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ORIGINAL ARTICLE

Preferred flavors and reasons for e-cigarette use and discontinued use among never, current, and former smokers

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Abstract
Objectives To compare e-cigarette flavors preferred and reasons for use and discontinued use across never, current, and former e-cigarette users and cigarette smokers.
Methods We recruited 1567 participants aged 18–34 years through Facebook ads targeting tobacco users and nonusers in August 2014 to complete an online survey. We assessed tobacco use, preferred flavors, and reasons for e-cigarette use and discontinued use.
Results Our sample was 49 % male, 87 % White; 56 % current cigarette smokers; and 53 % e-cigarette users. Current e-cigarette users used an average of 20.9 days in the past 30 (SD = 11.7) and 55.2 puffs/day (SD = 37.3). Compared to never and current smokers, former smokers used e-cigarettes more frequently (p's <0.001). Among users and nonusers, the most preferred was fruit flavors, and the most commonly reported reason for e-cigarette use was "they might be less harmful than cigarettes". The most endorsed reason for discontinued e-cigarette use was "using other tobacco products instead". Never, current, and former smokers had distinct reasons for e-cigarette use and discontinued use and differed in flavor preferences.
Conclusions Regulating marketing and flavors may impact e-cigarette uptake by young adults.

Keywords E-cigarettes · Harm reduction · Smoking cessation · Tobacco marketing · Tobacco control

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Introduction

E-cigarettes have had an impressive emergence in the US market in the past 5 years. A recent US study reported that awareness of e-cigarettes increased from 41 % in 2010 to 80 % in 2013 (King et al. 2015). Additionally, ever use increased from 3 % in 2010 to 9 % in 2013 (King et al. 2015). E-cigarette use is higher among young adults (Rath et al. 2012), women (Rath et al. 2012), and current smokers (McMillen et al. 2012; King et al. 2013; Zhu et al. 2013).

Controversy over e-cigarettes pertains to the potential harm reduction or cessation benefit they present for smokers (Benowitz and Goniewicz 2013; Farsalinos and Polosa 2014) versus the potential risk they pose to the general population (Callahan-Lyon 2014). Related to the former, a recent review concluded that e-cigarettes are a less harmful alternative to smoking and significant health benefits are expected in smokers who switch to e-cigarettes (Farsalinos and Polosa 2014). Research has demonstrated the efficacy of e-cigarettes in alleviating cravings for cigarettes (Bullen et al. 2010; Cahn and Siegel 2011) and their potential as a harm reduction or cessation aid (Bullen et al. 2013; Caponnetto et al. 2013; Berg et al. 2014; Etter and Bullen 2014).

On the other hand, the promotion of e-cigarettes might have a negative impact on population health if they influence nonsmokers to initiate e-cigarette use, if they serve as a gateway to tobacco products, or if they undermine smoke-free policies and ongoing efforts to denormalize smoking (Stratton et al. 2001). In addition, there is concern about the unknown long-term health effects (Riker et al. 2012; Chen 2013; Callahan-Lyon 2014). Moreover, e-cigarettes are highly accessible since they are available

online and in retail stores and are relatively inexpensive. While this might facilitate harm reduction among smokers, easy access also poses few barriers to youth access. Thus, the promotion of e-cigarette has important implications for public health.

Marketing strategies to promote e-cigarettes as a cessation aid, as an alternative to cessation, for use where smoking is not allowed (Gartner et al. 2007; Etter 2010), as a safer alternative to traditional cigarettes (Gray et al. 2005; Stepanov et al. 2008), and for use in social settings (Richardson et al. 2013). Indeed, e-cigarettes are perceived to be less harmful to health, less addictive, and more socially acceptable than most other types of tobacco products (Pearson et al. 2011; Berg et al. 2015b).

Another major marketing effort aimed at capturing a larger market involves novel flavor technologies and marketing and packaging highlighting flavoring (Carpenter et al. 2005). There is a compelling link between youth-targeted product innovations and smoking behavior (DiFranza et al. 1991; Wayne and Connolly 2002; Lovato et al. 2003; Wakefield et al. 2003). Flavored tobacco products contribute to youth tobacco use (Carpenter et al. 2005; Hersey et al. 2006; Klein et al. 2008) because flavoring promotes youth initiation and regular tobacco use by reducing the harsh taste and toxicity of tobacco, thus increasing its palatability and attractiveness (Wayne and Connolly 2002; Carpenter et al. 2005; Hersey et al. 2006). A recent study (Villanti et al. 2013) found that 19 % of youth tobacco users used flavored products. Despite this prior work, to date, research on flavors and young adult product use has not focused on e-cigarette flavors, and few studies have examined this issue in relation to cigarette smoking status.

In addition, little is known about why people discontinue e-cigarette use. One study (Hua et al. 2013) found that the most frequently reported negative health-related effects were in the respiratory, neurological, sensory, and digestive systems. However, whether these experiences discourage continued use or result in a lower likelihood of continued use is unknown. Furthermore, whether these experiences are associated with smoking status and history has also not been examined. It may be that never, current, and former smokers initiate, sustain, and/or discontinue e-cigarette use for different reasons.

Given these gaps in the literature, we aimed to compare (1) e-cigarette never, current, and former users; (2) never, current, and former traditional cigarette smokers in relation to e-cigarette use characteristics, flavors preferred and reasons for use; and (3) reasons for discontinued use among former e-cigarette users across never, current, and former smokers.

Methods

Procedures

The Emory University Institutional Review Board approved this study, IRB# 00073636. We recruited participants aged 18–34 years living in the US via advertisements on Facebook, a social networking website, targeting tobacco and marijuana users and nonusers. Recruitment occurred over a three-week period in August 2014. We advertised to Facebook users who "liked" certain tobacco- or marijuana-related pages (e.g., major cigarette brands, links to e-cigarette ads) or had identified related interests (e.g., "legalize marijuana"). We oversampled these categories to ensure sufficient sample size across tobacco use categories to enable attainment of the research objectives. Advertisements included images of tobacco products, marijuana-related images, and other benign images intended to recruit nonusers. Our recruitment was modeled after other published research methods (Ramo and Prochaska 2012).

Participants

Individuals who clicked on the advertisement were directed to a page including a description of the study and the consent statement. Consenting individuals were screened for eligibility (i.e., age); those eligible were forwarded to the online survey, administered via http://www.surveygizmo.com. To limit duplicate responses, one response per IP address was permitted. The questionnaire took approximately 30 min to complete. Participants were compensated $5.

Of the 4510 individuals who agreed to participate, 2244 did not complete the entire questionnaire (53 % of the 2244 did not move past the information and consent), and 699 were not eligible (482 were outside the age range, 77 declined consent, 140 provided responses that were not plausible). Thus, 1567 had complete and plausible responses.

Measures

Variables assessed in the questionnaire and included in these analyses are outlined below.

Sociodemographics We assessed age, sex, race, ethnicity, education level, employment status, marital status, children in the home, and type of community (i.e., rural, urban, suburban).

Alcohol and marijuana use Participants were asked if they had ever used alcohol and marijuana in their lifetime

and, if so, the number of days they used in the past 30 days. Those who had used in the past 30 days were considered "current users". We also assessed the number of days in the past 30 days they drank five or more drinks on one occasion (binge drinking) [Substance Abuse and Mental Health Services Administration (SAMHSA) 2013].

Tobacco use Participants were asked "About how many cigarettes have you smoked in your entire life? Zero; Just a few puffs; 1–19; 20–100; or More than 100". Lifetime cigarette smokers (smoked at least one cigarette in their lifetime) were further classified as either current smokers (smoked in the past 30 days) or former smokers (smoked more than 100 cigarettes in their lifetime but did not smoke in the past 30 days) (SAMHSA 2013). Participants were asked the number of times they had used other tobacco products (i.e., hookah, small cigars, smokeless tobacco) in their lifetime and, if they had used at least once, the number of days used in the past 30 days. Those using in the past 30 days were considered current users (SAMHSA 2013).

E-cigarette use characteristics Participants were asked, "How many times have you tried e-cigarettes (such as Blu, NJoy, or Ruyan) in your entire life? Zero; Just a few puffs; 1–19; 20–100; or More than 100". Among lifetime e-cigarette users (used at least once in their lifetime), we assessed age at first e-cigarette use and asked, "What best describes your first experience with e-cigarettes? 0 = not at all favorable to 3 = very favorable" and "Have you ever had any of the following adverse (negative) reactions to e-cigarettes: Respiratory problems (cough, bronchitis, etc.); Headaches; or Chest pains or heart issues" (Hua et al. 2013). Lifetime e-cigarette users also reported the number of days in the past 30 days that they had used e-cigarettes. Those reporting use in the past 30 days were considered current e-cigarette users; those who had not were considered discontinued users. Current e-cigarette users were asked to report the number of puffs per day they took from their e-cigarette, whether the e-cigarette they use most of the time was rechargeable or disposable, whether it contained a tank system, the usual level of nicotine in their e-liquid (Etter 2010), how soon after they awake in the morning that they use their e-cigarette (adapted from Heatherton et al. 1989), and where they typically store their e-cigarette (see Table 2 for response options).

Flavors used or of interest Current e-cigarette users were asked, "What flavor of juice or e-liquid do you use most of the time? (check up to three)". E-cigarette nonusers were asked, "Which of these e-cigarette juice flavors would you be most likely to try? (check up to three.)" These response options were categorized using findings from prior research (Zhu et al. 2014). See Tables 3 and 4 for response options.

Reasons for use or possible use Current e-cigarette users were asked, "For what reasons do you use e-cigarettes? (check all that apply)". E-cigarette nonusers were asked, "For what reasons might you use e-cigarettes? (check all that apply)". Response options were based on prior research (Berg et al. 2014, 2015a). See Tables 3 and 4 for response options.

Reasons for discontinued use Discontinued e-cigarette users were asked, "You indicated that you have used e-cigarettes in your lifetime but not in the past month. Why have you not used recently? (check all that apply)". These response options were created by an expert panel and pilot tested on an independent subset of ten former e-cigarette users for clarity and relevance. See Table 5 for response options.

Data analysis

Participant characteristics were summarized using descriptive statistics. Sociodemographic characteristics and substance use behavior were compared among never, current, and former e-cigarettes users. Among current e-cigarette users, these same characteristics were compared among never, current, and former smokers. We then compared (1) preferred flavors and reasons for use among current e-cigarette users; (2) flavors of interest and reasons for possible use in the future among nonusers; and (3) reasons for discontinued use among former e-cigarette users across cigarette smoker subgroups. ANOVAs were used to compare continuous variables across groups, and Chi-square tests were used to compare categorical variables. SPSS 23.0 was used for all data analyses. Statistical significance was set at $\alpha = 0.05$ for all tests.

Results

Participant characteristics

Participants were age 25.2 (SD = 5.1) on average, 49 % male, 87 % White, and 13 % Hispanic/Latino (Table 1). Current tobacco use prevalence was: 53 % e-cigarettes, 56 % cigarettes, 17 % hookah, 21 % small cigars, and 6 % smokeless tobacco.

Comparisons of never, current, and former e-cigarette users

Current e-cigarette users were older than never or former users ($p < 0.001$; Table 1). Current and former users were more likely to be male than never users ($p = 0.013$). Those married or living with a partner ($p < 0.001$) and those with children ($p = 0.001$) were more likely to be current versus

Table 1 Comparison of selected characteristics among never, current and former e-cigarette users among young adults aged 18–34 years in the US, 2014

Variable	Total ($n = 1567$)	E-cigarette use			p
		Never ($n = 267$)	Current ($n = 832$)	Former ($n = 468$)	
Sociodemographics					
Age (years), mean (SD)	25.2 (5.1)	24.0 (4.9)	26.2 (5.2)	24.0 (4.7)	<0.001
Sex (%)					0.013
Male	49.2	40.4	51.9	49.6	
Female	49.6	58.8	46.7	49.6	
Other	1.1	0.7	1.4	0.9	
Race/ethnicity (%)					
Black	5.5	7.9	4.2	6.4	0.043
White	87.0	81.6	88.6	87.2	0.014
American Indian/Alaskan Native	5.0	3.0	5.4	5.3	0.262
Asian/Pacific Islander	5.7	8.6	5.1	5.3	0.085
Other	6.6	5.2	7.0	6.8	0.599
Hispanic/Latino (%)	13.1	11.7	13.0	13.7	0.748
Education (%)					<0.001
≤High school	32.5	30.3	30.0	38.2	
Some college	51.1	44.2	55.0	48.1	
≥Bachelor's degree	16.4	25.5	15.0	13.7	
Employment/education (%)					0.005
Employed part- or full-time	50.4	46.1	54.0	46.2	
College student part- or full-time	21.5	27.7	19.1	22.2	
Unemployed or other	28.1	26.2	26.8	31.6	
Relationship status (%)					<0.001
Married or living with partner	42.2	35.6	48.0	35.9	
Other	57.8	64.4	52.0	64.1	
Have children (%)	28.7	22.5	32.7	24.8	0.001
Community type (%)					0.013
Rural	25.5	27.0	22.6	29.9	
Urban	31.5	31.5	30.9	32.7	
Suburban	42.9	41.6	46.5	37.4	
Substance use (%)					
Lifetime alcohol use	94.4	82.4	97.7	95.5	<0.001
Current alcohol use	69.7	57.0	73.2	70.7	<0.001
Current binge drinking	54.0	35.3	57.2	56.6	<0.001
Lifetime marijuana use	80.3	52.4	86.0	86.1	<0.001
Current marijuana use	41.4	22.5	40.9	53.2	<0.001
Lifetime tobacco use (%)					
Cigarette use	82.9	37.1	95.7	86.5	<0.001
Former smoker	21.1	4.5	32.7	9.8	<0.001
Hookah use	68.6	41.2	74.1	74.6	<0.001
Small cigar use	78.1	39.7	86.6	85.0	<0.001
Smokeless tobacco use	42.5	16.1	50.8	42.9	<0.001
Current tobacco use (%)					
Cigarette use	56.3	23.2	59.3	69.9	<0.001
Hookah use	16.5	9.0	18.5	17.1	0.001
Small cigar use	20.5	13.9	20.3	24.6	0.002
Smokeless tobacco use	5.9	3.0	7.1	5.3	0.039

Table 1 continued

Variable	Total ($n = 1567$)	E-cigarette use			p
		Never ($n = 267$)	Current ($n = 832$)	Former ($n = 468$)	
Among lifetime e-cigarette users					
Age at first use, mean (SD)	23.8 (5.2)	–	24.3 (5.2)	22.0 (4.9)	<0.001
Favorability of first experience, mean (SD)	2.3 (0.9)	–	2.4 (0.8)	1.8 (0.9)	<0.001
Adverse reactions (%)					
Respiratory problems	12.9	–	10.6	20.3	<0.001
Headaches	13.6	–	11.3	21.1	<0.001
Chest pains or other heart issues	4.2	–	3.9	5.5	0.171

Note: Bonferroni post hoc tests indicated current e-cigarette users were older than never and former users (p's < 0.001)

never or former users. Never users had significantly lower prevalence of use of alcohol, marijuana, and other tobacco products (p's < 0.001). Compared to former e-cigarette users, current users began using e-cigarettes at an earlier age ($p < 0.001$), reported more favorable first experiences with e-cigarettes ($p < 0.001$), and reported fewer adverse reactions (respiratory problems, headaches; p's < 0.001).

Comparison of current e-cigarette users by cigarette smoking status

Among current e-cigarette users, former smokers were older than never or current smokers ($p < 0.001$; Table 2). Whites, those married or living with a partner, and those with children were more likely to be former versus never or current smokers (p's < 0.001).

Current e-cigarette users used an average of 20.9 days in the past 30 (SD = 11.7) and reported 55.2 puffs per day (SD = 37.3; Table 2). Most used rechargeable e-cigarettes (93 %) with tanks (78 %). Among users, 48 % used their e-cigarettes within 30 min of waking, with 14 % reporting that they do not use every day.

Regarding differences in e-cigarette use characteristics across cigarette smoker status, former smokers were older at age of first initiation compared to never or current smokers (p's < 0.001; Table 2), and current smokers indicated lower favorability of first e-cigarette experience compared to never and former smokers ($p = 0.002$ and $p = 0.003$, respectively). Current smokers reported adverse reactions to e-cigarettes most frequently (p's < 0.05). Compared to never and current smokers, former smokers used e-cigarettes on more days and reported more puffs per day (p's < 0.001), were the most likely to report using rechargeable e-cigarettes with tanks (p's < 0.001), and were more likely to use their e-cigarette within 30 min of waking (61 %), compared to never (24 %) or current smokers (43 %, $p < 0.001$). Never smokers reported using the lowest nicotine levels in their e-liquid ($p < 0.001$). Regarding storage, former smokers were the most likely to carry their e-cigarettes in their pocket or purse ($p < 0.001$) or have it at work ($p = 0.004$).

Flavors used and reasons for use among current e-cigarette users

Among current e-cigarette users, the most commonly used flavor was fruit flavors (67 %), which was also most commonly reported by never cigarette smokers (80 vs. <75 % in the other smoker categories, $p < 0.001$; see Table 3). While current smokers were the most likely to report using tobacco flavored e-liquid flavors (27 vs. <16 % in the other smoker categories, $p < 0.001$), they were the least likely to report using caramel, vanilla, chocolate, or cream flavors (27 vs. >42 % in the other smoker categories, $p < 0.001$) or candy flavors (29 vs. >42 % in the other smoker categories, $p < 0.001$). Former smokers were least likely to report using menthol or mint flavors (23 vs. >34 % in the other smoker categories, $p = 0.002$).

The most commonly reported reasons for e-cigarette use were "they might be less harmful than cigarettes" (77 %); "they do not smell" (77 %); "they help people quit smoking" (66 %); and "they cost less than other forms of tobacco" (62 %); these reasons were more frequently endorsed by former smokers than the other two subgroups (p's ≤ 0.001). The two items reporting the importance of flavoring were also highly endorsed (roughly 60 %, respectively), with no significant differences across smoker subgroups.

Flavors of interest and reasons for potential use among e-cigarette nonusers

Overall, 36 % of nonusers (never and former users) of e-cigarettes reported no interest in using e-cigarettes, with

Table 2 Comparisons of selected characteristics of current e-cigarette users according to cigarette smoking status among young adults aged 18–34 years in the US, 2014

Variable	Current e-cigarette user ($n = 832$)	Cigarette smoking status			p
		Never smoker ($n = 67$)	Current smoker ($n = 493$)	Former smoker ($n = 272$)	
Sociodemographics					
Age (years), mean (SD)	26.2 (5.2)	24.5 (5.3)	25.1 (5.2)	28.5 (4.3)	<0.001
Sex (%)					0.768
Male	51.9	54.5	51.9	51.1	
Female	46.7	42.4	46.7	47.8	
Other	1.4	0.0	1.4	0.0	
Race/ethnicity (%)					
Black	4.2	6.1	5.3	1.8	0.057
White	88.6	77.3	86.8	94.5	<0.001
American Indian/Alaskan Native	5.4	1.5	6.7	4.0	0.104
Asian/Pacific Islander	5.1	10.6	4.5	4.8	0.098
Other	7.0	10.6	7.9	4.4	0.093
Hispanic/Latino (%)	13.0	12.1	15.7	8.5	0.017
Education (%)					<0.001
≤High school	30.0	15.2	35.5	23.5	
Some college	55.0	65.2	52.3	57.4	
≥Bachelor's degree	15.0	19.7	12.2	19.1	
Employment/education (%)					0.010
Employed part- or full-time	54.0	57.6	50.1	60.3	
College student part- or full-time	19.1	22.7	22.1	12.9	
Unemployed or other	26.8	19.7	27.8	26.8	
Relationship status (%)					<0.001
Married or living with partner	48.0	42.4	40.0	63.6	
Other	52.0	57.6	60.0	36.4	
Have children (%)	32.7	22.7	27.0	45.6	<0.001
Community type (%)					0.259
Rural	22.6	18.2	23.7	21.7	
Urban	30.9	37.9	32.0	27.2	
Suburban	46.5	43.9	44.2	51.1	
Substance use (%)					
Lifetime alcohol use	97.7	93.9	97.2	99.6	0.009
Current alcohol use	73.2	66.7	73.6	73.9	0.461
Current binge drinking	57.2	54.3	64.3	45.1	<0.001
Lifetime marijuana use	86.0	68.2	88.4	86.0	<0.001
Current marijuana use	40.9	27.3	49.7	28.3	<0.001
Lifetime tobacco use (%)					
Hookah use	74.1	75.8	77.4	67.6	0.012
Small cigar use	86.6	63.6	88.6	88.6	<0.001
Smokeless tobacco use	50.8	24.2	54.1	51.3	<0.001
Current tobacco use (%)					
Hookah use	18.5	25.8	23.9	7.0	<0.001
Small cigar use	20.3	19.7	27.8	7.0	<0.001
Smokeless tobacco use	7.1	4.5	10.1	2.2	<0.001
Among lifetime e-cigarette users					
Age of first use, mean (SD)	24.3 (5.2)	22.8 (5.7)	23.3 (5.2)	26.6 (4.4)	<0.001
Favorability of first experience, mean (SD)	2.4 (0.8)	2.7 (0.6)	2.3 (0.8)	2.5 (0.8)	<0.001

Table 2 continued

Variable	Current e-cigarette user ($n = 832$)	Cigarette smoking status			p
		Never smoker ($n = 67$)	Current smoker ($n = 493$)	Former smoker ($n = 272$)	
Adverse reactions (%)					
Respiratory problems	10.6	12.1	14.2	3.7	<0.001
Headaches	11.3	7.6	14.8	5.9	0.001
Chest pains or other heart issues	3.9	3.0	5.3	1.5	0.031
Among current e-cigarette users					
Days of use, past 30 days, mean (SD)	20.9 (11.7)	18.4 (12.3)	17.1 (12.1)	28.6 (5.3)	<0.001
Puffs per day, mean (SD)	55.2 (37.3)	40.7 (37.2)	46.5 (37.2)	74.6 (29.5)	<0.001
Nicotine level in e-liquid (%)					<0.001
0 mg	7.8	34.8	5.7	5.1	
6 mg	20.9	22.7	13.2	34.6	
12 mg	20.0	12.1	20.9	20.2	
18 mg	20.9	7.6	23.7	19.1	
26 mg	5.8	1.5	8.5	1.8	
Other	13.1	10.6	10.1	19.1	
Do not know	11.4	10.6	17.8	0.0	
Rechargeable (vs. disposable) (%)	93.3	92.4	89.7	100.0	<0.001
E-cigarette has tank (%)	77.5	77.3	74.7	82.7	0.039
Time to first e-cig (%)					<0.001
Within 5 min	17.2	6.0	16.4	21.0	
6–30 min	30.5	18.0	26.6	40.1	
31–60 min	13.5	12.0	11.0	18.0	
After 60 min	25.3	38.8	27.0	18.4	
I do not use every day	13.5	24.0	17.8	2.6	
Place of storage (%)[a]					
Around your neck on a lanyard	9.1	9.1	8.5	10.3	0.171
In your pocket or purse	79.2	75.8	74.6	88.2	<0.001
At work	16.7	19.7	13.2	22.4	0.004
Always leave it at home	40.2	47.0	38.9	40.8	0.444
Home, unless going to bar, party	21.4	39.4	21.1	17.6	0.001

Note: Bonferroni post hoc tests indicated that former smokers were significantly older compared to never and current smokers (p's <0.001); former smokers were older at age of first initiation compared to never and current smokers (p's <0.001); current smokers indicated lower favorability of first e-cigarette experience compared to never and former smokers ($p = 0.002$ and $p = 0.003$, respectively); compared to never and current smokers, former smokers used e-cigarettes on significantly more days (p's <0.001) and used more puffs per day (p's <0.001)

[a] Check all that apply

never (63 %) and former smokers (45 %) being more likely to endorse this response compared to current smokers (15 %, $p < 0.001$; see Table 4). Among nonusers of e-cigarettes, the flavor of most interest was fruit flavors (39 %), which was reportedly more of interest to current smokers (43 %) versus <40 % in the other two smoker categories. Current smokers were more likely to report interest in caramel, vanilla, chocolate, or cream flavors; menthol; and tobacco flavors versus other smoker categories (p's <0.001).

The most frequently reported reason for possible e-cigarette use in the future among nonusers was "they might be less harmful than cigarettes" (41 %), which was more commonly endorsed by current smokers (55 vs. <40 % in the other smoker categories, $p < 0.001$). Other frequently endorsed reasons included "they don't smell" (34 %, which was more commonly reported among current smokers, 45 vs. <31 % in the other smoker categories, $p < 0.001$) and "they come in appealing flavors" (32 %, which was more commonly reported among current

Table 3 Preferred e-cigarette flavors and reasons for use by current e-cigarette users across cigarette smoking status categories among young adults in the US, 2014

	Current e-cigarette user ($n = 832$) (%)	Cigarette smoking status			p
		Never smoker ($n = 66$) (%)	Current smoker ($n = 493$) (%)	Former smoker ($n = 272$) (%)	
Flavors used (check up to 3)					
Fruit flavors	66.9	80.3	60.9	74.0	<0.001
Caramel, vanilla, chocolate, cream	33.3	45.5	26.8	42.3	<0.001
Candy (e.g., licorice, gummy bears)	35.1	42.4	29.4	43.8	<0.001
Menthol or mint	30.9	36.4	34.7	22.8	0.002
Tobacco	21.8	6.1	27.4	15.4	<0.001
Coffee or tea	14.4	21.2	15.8	10.3	0.030
Alcoholic drinks (e.g., mojitos, daiquiris)	6.0	6.1	6.9	4.4	0.384
Other foods (e.g., cupcakes, muffins)	17.0	22.7	11.8	25.0	<0.001
Reasons for use (check all that apply)					
Flavors					
They come in appealing flavors	60.2	69.7	58.2	61.4	0.178
I like experimenting with various flavors	59.5	60.6	56.8	64.3	0.104
Social factors					
They are more acceptable to nonsmokers	48.7	50.0	49.9	46.3	0.624
I like socializing with other users.	25.0	43.9	21.3	27.2	<0.001
People who are important to me use them	8.1	16.7	7.5	7.0	0.027
People in the media or other public figures use them	1.6	0.0	2.4	0.4	0.050
Substitution/harm reduction					
They help people quit smoking cigarettes	66.4	43.9	59.0	85.3	<0.001
They might be less harmful than cigarettes	76.7	71.2	71.6	87.1	<0.001
I quit smoking regular cigarettes using them	51.7	21.2	33.7	91.9	<0.001
I use them when I cannot smoke regular cigs	25.2	0.0	41.6	1.5	<0.001
Using them feels like smoking regular cigarettes	34.3	15.2	31.8	43.4	<0.001
Other reasons					
They don't smell	77.3	68.2	74.2	84.9	0.001
They cost less than other forms of tobacco	61.6	40.9	56.6	75.7	<0.001
I use them because I think they are cool or intriguing	14.3	33.3	14.2	9.9	<0.001
I like the buzz from nicotine but don't like regular cigs	12.9	37.9	10.3	11.4	<0.001
I use them to manage my weight	6.6	13.6	5.3	7.4	0.031

smokers, 39 versus <31 % in the other smoker categories, $p < 0.001$). Current smokers were more likely to report several reasons.

Reasons for discontinued use among former e-cigarette users

The most common reason for discontinued e-cigarette use among lifetime users not currently using e-cigarettes was "using other tobacco products instead" (43 %), which was more likely to be reported by current smokers (53 vs. 10 % among never smokers and former smokers, $p < 0.001$; see Table 5). Three other important reasons were "they are too expensive" (35 %); "I just don't think about it" (31 %, which was more frequently reported by never smokers, 59 vs. <30 % in the other two smoker categories, $p = 0.001$); and "I don't like the flavor(s)" (20 %, which was more commonly reported by current smokers, 24 vs. <10 % in the other two smoker categories, $p = 0.022$).

Discussion

This study suggests that never, current, and former smokers prefer different flavors and have different reasons for e-cigarette use and discontinued use. Clearly, flavoring

Table 4 E-cigarette flavors of interest and potential reasons for use among nonusers (never and former users) across cigarette smoking status categories among young adults in the US, 2014

	E-cigarette nonuser ($n = 735$) (%)	Cigarette smoking status			p
		Never smoker ($n = 288$) (%)	Current smoker ($n = 389$) (%)	Former smoker ($n = 58$) (%)	
Flavors of interest (check up to 3)					
Fruit flavors	38.8	32.3	43.4	39.7	0.013
Caramel, vanilla, chocolate, cream	27.3	18.8	33.9	25.9	<0.001
Candy (e.g., licorice, gummy bears)	25.6	21.5	28.5	25.9	0.118
Menthol or mint	25.4	16.0	32.9	22.4	<0.001
Tobacco	21.0	5.6	34.2	8.6	<0.001
Coffee or tea	14.4	11.8	17.2	8.6	0.059
Alcoholic drinks (e.g., mojitos, daiquiris)	13.1	10.4	15.2	12.1	0.188
Other foods (e.g., cupcakes, muffins)	6.0	4.2	7.7	3.4	0.110
I would not be interested in using these flavors	29.3	52.8	11.1	34.5	<0.001
Reasons for possible use in the future (check all that apply)					
Flavors					
They come in appealing flavors	31.8	22.6	38.8	31.0	<0.001
I would like experimenting with various flavors	30.2	13.5	58.7	24.1	<0.001
Social factors					
They are more acceptable to nonsmokers	26.8	12.2	37.8	25.9	<0.001
I would like socializing with other users	6.5	6.6	6.9	3.4	0.603
People who are important to me use them	3.7	1.4	5.1	5.2	0.030
People in the media or other public figures use them	1.8	1.4	2.1	1.7	0.808
Substitution/harm reduction					
They help people quit smoking cigarettes	26.0	9.4	37.5	31.0	<0.001
They might be less harmful than cigarettes	40.5	22.2	54.5	37.9	<0.001
I could quit smoking regular cigarettes using them	20.7	2.8	33.9	20.7	<0.001
I could use them when I cannot smoke regular cigs	27.5	5.2	45.8	15.5	<0.001
Using them might feel like smoking regular cigarettes	19.7	4.2	30.8	22.4	<0.001
Other reasons					
They do not smell	34.0	20.1	44.7	31.0	<0.001
They cost less than other forms of tobacco	28.5	16.0	37.8	27.6	<0.001
I think they are cool or intriguing	5.9	7.3	5.1	3.4	0.359
I like the buzz from nicotine but do not like regular cigs	5.9	3.8	6.7	10.3	0.092
I could use them to manage my weight	5.0	2.4	7.2	3.4	0.017
I would not be interested in trying them	35.9	62.5	14.9	44.8	<0.001

plays an important role in reasons for use across subgroups. Sweet flavors, particularly fruit flavors, were preferred among both current e-cigarette users and nonusers across the smoking status subgroups, as found previously (Villanti et al. 2013). Tobacco flavored e-liquids were not popular among never smokers. A dominant theme regarding reasons for use was flavor; a majority of e-cigarette users and one-third of nonusers reported using "because they come in appealing flavors" and using to "experiment with various flavors". Taken together, this suggests that regulating or restricting the range and variability of e-liquids available may reduce uptake, particularly among never smokers. Interestingly, a fifth of former e-cigarette users reported no recent use because they "don't like the flavor(s)". These findings highlight the importance of flavoring in e-cigarette consumer behavior.

Almost two-thirds of nonsmokers and almost half of former smokers who were not current e-cigarette users reported no interest in using e-cigarettes, whereas less than 15 % of current smokers reported no interest. Among nonusers of e-cigarettes, the most frequently reported reason for possible e-cigarette use in the future was "they might be less harmful than cigarettes", which was endorsed by more than half of current smokers.

Table 5 Reasons for discontinued use of e-cigarettes among former users across cigarette smoking status categories among young adults in the US, 2014

Reasons for discontinued use (check all that apply)	Former e-cigarette user ($n = 256$) (%)	Cigarette smoking status			p
		Never smoker ($n = 29$) (%)	Current smoker ($n = 194$) (%)	Former smoker ($n = 33$) (%)	
Flavor					
I do not like the flavor(s)	20.3	6.9	24.2	9.1	0.022
Social factors					
It has not come up in social situations	14.5	48.3	10.3	9.1	<0.001
My friends do not use them	4.7	6.9	5.2	0.0	0.362
I did not like the image it projected about me	3.9	6.9	3.1	6.1	0.487
I think they are weird or socially unacceptable	3.1	3.4	3.1	3.0	0.994
Other reasons					
I use other tobacco products instead	42.6	10.3	53.1	9.1	<0.001
They are too expensive	35.2	37.9	37.6	18.2	0.091
I just do not think about it	30.9	58.6	28.9	18.2	0.001
I quit tobacco/nicotine altogether	13.3	10.3	3.6	72.7	<0.001
I do not like the idea of using any kind of nicotine/tobacco	10.2	24.1	4.1	33.3	<0.001
I think it's unhealthy	9.0	13.8	6.7	18.2	0.065
I do not like the buzz	9.0	0.0	10.8	6.1	0.135
I do not like the smell	5.1	3.4	5.2	6.1	0.892
They are messy	3.1	6.9	3.1	0.0	0.297

Additionally, over two-thirds of e-cigarette users reporting using them because "they might be less harmful than cigarettes" or "they help people quit smoking", which were more frequently endorsed among former smokers compared to the other two categories. In addition, over 90 % of former cigarette smokers who were current e-cigarette users reported using e-cigarettes to quit smoking.

Notably, former smokers in this sample of current e-cigarette users reported higher frequency of e-cigarette use and using them sooner after waking compared to the other two smoker categories, indicating that they perhaps replaced cigarettes with e-cigarettes. Despite the promise of these findings, these data do not contextualize the results in terms of smokers who may have tried e-cigarettes to quit smoking and either discontinued e-cigarette use or continued to smoke cigarettes. We also do not have data regarding prior smoking levels among former smokers who quit using e-cigarettes; thus, we cannot ascertain the magnitude of harm reduction. Prior research has documented high rates of misbeliefs about FDA approval of e-cigarettes for smoking cessation, particularly among current smokers (Berg et al. 2015a), suggesting a need to inform the general population about the caveats of using e-cigarettes for this purpose.

Only one quarter of participants indicated that a reason for use was that e-cigarettes can be used in situations where smoking is not permitted, and less than 15 % reported using or potentially using because of the intrigue of the product. This is in line with research indicating that current smokers were more interested in reducing health risks or cigarette consumption or to aid in smoking cessation and were less interested in e-cigarettes because of the potential to use them where smoking is prohibited or due to product novelty/intrigue (Berg et al. 2015a). This is important given the concerns about whether using them for these latter reasons might curtail the potential for harm reduction or increase a smoker's total nicotine exposure. However, a concern is that our data also indicated that current smokers used e-cigarettes on fewer days and reported fewer puffs per day than former smokers but used higher doses of nicotine levels in their e-liquids. As such, they may still be experiencing high exposure to nicotine given the dual and potential polyuse of tobacco and nicotine products, which could ultimately make cessation of nicotine use more difficult.

Nearly half of former e-cigarette users reported discontinued use because they were "using other tobacco products instead", with over half of current cigarette smokers endorsing this response. Of note, there was a high

dual use prevalence of e-cigarettes and other types of tobacco products, which has been documented previously (Bombard et al. 2007; Rath et al. 2012; Enofe et al. 2014). In contrast, over half of never smokers said they did not recently use e-cigarettes because they "just don't think about it", possibly indicating that addiction did not play a role in their use. Also of interest, compared to former e-cigarette users, current users reported a more favorable first experience with e-cigarettes and reported less adverse reactions to using them. Among current e-cigarette users, current smokers indicated lower favorability of first e-cigarette experience compared to never and former smokers and most frequently reported adverse reactions to e-cigarettes. This may suggest that smokers with less favorable initial experiences are less likely to achieve cessation using e-cigarettes.

These findings have implications for research and practice. Future research should examine cessation rates and harm reduction outcomes (e.g., changes in nicotine biomarkers, smoking reduction) related to using e-cigarettes compared to other forms of cessation assistance (e.g., nicotine replacement, behavioral counseling) among current smokers. Moreover, research should examine trajectories of e-cigarette use by smoking status category and flavors used to determine the impact of flavors on experimentation and continued e-cigarette and cigarette use. Qualitative research is needed to examine reasons for uptake and/or discontinued use. In practice, clinicians and policy makers must be aware of the evolving context of tobacco use to counsel tobacco users and craft tobacco control policies and educational campaigns that address these changes, particularly in relation to flavors available and the way e-cigarettes are marketed and advertised.

Limitations

Limitations include unknown generalizability given that the sample compared young adults and specifically targeted tobacco and marijuana users. Future research should examine these and other related phenomena in a more representative national sample. Specifically, research might explore why differing subgroups of people use or discontinue using e-cigarettes. Additionally, it is important to note that questions regarding potential use of e-cigarettes among nonusers do not imply that any interest would actually indicate future use of e-cigarettes. Moreover, the categories of flavors investigated were limited, given the vast availability of flavors in the market (Zhu et al. 2014). The online survey format did not permit exploration of the reasons why individuals selected certain responses. Finally, the cross-sectional nature of this study limits the ability to infer causality.

Conclusions

The current study documented flavors of interest and reasons for use, potential use, and discontinued e-cigarette use among never smokers, current smokers, and former smokers. We found less interest in using these products in places that prohibit smoking or due to curiosity about the product and more interested related to reducing health risks or cigarette consumption or to aid in cessation. A common reason for discontinuing e-cigarette use was because of using other tobacco products. Flavors play an important role in reasons for use. Sweet flavors, particularly fruit flavors, are preferred. Regulating flavors may impact uptake by young adults. These findings should inform tobacco regulations, particularly regarding what messages are used to advertise and market e-cigarettes, as well as what flavors are allowed in the market.

Compliance with ethical standards

Conflict of interest The authors declare no conflicts of interest.

Statement of ethical approval The Emory University Institutional Review Board approved this study, IRB# 00073636.

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