Original investigation

Adolescents' and Young Adults' Perceptions of Electronic Cigarettes for Smoking Cessation: A Focus Group Study

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Abstract

Introduction: Research has shown that adults perceive that electronic cigarettes (e-cigarettes) are effective for smoking cessation, yet little is known about adolescents and young adults' perceptions of e-cigarettes for quitting cigarette smoking. This study describes middle, high school, and college students' beliefs about, and experiences with, e-cigarettes for cigarette smoking cessation.

Methods: We conducted 18 focus groups ($n = 127$) with male and female cigarette smokers and nonsmokers in 2 public colleges, 2 high schools, and 1 middle school in Connecticut between November 2012 and April 2013. Participants discussed cigarette smoking cessation in relation to e-cigarettes. Verbatim transcripts were analyzed using thematic analysis.

Results: All participants, regardless of age and smoking status, were aware that e-cigarettes could be used for smoking cessation. College and high school participants described different methods of how e-cigarettes could be used for smoking cessation: (a) nicotine reduction followed by cessation; (b) cigarette reduction/dual use; and (c) long-term exclusive e-cigarette use. However, overall, participants did not perceive that e-cigarette use led to successful quitting experiences. Participants described positive attributes (maintenance of smoking actions, "healthier" alternative to cigarettes, and parental approval) and negative attributes (persistence of craving, maintenance of addiction) of e-cigarettes for cessation. Some college students expressed distrust of marketing of e-cigarettes for smoking cessation.

Conclusions: Adolescent and young adult smokers and nonsmokers perceive that there are several methods of using e-cigarettes for quitting and are aware of both positive and negative aspects of the product. Future research is needed to determine the role of e-cigarettes for smoking cessation in this population.

Introduction

Electronic cigarettes (e-cigarettes) are battery-operated devices that deliver vapor through inhalation. Proponents of e-cigarettes argue that increased use among adults and adolescents who smoke

cigarettes may promote smoking cessation or represent a healthier alternative to cigarette smoking, potentially leading to improved population health outcomes due to decreased exposure to cigarettes.¹ However, there is also concern that e-cigarettes may not

enhance cigarette cessation and instead, promote dual use.² Although the safety and efficacy of e-cigarettes for cessation remains largely unknown, it is clear that e-cigarette use among both adolescents and young adults is increasing.^{3,4} Data from the National Youth Tobacco Survey demonstrates that lifetime e-cigarette prevalence among middle and high school students has increased from 3.3% to 6.8% between 2011 and 2012.⁵

E-cigarette use also is increasing in adults,⁶ and data suggest that this may be due to their interest in using the product for smoking cessation. For example, a prospective study of 1,379 young adult cigarette smokers and nonsmokers at baseline found that the belief that e-cigarettes could help with cessation predicted e-cigarette initiation at 1-year follow-up.⁷ Current adult e-cigarette users also report using the product for smoking cessation. Foulds et al. surveyed a convenience sample of 104 experienced adult e-cigarette users and reported a near universal perception (99% of the respondents) that e-cigarettes could help them quit smoking cigarettes.⁸ Similarly, a 2010 internet survey of 3,587 adult e-cigarette users frequenting smoking cessation or e-cigarette websites found that 92% reported that e-cigarettes helped them reduce their cigarette smoking.⁹

Currently, there is a paucity of research exploring the reasons why users perceive e-cigarettes to be helpful smoking cessation tools. Barbeau et al. conducted a small qualitative study of 11 adult e-cigarette users and found that bio-behavioral similarities between e-cigarettes and cigarettes, as well as social benefits (e.g., having a community of fellow e-cigarette users trying to quit) contributed to their perception of effectiveness of e-cigarettes for smoking cessation.¹⁰ Similarly, Choi et al. found that young adult smokers and nonsmokers felt that e-cigarettes could help with quitting through the ability to gradually reduce nicotine content.¹¹ However, there are no studies exploring the perceptions of both adolescents and young adults.

To better understand the unique perspective of adolescents and young adults, we conducted 18 focus groups with middle school, high school, and college students to examine adolescent and young adults' perceptions of e-cigarettes for smoking cessation. Understanding the unique perceptions of this population is important given that youth are increasingly initiating e-cigarettes^{3,4} but have documented lower rates of smoking cessation than adults.¹² Because social norms influence quitting behaviors in smokers,¹³ we included both smokers and nonsmokers to capture both first- and second-hand experiences with e-cigarette use for cessation as well as to acquire a wider range of social norms around e-cigarette use and cessation. We chose a qualitative approach to more clearly discern youths' perceptions and attitudes about the role of e-cigarettes in smoking cessation. We conducted focus groups with middle school, high school, and college students to facilitate comparisons of perspectives across the developmental period spanning early adolescence through young adulthood.

Methods

Design and Population

We conducted 18 focus groups in two public colleges (one public university, one community college; $n = 8$ groups), two public high schools ($n = 8$ groups), and one public middle school ($n = 2$ groups) in New Haven County, CT from November 2012 to April 2013. We aimed for a purposive sample¹⁴ of smokers and nonsmokers; therefore, college and high school groups were stratified by gender and smoking status, such that two focus groups were conducted for each of the following participant compositions for college and

high school groups: male smokers, male nonsmokers, female smokers, and female nonsmokers. As part of a screening questionnaire, high school and college students were asked, "How often do you smoke cigarettes?" (response options were: "every day," "occasionally," "I quit," "I never smoked"). Students who reported smoking "occasionally" or "every day" were defined as smokers. One female college student participated in a smoker focus group, however revealed that she was, in fact, a nonsmoker during the discussion. Therefore, we excluded her personal contributions from the data analysis. Due to low prevalence of cigarette use among middle school students, the groups conducted in middle schools were stratified by gender only (i.e., one male group; one female group). As our goal was to compare perspectives between age groups, we pre-specified that we would conduct 2–4 focus groups per school strata and were prepared to add more focus groups to reach data saturation.¹⁴

After obtaining permission from the local school boards and principals, middle and high school students were recruited through the use of brief presentations in the lunchroom, brochures, and flyers. After receiving permission from college administrators, college students were recruited with business cards describing the study that were handed out in the student unions and other frequented on-campus locations. Passive parental permission for middle and high school was obtained through letters mailed home to parents instructing them to call the research staff if they did not want their child participate. Written assent (for ages <18) or consent (for ages ≥18) was required from all participants. Research staff informed the students about confidentiality and the voluntary nature of the focus groups prior to their participation. Participants were remunerated with gift cards (worth \$25–\$50) for their participation in the focus groups. A snowballing approach was used to enhance recruitment, wherein participants were invited to ask peers within the same school to join the focus groups.¹⁴ This study was approved by the Yale University Institutional Review Board and local high school and college boards.

Focus Group Procedures

Data analysis and reporting were conducted in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines ([Supplementary Materials](#)).¹⁵ The focus groups contained 4–8 participants, lasted about 1 hr and were conducted at the school or college after school hours in the afternoon or evenings. The focus groups were conducted by female PhD and MD-level facilitators (DAC and DRC), with expertise in adolescent psychology, adolescent medicine and training in focus groups techniques. We used standardized, semi-structured qualitative guides that were developed after pilot testing in one high school and one college focus group ($n = 12$) ([Table 1](#)).

The focus groups began with a warm up discussion wherein participants were asked to define "electronic cigarettes". The facilitators then stated that "Electronic cigarettes are products that deliver nicotine in the form of a vapor. They are run by a battery and have a cartridge that contains nicotine or other chemicals. They are often made to look like such products as cigarettes, cigars, and pipes." Participants were asked to discuss their motivations to use e-cigarettes, their experiences with e-cigarettes, the comparison between e-cigarettes and cigarettes, and social norms around e-cigarette use ([Table 1](#)). Data concerning overall motivations to use e-cigarettes are presented elsewhere¹⁶ and data concerning e-cigarettes and smoking cessation are presented here. Probes were used to encourage clarification and evoke greater detail into

Table 1. Focus Group Semi-Structured Interview Guide

Domain	Question
Knowledge	Tell me what you have heard about electronic cigarettes? What are e-cigarettes?
Motivations to use	What would make kids your age who smoke cigarettes try or use an e-cigarette? Probe: Would they use it for quitting?
Experiences with electronic nicotine delivery systems (ENDS)	What do you think it is like to smoke an electronic cigarette? (For individuals with firsthand experience) Tell us about the first time you used an e-cigarette. Probe: Why are you using an e-cigarette? Do your parents or friends use e-cigarettes? Anyone else? Probe: Why are they using an e-cigarette?
Comparative perception to cigarettes	How do you think e-cigarettes are different from cigarettes?
Social norms	How do you think your friends would react if you used an e-cigarette? Your parents?

participants' narrative. Participants were probed to discuss cigarette smoking cessation in relation to motivations to use and experiences with e-cigarettes, and participants spontaneously discussed e-cigarettes and cessation when discussing comparative perceptions to cigarettes and social norms. A research assistant took detailed field notes during the focus groups and the groups were audio-taped and professionally transcribed. At the conclusion of each focus group, we debriefed all participants on the risks of cigarette smoking and nicotine exposure.

Data Analysis

We analyzed the data using the framework analysis technique¹⁷ to allow for the analysis of a priori themes identified by the researchers (such as smoking cessation) and emergent themes. In the first step (i.e., the familiarization process), team members (DRC and GK) reviewed the transcripts to identify recurrent themes. We put forth a conceptual framework, which included four main themes, all of which contained smoking cessation as a subtheme: (a) descriptions of the product; (b) personal experiences with the product; (c) perceptions of others' use; and (d) comparison to traditional cigarettes. Three pairs of research team members reviewed transcripts using the resulting conceptual framework. Each reviewer coded (or indexed) six transcripts for these a priori themes and also identified emergent themes. The reviewers then met in pairs to review the initial indexing results. Final codes were developed through consensus. A group of four research team members with expertise in adolescent smoking cessation, adolescent medicine, and child development (DRC, MM, PS and CMC) then reviewed the content coded with "Quit Smoking" and individually synthesized and charted the data into a thematic chart. The same four team members then conducted interpretative analysis to group together similar key points and identify recurrent themes that revealed attitudes towards e-cigarettes and quitting. We also analyzed data by school strata and smoking status. The most salient quotes representing each theme were included in the final manuscript.

Results

We conducted eight focus groups with college students ($n = 59$), eight focus groups with high school students ($n = 52$) which were stratified by gender and smoking status, and two focus groups with middle school students ($n = 16$) which were stratified by gender only. Overall, the sample was 48.4% female, 56.7% non-Hispanic White, 20.5% non-Hispanic Black, 10.2% Hispanic White, 3.9% Asian and 8.7% other or multiple race/ethnicity. Almost all (94.5%) participants had heard about e-cigarettes and 33.9% had

tried an e-cigarette. However, experience with e-cigarettes differed by school status, and 0% of middle schools students, 30% of high school students and 46% of college students had tried an e-cigarette. All participants who expressed interest in the study participated and there were no dropouts. Interpretive analysis revealed the following themes around use of e-cigarettes for smoking cessation: (a) methods for smoking cessation; (b) the effectiveness of e-cigarettes for smoking cessation; (c) positive and negative perceptions of e-cigarettes for smoking cessation; and (d) marketing for smoking cessation. Table 2 contains participant quotations that illustrate each theme.

Theme: Methods for Smoking Cessation

When initially asked to define "electronic cigarette", most participants, including middle school students, were aware that e-cigarettes may be used for cigarette smoking cessation. College and high school students perceived that these patterns of e-cigarette use could lead to smoking cessation: (a) nicotine reduction followed by eventual smoking cessation; (b) cigarette reduction and dual use without a goal of cessation; and (c) switching to e-cigarettes followed by long-term exclusive e-cigarette use. However, despite these perceptions, only a few participants had first-hand experiences with using e-cigarettes for cessation; most students described the patterns of smoking cessation by recounting experiences of their friends and families. Although college and high school smokers and nonsmokers described perceptions about using e-cigarettes for nicotine reduction followed by eventual cessation, the other two patterns (i.e., dual use and long-term exclusive e-cigarette use) were described almost exclusively by college smokers.

Nicotine Reduction Followed by Eventual Smoking Cessation

College and high school smokers and nonsmokers perceived that e-cigarette users could gradually reduce or "wean" nicotine dosage. When describing the "weaning" process, college and high school smokers and nonsmokers indicated that they believed this process may be helpful for smokers who wanted to gradually reduce their smoking behavior as well as level of nicotine use.

Cigarette Reduction and Dual Use Without a Goal of Cessation

College smokers also described how they were interested in e-cigarettes to reduce, but not cease, cigarette intake. Participants generally did not have first-hand experience with this method of cessation, although some described how their parents employed this method of cessation.

Switching to E-Cigarettes Followed by Long-Term Exclusive E-Cigarette Use

College smokers identified a pattern of smoking cessation wherein cigarette smokers switched to using e-cigarettes exclusively. They related the long-term exclusive use of e-cigarettes to the belief that they provide a healthier alternative to tobacco cigarettes. For example, a college smoker described how his friend used e-cigarettes during times of stress, even after ceasing cigarette smoking.

Theme: The Effectiveness of E-Cigarettes for Smoking Cessation

Many participants shared failed first- and second-hand experiences with using e-cigarettes for cessation. Furthermore, no college or high school smokers described successful personal experiences with complete cessation with e-cigarettes. For example, one participant described how he tried to use the product to stop smoking, but returned to cigarettes. A few smokers were in the process of trying to switch to e-cigarettes, and could not yet comment on whether they were successful in their cessation efforts. Several college and high school participants reported that their friends had tried e-cigarettes to quit smoking without positive effects. Consistent with the views described previously, however, some reported that their friends were engaging in dual use or long-term exclusive e-cigarette use. Additionally, some participants (including middle school students and nonsmokers) recounted episodes wherein their parents were unsuccessful in their e-cigarette-related quit attempt. However there was one account of a parent using e-cigarettes, discontinuing its use due to lack of satisfaction with the product, and then quitting cigarette smoking “cold turkey”.

Theme: Positive Perceptions of E-Cigarettes for Smoking Cessation

College smokers and nonsmokers described several reasons why e-cigarettes may be useful for cessation. Overall, these participants perceived that e-cigarettes could help with smoking cessation by maintaining smoking actions and allowing individuals to use a “healthier” nicotine product. They described how e-cigarettes maintained the tactile sensations (e.g., mouth fixation, hand motion) or habits (e.g., coffee drinking, driving) associated with smoking. Some college smokers who had firsthand experiences with e-cigarettes described how the maintenance of smoking actions allowed them to cope with conditioned smoking cues. For example, a college smoker described how driving was a personal smoking cue and she therefore used e-cigarettes while driving. However, although this participant did eventually quit smoking, she reported it was due to her boyfriend’s disapproval of smoking, and that she “did not like” e-cigarettes. College smokers also described how e-cigarette use allows users to maintain rituals associated with smoking, such as coffee drinking, while still trying to quit cigarette smoking.

College smokers and nonsmokers also perceived that e-cigarettes were healthier than cigarettes, and this was an added benefit when individuals were trying to quit. They perceived that the healthiness of the product stemmed from the lack of additives and the potential to have better health outcomes. Middle school students and college and high school nonsmokers expressed parental disapproval of any e-cigarette use. In contrast, both college and high school smokers perceived that there was positive parental approval for the use of e-cigarette for the purpose of complete cessation (rather than cigarette reduction or long-term exclusive e-cigarette use). Among smokers,

there was a sense that parents would approve of e-cigarettes because it was a healthier alternative to cigarettes. Several college and high school smokers also described instances when their parents offered them e-cigarettes with the expectation that they would use them to quit smoking altogether.

Theme: Negative Perceptions of E-Cigarettes for Smoking Cessation

College and high school smokers, more so than nonsmokers, also reported several negative attributes of e-cigarettes for the purpose of smoking cessation. Smokers identified the use of e-cigarettes could lead to the persistence of “craving” as a barrier to successful smoking cessation. They described a lingering desire to smoke a cigarette after initiating e-cigarettes. Some smokers also felt that e-cigarettes maintained nicotine addiction, making it difficult to quit.

Theme: Marketing for Smoking Cessation

College students perceived that e-cigarette manufacturers were marketing their product as an aid for smoking cessation. However, many college students also asserted that manufacturers promote e-cigarette use more as a substitute or “alternative” for smoking than as a direct tool for smoking cessation. Further, some participants expressed distrust of marketing practices, believing that the manufacturers are more interested in “making money” than promoting cessation.

Comparisons of Themes Across Age Groups

All age groups shared the perception that few, if any, smokers had success with e-cigarettes for smoking cessation (Table 2). Middle school students shared views with nonsmokers in high school and college regarding parental disapproval for e-cigarette use. College and high school students shared perceptions that e-cigarettes could be used for smoking cessation through nicotine reduction, and college and high school smokers additionally viewed cigarette reduction, and long-term exclusive e-cigarette use as methods of cessation. College students shared perceptions that e-cigarettes had positive attributes of maintaining the actions of smoking and serving as a healthy alternative to smoking, and they perceived that the product was being marketed for smoking cessation. College smokers additionally reported negative attributes of the product and perceived parental approval of e-cigarettes for smoking cessation. Overall, our analysis demonstrated that perceptions were similar across age groups, however some perspectives were expressed only within certain age groups.

Discussion

This study described adolescents’ and young adults’ perceptions of e-cigarettes for smoking cessation. Overall, most students described the patterns of smoking cessation by recounting experiences of their friends and families and had limited and unsuccessful personal experiences with e-cigarettes for cessation. However participants reported a general awareness that e-cigarettes were used for cessation, and described three distinct patterns of e-cigarette use in relation to cessation: (a) nicotine reduction followed by eventual cessation; (b) cigarette reduction and dual use without a goal of cessation; and (c) switching to e-cigarettes followed by long-term exclusive e-cigarette use. Overall, no participants reported successful first- or second-hand experiences with e-cigarettes for cessation, and smokers identified the persistence of craving and nicotine addiction as barriers to

Table 2. Perceptions of Electronic Cigarettes (E-Cigarettes) for Smoking Cessation: Major Themes and Illustrative Quotations

Overall theme	Population	Participant quotations
Methods for smoking cessation		
Nicotine reduction followed by cessation	C, H	I feel if you're trying to quit it actually is useful because you can get ones with progressively less nicotine.—College, male smoker (#53) She couldn't run anymore. She was like "Well, I don't want to stop smoking and I essentially can't stop smoking." So she started smoking the fake ones to try and wean herself off of it or something.—High school, female nonsmoker (#84)
Cigarette reduction/dual use	CS, HS	I just kind of wanted to see if they would help me reduce smoking.—College, male smoker (#25) She (my mom) said it [e-cigarettes] just might cut it down a little bit.—College, female smoker (#9)
Long term exclusive e-cigarette use	CS, HS	My dad started it and he's now no longer smoking cigarettes. He's still using the electric cigarette, though, but I know it doesn't have as harmful effects as actual cigarettes.—College, female smoker (#42) He was smoking a pack and a half a day since he was 16, and he's 27 now, and in two weeks he got an e-cigarette and in two weeks he quit smoking. He just keeps it around because he just keeps it there. He gets stressed out he smokes it but he doesn't smoke any cigarettes.—College, male smoker (#28)
Effectiveness of e-cigarettes		
	C, H, M	I tried for like a week or two, no for less than a week I didn't have a cigarette and then after a while, I was like '[expletive] this' and went out and bought a pack.—College, male smoker (#53) Well, my dad used it once because he smoked for a really long time but he felt that it didn't do anything for him so immediately after he just quit cold turkey. So he stopped smoking.—Female middle school student (#117)
Positive attributes		
Maintenance of smoking actions	C	For me it was the motion when I was driving. That was the hardest for me. I was so used to that, everywhere I went and just the motion. So stuff like, some of that made it easier to quit because I didn't think it was as hard.—College, female nonsmoker (#5) It's like the same motion as smoking a cigarette, that's how I think it helps people quit, you know because some people smoke when they have their morning coffee.—College, female, smoker (#42)
Healthier alternative	C	I think it's cool in that it's a healthier alternative if someone is trying to quit. I have a respect for it. I like that it exists because I know in my father's case and people who are stuck, they can't quit. So if they can still save their health somehow that's like a really cool thing.—College, male, nonsmoker (#18)
Perceived parental approval	CS, HS	If my mom knew I smoked regular cigarettes and I smoked a fake cigarette she'd be like 'At least it's better for you.' She'd be like 'I want you to stop but it's better for you.—High school, female smoker (#92)
Negative attributes		
Craving	CS, HS	I've heard that it's good to quit or it helps you quit. But after smoking that you just want a real cigarette, honestly.—High school, male smoker (#83)
Maintenance of addiction	CS, HS	Its high nicotine though and when you smoke it a lot you end up being more addicted to nicotine more than you normally would.—College, male smoker (#26)
Marketing		
	C	They're not saying quit, they're saying 'Stop cigarettes and switch to us.' So they're not telling me to quit. They're telling me to use something better.—Male, college smoker (#25) They want you to buy their product. They don't care if you quit. They want more money coming to them.—Male, college smoker (#28)

Note. C = college smokers and nonsmokers; CS = college smokers; H = high school smokers and nonsmokers; HS = high school smokers; M = middle school students. Participant numbers (e.g., #28) denote de-identified participant identification numbers.

success. However they also perceived e-cigarettes as a less harmful substitute that allowed smokers to maintain smoking behaviors and rituals. Smokers reported positive parental approval of e-cigarettes for cessation, and college students perceived that e-cigarettes were marketed for smoking cessation.

Comparison of these themes across middle school, high school, and college respondents, demonstrated that there is consistent awareness of e-cigarettes for cessation but no reported experience of success with e-cigarettes for cessation. These perspectives contrast with data from small studies of experienced older adult users

of e-cigarettes, which demonstrates enthusiasm for their use as an aid for cessation.^{8,10} The enthusiasm for e-cigarettes among older, more experienced smokers have contributed to the college and high school smokers' reports of parents approving of e-cigarette use for the purpose of cessation. Future research is needed to determine how parental experiences with e-cigarettes may influence their children's tobacco use patterns.

We did not find that the perspectives differed between age groups, although older age groups had more detailed descriptions of how e-cigarettes could be used for smoking cessation. For example,

college and high school students had more detailed perspectives about how e-cigarettes were used for quitting, and the positive and negative attributes, probably due to their higher likelihood of having a person in their social network attempt to quit. Additionally, a larger proportion of older students had heard of or used e-cigarettes, and these experiences may have increased their likelihood of having more developed perspectives of the product.

Although smaller studies and qualitative studies of adults^{8,10,18} and young adults¹¹ report successful quit attempts with e-cigarettes, large population-based studies in adults have shown that e-cigarette use is not generally associated with successful cessation^{19–21} except among intensive users of e-cigarettes.²² Our study did not expressly examine quit rates with e-cigarette use, although our results indicate that youth across age groups and smoking strata primarily reported unsuccessful attempts at cessation with e-cigarettes for themselves, their friends, and their parents. These perceptions may indicate that adolescents and young adults do not perceive e-cigarettes as an effective tool for cessation or a general awareness of the overall lack of success with smoking cessation among all populations. Further research is needed to determine whether these perspectives influence whether adolescents and young adults use e-cigarettes for cessation or to maintain other tobacco use behaviors.

Smokers in our study described the persistence of craving as a potential barrier to using e-cigarettes for successful smoking cessation, suggesting that some users may not receive adequate nicotine from the product to suppress withdrawal symptoms. Previous research suggests that the persistence of craving may stem from variability in the product's nicotine content and delivery capability^{23,24} or the possibility that novice users vary their inhalation patterns and do not obtain consistent and adequate levels of nicotine from e-cigarettes²⁵. College students also identified that the maintenance of smoking actions with e-cigarettes may help with cessation. Barbeau et al.'s study of 11 adult e-cigarettes users participating in focus groups similarly found that the bio-behavioral feedback with e-cigarettes was similar to that of cigarettes, allowing users to easily substitute e-cigarettes for cigarettes during daily routines during a quit attempts.¹⁰ Although youth may perceive the maintenance of smoking actions as a positive attribute of e-cigarettes, it may maintain some smoking cues that may lead to cigarette smoking relapse.

However, studies have shown that craving can be reduced in the absence of nicotine, through the use of de-nicotinized cigarettes or nicotine-free e-cigarettes, indicating that the behavioral act of smoking can suppress craving independent of nicotine delivery.²⁶ Although not formally studied in younger smokers, this phenomenon was identified by our participants, indicating that this attribute may help attract younger smokers to e-cigarettes who are interested in quitting.

Interestingly, college students perceived that e-cigarettes were marketed for smoking cessation, even though e-cigarette manufacturers may not claim their products are used as smoking cessation devices without formal approval through the Food and Drug Administration. It is unclear from our data whether the participants' perceptions of cessation-related marketing stems from formal marketing practices or from more informal marketing venues such as social networking and internet advertising sites.²⁷ A 2013 study of 365 YouTube videos found that 9.3% made a health claim that "e-cigarettes help with quitting,"²⁸ and a study of 59 websites found that 64% had a smoking cessation-related claim,²⁹ indicating that internet sites may be a source of smoking cessation health claims that not currently are scientifically supported.³⁰ However, even though youth perceive that the product is marketed for cessation, they do

not perceive that e-cigarettes are effective for cessation, indicating that they may be distrustful of the marketing. Continuing research is needed to explore this possibility and determine how e-cigarette marketing practices effect youth perceptions and behaviors.

This study has several limitations. All focus groups were conducted in one geographic area, which may limit the transferability of the results. The participants were all enrolled in school/college; therefore these perspectives may not reflect those of adolescents and young adults who do not attend school. These data do not allow us to make conclusions as to how the perceived effectiveness, positive, or negative attributes of e-cigarettes directly relate to the method of quitting employed with e-cigarettes, as we did not probe specifically on this subject. We defined e-cigarettes as battery operated devices that delivery nicotine and may resemble existing tobacco products, therefore the participant's perceptions of these products may not represent those of all electronic nicotine delivery systems such as "vape pens". Future research should more fully describe how the method of e-cigarette use for quitting correlates with cessation outcomes and satisfaction with the product.

Conclusions

In spite of the study limitations, these data importantly contribute to the literature by providing one of the first descriptions of both adolescents' and young adults' perceptions of e-cigarettes for smoking cessation. Participants identified a variety of patterns of e-cigarette use in relation to quit attempts and characterized positive and negative attributes of the product. Our exploratory data suggest that youth are able to describe positive attributes of e-cigarettes for cessation. However they do not perceive that this product is helpful for cessation, which may indicate that they will not successfully use e-cigarettes for this purpose. Continued surveillance is needed to fully understand the intentions and behaviors surrounding the increasing initiation of e-cigarettes in youth.

Supplementary Material

Supplementary Materials can be found online at <http://www.ntr.oxfordjournals.org>

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Declaration of Interests

None declared.

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References

1. Cahn Z, Siegel M. Electronic cigarettes as a harm reduction strategy for tobacco control: a step forward or a repeat of past mistakes? *J Public Health Policy*. 2011;32:16–31.

2. Grana RA. Electronic cigarettes: a new nicotine gateway? *J Adolesc Health*. 2013;52:135–136.
3. Camenga DR, Delmerico J, Kong G, et al. Trends in use of electronic nicotine delivery systems by adolescents. *Addict Behav*. 2014;39:338–340.
4. Centers for Disease Control and Prevention. Notes from the field: electronic cigarette use among middle and high school students—United States, 2011–2012. *MMWR*. 2013;62:729–730. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6235a6.htm>. Accessed January 15, 2015.
5. Centers for Disease Control and Prevention. Tobacco product use among middle and high school students—United States, 2011 and 2012. *MMWR*. 2013;62:893–897. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6245a2.htm>. Accessed January 15, 2015.
6. Regan AK, Promoff G, Dube SR, Arrazola R. Electronic nicotine delivery systems: adult use and awareness of the ‘e-cigarette’ in the USA. *Tob Control*. 2013;22:19–23.
7. Choi K, Forster JL. Beliefs and experimentation with electronic cigarettes: A prospective analysis among young adults. *Am J Public Health*. 2014;46:175–178.
8. Foulds J, Veldheer S, Berg A. Electronic cigarettes (e-cigs): views of aficionados and clinical/public health perspectives. *Int J Clin Pract*. 2011;65:1037–1042.
9. Etter JF, Bullen C. Electronic cigarette: users profile, utilization, satisfaction and perceived efficacy. *Addiction*. 2011;106:2017–2028.
10. Barbeau AM, Burda J, Siegel M. Perceived efficacy of e-cigarettes versus nicotine replacement therapy among successful e-cigarette users: a qualitative approach. *Addict Sci Clin Pract*. 2013;8:5.
11. Choi K, Fabian L, Mottey N, Corbett A, Forster J. Young adults’ favorable perceptions of snus, dissolvable tobacco products, and electronic cigarettes: findings from a focus group study. *Am J Public Health*. 2012;102:2088–2093.
12. Bancej C, O’Loughlin J, Platt RW, Paradis G, Gervais A. Smoking cessation attempts among adolescent smokers: a systematic review of prevalence studies. *Tob Control*. 2007;16:e8.
13. Zhang X, Cowling DW, Tang H. The impact of social norm change strategies on smokers’ quitting behaviours. *Tob Control*. 2010;19(suppl 1):i51–55.
14. Patton MQ. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, CA: Sage Publications; 2002.
15. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19:349–357.
16. Kong G, Morean ME, Cavallo DA, Camenga DR, Krishnan-Sarin S. Reasons for electronic cigarette experimentation and discontinuation among adolescents and young adults [published online ahead of print December 06, 2014]. *Nicotine Tob Res*. doi: 10.1093/ntr/ntu257.
17. Ritchie J, Lewis J. *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. London, UK: SAGE Publications; 2003.
18. Siegel MB, Tanwar KL, Wood KS. Electronic cigarettes as a smoking-cessation tool: Results from an online survey. *Am J Prev Med*. 2011;40:472–475.
19. Adkison SE, O’Connor RJ, Bansal-Travers M, et al. Electronic nicotine delivery systems: international tobacco control four-country survey. *Am J Prev Med*. 2013;44:207–215.
20. Popova L, Ling PM. Alternative tobacco product use and smoking cessation: a national study. *Am J Public Health*. 2013;103:923–930.
21. Grana RA, Popova L, Ling PM. A longitudinal analysis of electronic cigarette use and smoking cessation. *JAMA Intern Med*. 2014;174:812–813.
22. Biener L, Hargraves JL. A longitudinal study of electronic cigarette use in a population-based sample of adult smokers: association with smoking cessation and motivation to quit. *Nic Tob Research*. 2015;17:127–33. doi: 10.1093/ntr/ntu200.
23. Vansickel AR, Weaver MF, Eissenberg T. Clinical laboratory assessment of the abuse liability of an electronic cigarette. *Addiction*. 2012;107:1493–1500.
24. Vansickel AR, Cobb CO, Weaver MF, Eissenberg TE. A clinical laboratory model for evaluating the acute effects of electronic “cigarettes”: nicotine delivery profile and cardiovascular and subjective effects. *Cancer Epidemiol Biomarkers Prev*. 2010;19:1945–1953.
25. Vansickel AR, Eissenberg T. Electronic cigarettes: effective nicotine delivery after acute administration. *Nicotine Tob Res*. 2013;15:267–270.
26. Buchhalter AR, Acosta MC, Evans SE, Breland AB, Eissenberg T. Tobacco abstinence symptom suppression: the role played by the smoking-related stimuli that are delivered by denicotinized cigarettes. *Addiction*. 2005;100:550–559.
27. Ayers JW, Ribisl KM, Brownstein JS. Tracking the rise in popularity of electronic nicotine delivery systems (electronic cigarettes) using search query surveillance. *Am J Prev Med*. 2011;40:448–453.
28. Paek H-J, Kim S, Hove T, Huh JY. Reduced harm or another gateway to smoking? source, message, and information characteristics of e-cigarette videos on YouTube. *J Health Comm*. 2014;19:545–60. doi: 10.1080/10810730.2013.821560.
29. Grana RA, Ling PM. “Smoking revolution”: a content analysis of electronic cigarette retail websites. *Am J Prev Med*. 2014;46:395–403.
30. Zhu SH, Sun JY, Bonnevie E, et al. Four hundred and sixty brands of e-cigarettes and counting: implications for product regulation. *Tob Control*. 2014;23(suppl 3):iii3–iii9.