cigarette product displays. There were no significant interactions between exposure to product displays for e-cigarette and conventional cigarettes.

## Discussion

This study focused on the impact of exposure to conventional cigarette and e-cigarette retail marketing on subsequent young adult cessation behaviors. Unique to this study was an examination of the interaction of conventional cigarette and e-cigarette marketing exposure. Examining the interaction of these marketing sources is critically important given that young adults encounter these marketing exposures in the same locations (eg, retail setting) and both use similar visual messages,<sup>23,24</sup> which may offset or exacerbate the impact of each form of marketing.

This study has several key findings. First, baseline e-cigarette advertising exposure was associated with using an e-cigarette for cigarette smoking cessation/reduction at 6-month follow-up, even when adjusting for baseline cigarette advertising exposure. These findings were qualified by the significant interaction indicating that exposure to e-cigarette advertising was associated with use of e-cigarette devices for cigarette smoking cessation primarily among young adults exposed to low levels of cigarette advertising. Thus, although e-cigarette advertising may increase the odds that a young adult cigarette smoker uses e-cigarettes for cessation/reduction, exposure to high levels of cigarette advertising exposure may undermine this association. Furthermore, the findings of this study are notable given that e-cigarette advertising was not associated with cigarette smoking cessation at 6-month follow-up even after controlling for a number of strong predictors of subsequent cigarette cessation behavior such as nicotine dependence, intentions to quit, and past quit attempts.<sup>41,42</sup>

An additional key finding is that baseline exposure to e-cigarette product displays was associated with lowered odds of cigarette smoking abstinence at 6-month follow-up. This relationship was observed even when controlling for baseline exposure to cigarette product displays. There was no interaction effect between exposure to e-cigarette and conventional cigarette product displays on subsequent abstinence. This finding builds on experimental studies indicating that e-cigarette marketing exposure probably increases the use of conventional cigarettes and may undermine cessation attempts and success.<sup>25,26</sup> It is also notable that exposure to advertising of e-cigarettes was not associated with abstinence at 6 months, even though a negative relationship was found between exposure to e-cigarette product displays and abstinence. Although much is known about the impact of conventional cigarette product displays on cue-response, unplanned cigarette purchases, and smoking relapse,<sup>8-13,18-22,36</sup> findings of the present study indicate that the impact of e-cigarette product displays on cigarette smoking behaviors should be similarly examined.

Cigarette smoking cessation is a complex behavior with many factors that influence success and failure. Findings from this study suggest that e-cigarette advertising and product displays may play multiple roles in cigarette use behaviors. First, e-cigarette

marketing has been found to simulate cigarette smoking visual cues.<sup>23,24</sup> Interpreting this study's findings with an understanding of cue-response theory suggests that images and messages may directly or indirectly undermine cessation/abstinence. Specifically, the presence of nicotine-related visual stimuli could evoke negative subjective (eg, cravings, withdrawal)<sup>8</sup> or physical (eg, elevated heart rate)<sup>12</sup> responses among those contemplating or attempting cigarette smoking cessation/abstinence. Second, though cue-response is a strong factor in tobacco use behaviors,<sup>9,12</sup> individual-level influences (eg, motivations to quit, self-efficacy<sup>43</sup> and harm perceptions<sup>44</sup>) are also associated with cigarette smoking cessation/abstinence. Additional factors are critically important in interpreting the presented findings for several reasons. First, data show that though cigarette smokers recognize the health risks of cigarette smoking<sup>45</sup>; these individuals perceive e-cigarettes as a significantly healthier alternative.<sup>29,46</sup> Second, most (56.0%) study participants reported a recent cigarette quit attempt and 42% reported a desire to quit at baseline. Given the concurrent presence of cigarettes and e-cigarettes at the point-of-sale, it is possible that recalled exposure to cigarette retail marketing in the presence of a perceived healthier alternative, such as e-cigarettes, may serve as a cue to action towards the use of this alternative product. However, this relationship requires further study, both quantitatively and qualitatively.

Given the health and economic benefits of successful smoking cessation, any attempt to quit by smokers is an encouraging sign. Unfortunately, the present study's findings reveal that e-cigarette advertising and product displays may guide smokers towards a cessation aid (e-cigarettes) that remains unproven.<sup>31,47</sup> Our study suggests that though exposure to product displays did increase cessation attempts, actual cessation of cigarette smoking did not occur. It is vital that all cigarette smokers are afforded the opportunity to access evidence-based cessation therapy (ie, counseling, quitlines, NRT) to maximize smoking cessation success rates. Along with offering evidence-based cessation services, policies on the marketing of all tobacco products should foster an environment that supports cigarette cessation to effectively reduce morbidity and mortality related to smoking.

This study has some limitations. First, this study only examines current young adult smokers at baseline, thus excluding successful quitters and abstainers. As such, this research is unable to examine the impact of advertising and product displays on cigarette smoking relapse among individuals that may have been in the action or maintenance stage<sup>48</sup> of cigarette smoking cessation. Similarly, as cigarette smokers experience several stages of change prior to attempting cigarette smoking cessation (ie, precontemplation, contemplation, and preparation),<sup>46</sup> this research is unable to examine progression through these stages. Future research should examine the relationship of marketing exposure on all stages of change related to smoking cessation. Similarly, future research may examine these behaviors beyond 6-month follow-up. A second limitation of the present study is that exposure to advertising and product displays is subject to recall bias. It is possible that young adults who are more interested in or open to using e-cigarettes are more likely to notice and report marketing exposure, as compared to other young adults. For this reason, this research should be examined in concordance with experimental studies of marketing exposure<sup>25,26</sup> as well as ecological momentary assessment<sup>48,49</sup> and direct observations of the point-of-sale environment. Third, it is possible that first year students may differ by some relevant factors compared with students who are in their later college years. Future studies should explore this as our study

did not measure for year classification (eg, 1st year, 2nd year, etc.). Finally, nearly half of the participants also used hookah or smoked cigars, and the impact of that use on cessation attempts or quitting is not known, but should be examined in future research.

These findings have mixed public health implications. First, cigarette smoking cessation should be promoted and encouraged. However, if marketing of e-cigarettes for cigarette smoking cessation pushes smokers towards an ineffective cessation method, cessation/abstinence efforts may ultimately be undermined. Policies should be considered that balance encouraging cigarette smoking cessation, while limiting marketing strategies, such as POS product displays, that may undermine cessation attempts.

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