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Listening to Adolescents: Their Perceptions and Information Sources About E-cigarettes



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ABSTRACT

Purpose: There has been a sharp increase in adolescent electronic cigarette (e-cigarette) use, and e-cigarettes are now the most commonly used tobacco product among U.S. middle and high school students. Frequent use among high school students was reported to be 27.7% in 2018, an increase of almost 8% from 2017. As yet we have only a limited understanding of adolescent perceptions of e-cigarettes and where adolescents receive information about them.

Design and methods: Thirty-four adolescents from Western New York participated in semi-structured interviews. Both adolescents who had used e-cigarettes and never used e-cigarettes were included to capture a broad perspective. The interview data were analyzed using content analysis.

Results: Both adolescents who had used e-cigarettes and never used e-cigarettes acknowledged the popularity and acceptance of e-cigarettes among their peers. E-cigarettes were viewed as a healthy alternative to regular cigarettes that mimicked the appearance but were less harmful and more enjoyable. Reasons for not using e-cigarettes included harms to health, risk of addiction, and the gateway effects for other risky behaviors. Major information sources about e-cigarettes included advertisements, family, peers, social media, and the internet.

Conclusions: Adolescent perceptions of e-cigarettes, which contribute to reasons for e-cigarette use or not use, and the sources of information that may influence those perceptions were identified.

Practical implications: Our findings provide valuable information to guide prevention initiatives and develop interventions, particularly planning for preventive messages and effective communication methods to deliver for adolescents.

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Adolescent electronic cigarette (e-cigarette) use is an emerging health issue. E-cigarettes are devices that deliver nicotine and other liquid mixtures such as propylene glycol, glycerin, and other chemicals that have flavors added making it more attractive to users (Centers for Disease Control and Disease Prevention [CDC], 2019). E-cigarettes are marketed under various names, such as “e-cigs,” “e-hookahs,” “mods,” “vape pens,” “vapes,” and “JUUL,” and can also be used to deliver other drugs besides nicotine, such as marijuana (CDC, 2019). Although adolescent use of other tobacco products has declined significantly in recent years, e-cigarette use has increased dramatically from 1.5% in 2011 to 11.7% in 2017 among middle and high school students (CDC, 2018). E-cigarettes are now the most commonly used tobacco products among both middle and high school students in the U.S. (CDC, 2018). Given this rapid increase in e-cigarette use among adolescents who are at a

developmentally sensitive stage in their lives, a great deal of concern has been expressed about the implications for adolescent health now and in the future.

In spite of our admittedly limited knowledge about the long-term health effects of e-cigarette use, there is evidence to suggest that serious health consequences, including the potential impact on brain development and risk of addiction to nicotine, may result (Callahan-Lyon, 2014; Jensen, Luo, Pankow, Stronin, & Peyton, 2015; National Academies of Sciences, Engineering, and Medicine, 2018; Yuan, Cross, Loughlin, & Leslie, 2015). In addition, given that significant amounts of nicotine emit from e-cigarettes (Czogala et al., 2014), the secondhand inhalation of e-cigarette vapors also needs to be considered as contributing factor for nicotine exposure and initiation of smoking or e-cigarette use among adolescents (Okoli & Kodet, 2015; Zhang & Pu, 2016). Although risk of nicotine exposure from secondhand inhalation by e-cigarettes is reduced compared to combustible cigarettes, vapor can still be exhaled by the users (Czogala et al., 2014). Moreover, e-cigarette use has also been linked to greater engagement in other risky behaviors, particularly the use of other tobacco products (Bold

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et al., 2018; Miech, Patrick, O'Malley, & Johnston, 2017; Morgenstern, Nies, Goetze, & Hanewinkel, 2018; Wills, Sargent, Knight, Pagano, & Gibbons, 2015), marijuana (Audrain-McGovern, Stone, Barrington-Trimis, Unger, & Leventhal, 2018), binge drinking (Lessard et al., 2014; Milicic & Leatherdale, 2017), and violence and/or risky sexual behaviors (Demissie, Jones, Clayton, & King, 2017).

Given that adolescent perceptions are known to be a predictive factor for future risky behaviors (Halpern-Felsher, Beihl, Kropp, & Rubinstein, 2004; Song et al., 2009); and positive perceptions of e-cigarettes have also been associated with increased e-cigarette use (Amrock, Zakhar, Zhou, & Weitzman, 2015), it is important to understand what adolescents think about e-cigarette use. Perception is what participants are aware of, know, and understand as explained by Neisser (1979, p.21) in that “perception is the activity by which we pick up information about environmental objects and events”.

According to self-perception theory (Bem, 1972), individuals' perceptions are the way they “come to know their own attitudes, emotions, and other internal states by inferring them from observations of their own overt behaviors and/or the circumstances in which this behavior occurs” (Bem, 1972, p. 2). Perceptions thus not only facilitate the interpretation of individuals' or other people's behaviors, but also encompass the underlying meanings, motives, and intentions driving those behaviors and the contextual factors related to those circumstances. Perceptions are therefore especially important in the context of nursing and healthcare because it allows nurses to gain a more in-depth understanding of healthcare issues and develop better healthcare approaches (Bunting, 1988). In this study, we assume that perceptions, as defined above, can be assessed through the use of qualitative interviews.

Previous studies have focused on the perceived harms and benefits by adolescents compared to conventional cigarettes or explored the experiences of e-cigarette users. Only a few qualitative studies have explored perceptions of e-cigarettes from the perspective of both e-cigarette users and non-users. Compared to other substances, adolescents have fewer negative views and more positive views of e-cigarettes, especially relative to conventional cigarettes (Amrock et al., 2015; Roditis & Halpern-Felsher, 2015), which may be contributing to the recent uptick in the use among adolescents. In addition, some motives are unique to adolescents; the great majority of adolescent e-cigarette experimenters have never smoked any other tobacco products, while adult e-cigarette users often view them as a smoking cessation aid (Anand et al., 2015; Chapman & Wu, 2014; Romijnders, van Osch, de Vries, & Talhout, 2018). Adolescents tend to have positive perceptions of e-cigarettes, given that the majority believe that e-cigarettes are less harmful than cigarettes (Amrock et al., 2015). In order to understand this trend and the motivations that drive adolescents' adoption of e-cigarettes, we need to have more-in depth understanding of how adolescents perceive e-cigarettes and what shapes their perceptions related to contextual factors. In particular, it will be helpful to hear diverse perspectives from adolescents who have experimented with e-cigarettes and those who have not, which could provide valuable insights about protective and risk factors (Romijnders et al., 2018).

Furthermore, the current study aims to provide knowledge regarding where adolescents receive information about e-cigarettes and how this may be associated with adolescent perceptions of e-cigarettes. There are few studies that have examined adolescent information sources about e-cigarettes. One qualitative study indicated that adolescents in the U.S. learn about e-cigarettes from the media, from friends and family, and from the school environment (Roditis & Halpern-Felsher, 2015), while a study conducted in South Korea revealed that the majority of adolescents found their information from the internet and friends (Cho, Shin, & Moon, 2011). However, we still lack an understanding of what kind of information adolescents receive about e-cigarettes and from where. Particularly, no studies have explored how information sources may be different from ever-users and never-users of e-cigarettes. This remains an important issue because these sources

are likely to influence adolescent perceptions about e-cigarettes and the decisions to use or not use e-cigarettes.

The purpose of this study is to explore adolescent perceptions of e-cigarettes and the sources of information about e-cigarettes. The following research questions guided this research: (1) What are the adolescent perceptions of e-cigarettes as related to the decisions to use e-cigarettes or not? (2) What information sources do adolescents consult when seeking information about e-cigarettes?

Methods

Participants and setting

In total, 34 participants were interviewed. All were recruited from an urban and suburban area in Western New York State via purposeful sampling strategies, which included issuing invitations to those listed on a large research registry of families via email and mail, and distributing flyers at local community centers. Inclusion criteria for recruitment were that the adolescents were (1) between 10 and 18 years old; (2) able to communicate in English; and (3) interested and willing to share their perspectives about e-cigarettes. This study was approved by the Institutional Review Board of the affiliated university. We obtained both parental consent and minor assent from each participant.

To ensure that we were hearing from a heterogeneous group of adolescents, we tried to recruit adolescents from diverse demographic backgrounds, particularly attempting to have proportions of participants distributed to each age, gender, and racial/ethnic group, close to the national demographics. These efforts resulted in the following characteristics; 50% of the participants were female, 44.1% were Caucasian Americans, 32.4% African Americans, 14.7% Asian Americans, and 8.8% Latinos. Participants' mean age was 13.47 years old ($SD = 2.39$ and age range = 10–18 years old). We made extra efforts to recruit minority groups by distributing our flyers to local community centers where there were clusters of African Americans, Asian Americans, and Latinos. The majority of the participants self-reported themselves to be above average in school achievement and to have literacy levels that were either better than average (38.2%) or average (38.2%); over half (61.8%) were in receipt of free school lunches. Among participants, 20.6% indicated that their family had government sponsored health insurance, and 61.8% reported that they get free lunch at school. In total, 23.5% of the participants had either tried or were regular users of e-cigarettes (“ever-user”) and 76.5% had no prior use (“never-user”) at the time of the recruitment. Participants were compensated with a \$25 gift card for participating in the interview.

Procedures

Interviews were used for this qualitative research (Seidman, 2006). One-on-one, semi-structured interviews were conducted by two researchers who had received training on interviews for qualitative research prior to the study to interview adolescents. Both interviewers are licensed nurses and doctoral students in nursing. One interviewer is an Asian with various experiences working with adolescents around the globe through non-governmental organizations (NGOs), and the other is a non-Hispanic Caucasian who had an extensive former experience working directly with adolescents and was a nurse educator at the children's hospitals. Median age of two interviewers was 40. Each interview lasted 30 min to 1 h and was conducted either at the participant's home or in the researcher's office during the period of June to August 2018. Before starting questions about e-cigarettes, participants responded to a brief demographic questionnaire including age, gender, race/ethnicity, school achievement, literacy level, kinds of health insurance, whether receiving free lunch, and past experiences of e-cigarette use. Ten semi-structured interview questions were developed to reveal participants' perceptions and information sources about e-cigarettes

Table 1
Perceptions of electronic cigarettes (e-cigarettes) among adolescents: Major themes and illustrative quotations.

Overall theme	E-cig ever user or never-user	Quotes
Reasons for e-cigarette use Popularity	NU, EU	'Most of my friends don't do it, but I know that it's very popular now, especially around my age. Now, everyone's turning 18'. (#1: 17 years old female, never-user) 'Once e-cigarettes got popular, the trend of vapes got popular, then it (trend of cigarette smoking) kind of started all over again. And before I never heard I know a couple smokers of cigarettes but now, so many of my friends smoke JUUL or e-cigs. So I know for a fact that it makes it more acceptable, because it's seen like a more friendly I guess version and definitely has a social place because it's everywhere at the parties and just like around in friend groups and because it's an e-cigarette, it's seen as less harmful than regular cigarettes'. (#34: 18 years old male, ever-user) 'I know that kids use JUULs a lot. So, definitely, especially for the high school population, so high school sophomores and juniors, I know that's super popular'. (#9: 18 years old female, ever-user)
Coolness	NU, EU	'I feel like nowadays kids smoke to look cool or try to make themselves fit in with somebody... I know a lot of kids that smoke e-cigarettes. Nowadays kids will go into school and at lunch time they'll smoke their e-cigarettes at the lunch table. Obviously you can't smoke in a school and they still do'. (#13: 16 years old male, ever-user) 'Well I think the main reasons (if I were to vape in the future) would be to look cool, to be popular, and to hang out with the cool people. I think those are the main reason'. (#27: 11 years old male, never-user)
Pleasant and attractive due to the unique features	EU	'People smoke just to even see the smoke come out of their mouth. Even smoking that it (e-cigarette) is just better. People say cigarettes don't taste good and then the vape you can get multiple different varieties of kinds... An e-cigarette, really, you could blow the e-cigarette in the car with the window down and it would smell good. It's going to smell like whatever; cotton candy, this or that. I don't think it would harm as much as a cigarette at all'. (#13: 16 years old male, ever-user) 'I feel like people might believe it's less harmful because the smoke from regular cigarettes is a very pungent smell. And vapors are always scented. People might walk into a public area, and they'll be oh, why does that smell really good over here? They won't think anything of it, but it will actually be vapors from another e-cigarette'. (#9: 18 years old female, ever-user)
Healthier alternative	NU, EU	'the smoke from cigarettes is an actual burning smoke. It can be harmful to your lungs and all that stuff, instead of (as suppose to) vape smoke. Because vape it like vapor. It's not actually some that can really harm you that bad. But it's still not the best for you. So neither one is healthy. But cigarettes are just way worse than the vaping'. (#18: 14 years old male, never-user) '(When asked about breathing vapors from other people's e-cigarettes when passing/walking pass them) I don't think its harmful because if it was like a real cigarette I would say yes because the vapor is really more healthier and more less harmful than from a real cigarette. So if you are walking past you can't help but to inhale it, but I don't think it will harm you... I don't think it's healthy I just think it's better, a better choice than a real cigarette'. (#12: 14 years old female, never-user)
Reasons for not using e-cigarette Ambiguity	NU, EU	'I don't really have like a clear like mindset on it, because I feel like nobody is really going to know the health risks until like this generation grows up and you see what like it did to everyone who used it'. (#4: 17 years old female, ever-user) 'I feel that vapes are healthier, but they also don't have a lot of research on it. So, we don't actually know'. (#5: 14 years old female, never-user) 'I don't know if e-cigarettes harm you because I don't know a lot about e-cigarettes but I know about a lot about the regular cigarettes. You shouldn't breathe from them'. (#27: 11 years old male, never-user)
Harms to health	NU, EU	'I feel like e-cigs are probably worse for you in a different way than cigarettes are. Because like they sell the nicotine, like the addictive qualities, but cigarettes have so much more in them that you're breathing in than like the vapor does, because it's like water vapor and like nicotine and whatever else they put in it'. (#4: 17 years old female, ever-user) 'It's not good for your health, it can give you cancer, can give you other stuff I don't know about. Also, because it's harmful to your body, to yourself, like you look different, and I don't want- like when I see- you look older, like you might be 20, but you look like you're like 40, and I'm like, 'Oh my gosh', and you look- you don't look the same as you would- as other people would look". (#31: 11 years old female, never-user)
Risk for addiction	NU, EU	'I think you will become addicted because it's just like cigarettes. If you take one and you smoked, and you get addicted because usually it's because of the taste or you just can't stop doing it. You get used to it'. (#17: 13 years old male, never-user) 'Because, like if you already smoke regular cigarettes, and then you use e-cigarette, it's going to be way harder than usual, because you got the e-cigarettes too, that make, that you smoke, too. And it'll just make it harder for you to quit, because now you're smoking two instead of one'. (#19: 11 years old male, never-user) 'I feel like they (e-cigarette users) know deep down they're gonna get addicted, but they don't wanna face it'. (#23: 15 years old male, never-user)
Gateway	NU	'No. e-cigarettes is just the tip of iceberg in my opinion. If you start e-cigarettes when you're a teenager and when you become an adult, you'll start using real cigarettes. Like e-cigarettes is a root. It's like a dandelion which sprouts more and then more seeds which grow weeds and dandelions and it spreads more. So I don't think e-cigarettes are that good for youth'. (#27: 11 years old male, never-user) 'But people say it's (e-cigarettes) better, but it's really not because one day you might either 'I'm already on e-cigarette', or, 'I'm already on vaping, so I might as well- I can smoke cigarettes in, and my- I can smoke weed or something like that', it's getting higher (threshold)". (#31: 11 years old female, never-user) 'I had a friend - he was a great kid, and great athlete, great at school, whatever. So when he started the e-cigarettes, he quit the baseball team, he quit the football team, his grades plummeted - he was just a mess. So I just didn't wanna go down that road. It's (e-cigarettes) such a gateway - not even just a gateway drug. It's just a gateway to many other things - bad things' (#23: 15 years old male, never-user)

Note. EU = had ever used an e-cigarette product; NU = had never used an e-cigarette product.

based on previous studies (Copeland, Peltier, & Waldo, 2017; Roditis & Halpern-Felsher, 2015; Kong, Morean, Cavallo, Camenga, & Krishnan-Sarin, 2015; Tan, Lee, & Bigman, 2016; Tan, Lee, Nagler & Bigman, 2017). The guiding questions were used to elicit adolescent perceptions of e-cigarettes, particularly reasons for using e-cigarettes or not using e-cigarettes, perceived harms and benefits, and information sources. Sample interview questions included "What will be the most important

reason for your decision to use e-cigarettes or not in the future?"; "Can you tell me how people talk about e-cigarettes among your age group?"; "Where do you receive information about e-cigarettes?"; "Where do you think adolescents are hearing about e-cigarettes?" All interviews were audio-recorded. Pseudonyms were used during the interviews, and no information that would identify participants was included in the transcripts.

Data analysis

Content analysis was conducted using a qualitative descriptive approach (Elo & Kyngas, 2008). All audio files were transcribed verbatim using a transcription service. The researchers listened to the audio-recorded files and read the transcripts to check their accuracy. Two researchers independently read the transcripts and identified meaningful units of the data for the research questions based on open-coding methods to create a coding scheme. In the initial stage, the researchers sought to identify the maximum possible number of codes. These were then grouped together to create higher order themes based on convergent and divergent themes across interviews and each theme was labeled. The researchers immersed themselves in the data to find the embedded meanings and the relationships that emerged. The researchers jointly discussed these codes and themes to reach a consensus to identify the participants' perceptions about e-cigarettes related to reasons for e-cigarette use and reasons for not using e-cigarettes and the sources of information that may have influenced those perceptions from the data. Then, the data were analyzed using a deductive approach based on the participants' past experience with e-cigarettes and a table was created to code the most salient quotes corresponding to each theme. Discrepancies between coders were discussed and amended until a consensus was reached. In the current study, saturation was determined when no new information that could be used to create new categories regarding adolescent perceptions about e-cigarettes and information sources was identified (Saunders et al., 2018).

Results

This study explored adolescent perceptions about e-cigarettes related to reasons for e-cigarette use and reasons for not using e-cigarettes. The kinds of information sources that influenced the teens' thoughts about e-cigarettes were also discussed.

Perceptions of e-cigarettes among adolescents

The perceptions and experiences with e-cigarettes based on what the adolescent participants reported are presented in Table 1, where they are illustrated by representative quotations from individual interviews. Adolescent perceptions are presented in two categories: reasons for e-cigarette use and reasons for not using e-cigarettes. Subthemes are reported for each of groups, including ever-users and never-users ("ever-users", i.e. participants who had ever used e-cigarettes; "never-users", participants who had never used e-cigarettes), respectively.

Reasons for e-cigarette use

In an effort to understand what motivated adolescents to try or initiate e-cigarette use, the participants were asked to share their motivations, reasons for starting or future use, and the benefits they thought would come from using them. Although participants had difficulty coming up with benefits and reasons when discussing just e-cigarettes and their use, a fruitful discussion generated several subthemes when participants were asked to compare e-cigarettes with conventional cigarettes.

Popularity. Given the growing frequency of exposure to e-cigarettes among today's youth, it is not surprising that the majority of both ever users and never-users recognized that e-cigarettes are popular, especially among the high school students.

Ever-users. Ever users described in detail about how popular e-cigarettes are among adolescents. One of the participants stated that although recent reports have shown that smoking conventional cigarettes is declining among adolescents, the introduction of e-cigarettes has led to a rising trend in vaping, describing this phenomenon as "the smoking trend is starting all over again" (Participant #34: 18 years old male, ever-user). Further probing revealed e-cigarettes appear to be more

acceptable among adolescents; they definitely possess likeable features (e.g., flavoring); and are perceived as fun at popular social gatherings, such as parties. When asked if vaping among teens was regularly seen at their schools, other participants responded that it was most frequently seen outside of school such as at parties, at convenience stores or even at fast food vendors, but they had also seen it in school specifically in the bathrooms and at the lunch table. Another mentioned that "kids smoke their e-cigarettes at the lunch table" (Participant #13: 16 years old male, ever user), which shows the prevalence of e-cigarette use. When acknowledging its popularity, JUUL, a type of e-cigarette, was mentioned by many of the participants.

Never-users. Never-users also recognized the popularity of e-cigarettes. The apparent acceptability of e-cigarettes was another reason why some participants believed e-cigarettes were popular and widely used among their age group as one participant explained:

"The only reason that youth do it is because everyone else does it. And they think it's more acceptable. You'll see a 15-year-old girl with an e-cigarette, you won't really think much of it just because you see it so much now, whereas ten years ago, you'd see a 15-year-old girl with a cigarette, you just immediately freak out because you don't see that really. But times have definitely changed, especially with e-cigarettes because they don't think much of it. They just do it just because everyone else does it - oh, it's going to happen to me".

[(Participant #23: 15 years old male, never-user)]

Interestingly, one participant (#27: 11 years old male, a never-user) suggested that e-cigarettes were considered suitable for younger people like teenagers in the first place, just as conventional cigarettes used to be for adults. With the growing popularity of e-cigarettes, this participant believed the epidemic of smoking in general would never stop, stating, "even though we stop cigarette smoking, we would still have e-cigarette smoking. It's like a weed on the ground, it spreads and spreads".

Coolness. Many participants mentioned that one of the reasons why people vape in their age group was because they felt cool using it among their peers.

Ever-users. Ever users emphasized the importance of social pressure in addition to looking cool. In this context, feeling or looking cool appeared to have some association with peer pressure or trying to make themselves fit in for both the never-user and ever-user groups. "I could see for a lot of people would be with peer pressure and just the constant social circle around" (Participant #34: 18 years old, male, ever user).

Never-users. When never-users were asked what would be the most important reason for their decisions to use e-cigarettes in the future, one of the participants stated, "I think the main reason would be to look cool, be popular, and hang out with the cool people" (Participant #27: 11 years old male, never user). In addition, when asked about how people talk about e-cigarettes among their age group, a participant who had never used e-cigarettes stated, "they think it's cool. It's surprising that they feel that they are older because of it." (Participant: #26: 12 years old male, never-user). One participant mentioned that "they (e-cigarette users) think it's cool and that's going to make them popular, but really it's not", which clearly indicate that it may be the reason why they stayed as "never-users" (Participant #17: 13 years old male, never-user).

Pleasing and attractive due to its unique features. Adolescents perceived that e-cigarettes were not only attractive through appearing cool, but also had unique features such as the variety of flavors and scents available in the vape juice (e-juice).

Ever-users. Ever users particularly emphasized the importance of these characteristics as the main reasons for e-cigarette use. One participant explained,

“An e-cigarette, really, you could blow the e-cigarette in the car with the window down and it would smell good. It's going to smell like whatever; cotton candy, this or that. I don't think it would harm as much as a cigarette at all”.

[(Participant #13: 16 years old female, ever user)]

Further, another participant explained that they found it to be a convenient method of experiencing feeling high, believing that people switch to e-pens because they get the same high from using the e-juice as they get from weed without having to smoke the actual marijuana or the tobacco leaves. The participant quotes, “I think it's like CBD (cannabidiol, cannabis) oil in a CBD. (It) is like a certain chemical in marijuana that makes people like get that high feeling, so I think people switched to pen so that they don't smoke actual marijuana and the tobacco leaves. They switched to say converting from cigarettes to e-cigarettes or switching from weed actually weed to like a, like a juice from weed” (Participant #24: 18 years old male, ever user).

Healthier alternative. The perception that e-cigarettes are a less harmful or healthier alternative to smoking conventional cigarettes was extensively described by many of the participants. While the ever-users conveyed a strong belief that inhaling the vapor was much better for health than the smoke from conventional cigarettes, never-users shared the perception that e-cigarettes were less harmful but still remained harmful.

Ever-users. One participant indicated that he and his friends switched from cigarettes to e-cigarettes, as saying “my friend, he stopped smoking cigarettes and switched to an e-cigarette and he told me that it helps him, so I would see if it would help in when I'm hanging out with them. I don't smoke as many actual cigarettes.” (Participant #24: 18 years old male, ever user). Another participant described that this can be a good reason to use e-cigarettes, “they definitely justify the use as it's not an actual cigarette” (Participant #9: 18 years old female, ever user).

Never-users. One participant stated that inhaling vapor from other people's e-cigarettes when walking past them on the street was not harmful because the vapor was healthier and less harmful than that from conventional cigarettes. In another example, a number of never-users stated that if they were ever to decide to smoke, they would rather choose an e-cigarette, because they felt that e-cigarettes would be a better option than smoking cigarettes or weed. Moreover, although the ever-users discussed the benefits of smoking cessation, the never-users were also aware of this. As one participant stated, “E-cigarette is just a step down from actually really smoking. So I wouldn't say it helps people quit but it does make it easier on their body because of the less harm that's in the e-cigarettes” (Participant #28: 14 years old female, never-user).

Reasons for not using e-cigarettes

Three subthemes were identified as contributing to the reasons for not using e-cigarettes.

Harms to health. Participants identified several negative health consequences of using e-cigarettes, including acquiring lung disease or cancer, explaining that they were viewed as “not risk free” and may cause one to die at a young age.

Never-users. Additional health risk concerns included transmission of germs through saliva from using the same vaping device, as well as stained teeth, and an aversion to looking older than their actual age due to excessive vaping (i.e., wrinkles and sagging of skin tone). Those who held the view that e-cigarettes were harmful to their health were also more inclined to agree that secondhand vapor was equally damaging to health. Additionally, adolescents expressed concerns about the unknown chemicals in e-cigarettes.

Ever users. Interestingly enough, ever users expressed concerns that e-cigarettes were actually worse than conventional cigarettes, which can be seen in the following participant statement,

“I feel like e-cigs are probably worse for you in a different way than cigarettes are. Because like they sell the nicotine, like the addictive qualities, but cigarettes have so much more in them that you're breathing in than like the vapor does, because it's like water vapor and like nicotine and whatever else they put in it”.

[(Participant #4: 17 years old female, ever-user)]

Risk of addiction. Both ever-users and never-users mentioned about the potential risk of addiction when using e-cigarettes.

Never-users. The never users often brought up their personal experience of observing those close to them become addicted and described the effects of long-term e-cigarette use in tandem with drug addiction.

Ever-users. The vast majority of never-users expressed concerns about addiction and dependency, while the contrary view was held by ever-users, who believed that habitual dependency would only develop due to the nicotine content, not merely through the use of e-cigarettes alone. One of the ever-users noted that smoking e-cigarettes became a habit over time and that with some vapes, a similar “hit” could be experienced with conventional cigarettes that contained nicotine, making it easier to become addicted. Interestingly, one of the participants described e-cigarette addiction using the analogy of electronic device addiction, and stated that just as with iPad addiction, it is easy to become addicted to e-cigarettes with every day use.

Gateway. When the adolescents were asked about harms of e-cigarette use and reasons for not using e-cigarettes, the gateway effect was not mentioned among ever-users as a potential problem, while many never users expressed concerns of starting other risk behaviors after e-cigarette use.

Never-users. Many never-users expressed agreement, saying that although no teens should be using e-cigarettes in the first place, vaping was common among their age group and that this behavior in some way appeared justified. Some never-users thought that this attitude not only put both users and never-users at risk, but also inherently led to the use of conventional cigarettes in adulthood for the users. For example, one never-user described e-cigarette use as just the tip of the iceberg and stated, “If you start e-cigarettes when you are a teenager and when you become an adult, you will start using real cigarettes”. (Participant #27: 11 years old male, never-user) Another participant, also a never-user, emphasized that e-cigarettes are not just a gateway drug but also a gateway to many other health risk-taking behaviors, including a decline in academic and sports performance at school that would lead to future failure.

Ambiguity. Although the general harms associated with conventional cigarettes were relatively well-known among adolescents, the majority of the participants expressed only a vague understanding of the harms that may be caused from e-cigarette use, including secondhand inhalation of vapor.

Never-user. Most never-users were unable to draw a definite line and convey their opinions on the differences between harmful effects caused by smoking conventional cigarettes and e-cigarettes. Many of the participants felt that they were not educated enough to answer or that they did not know enough about either the harms or benefits of vaping.

“I don't feel like I'm educated enough to answer this properly but – because I don't know if the smoke from a cigarette is just as bad as the smoke from an e-cigarette”.

[(Participant #20: 12 years old male, never-user)]

“I don't know if e-cigarettes harm you because I don't know a lot about e-cigarettes but I know a lot about the regular cigarettes”.

[(Participant #27: 11 years old male, never-user)]

Ever users. Harmful health effects were perceived as distal and ambiguous to ever users as well, as one described, “I don't really have like clear mind set on it, because I feel like nobody is really going to know

the health risks until like this generation grows up and you see what like it did to everyone who used it" (Participant #4: 17 years old female, ever user).

E-cigarette information sources

The participants were asked about the kind of information sources that influenced their thoughts about e-cigarettes. The findings indicate that their thoughts and opinions were influenced by advertisements, marketing, and online and offline companies' schemes; family and friends; the internet and social media, including online news articles; and information received in school (listed in Table 2).

Advertisement and marketing

Both ever-users and never-users of e-cigarettes perceived that e-cigarette manufacturers were marketing their product by describing vaping as being far better than conventional cigarettes in a number of ways. When discussing the health-related commercials that appear on the television warning about the harmful nature of smoking, many expressed doubts regarding whether e-cigarettes were a form of smoking or not. For instance, one participant readily recalled an advertisement and expressed frustration that these commercials lacked clarification about the harmfulness or usefulness of e-cigarettes, saying:

We see a lot of, like, commercials that are like funded by, like, the companies but they don't highlight e-cigarettes and they only highlight the bad and the harmful effects of the traditional cigarettes. They don't really highlight like vaping or like using an e-cigarette or like just like other methods of smoking. So it's more like younger kids, people my age and be like, oh they are not talking about the harms of it so there's probably not that many to it or some might think that there are no harms to it so why not do it?

[(Participant #2: 14 years old female, never-user)]

Family influence

Many adolescents, including ever-users and never-users of e-cigarette reported that they obtain e-cigarette information through conversations with parents or by observing their older sibling who vaped. Never-users mentioned their parents conveyed information that e-cigarettes were bad and caused disease, while ever-users explained their older siblings influenced their views about e-cigarette as being more beneficial. One ever-user watched her sister quit conventional cigarettes after switching to e-cigarettes and therefore felt that e-cigarettes were better than conventional cigarettes. A similar instance was described by a never-user participant:

It'll be less harmful, because my brother told me, and because he used to smoke e-cigarettes. But he don't no more. He told me that is, that is not as much tobacco in it than a regular cigarette. And it's not, it don't have that much stuff in it that makes it as addicted, I mean, as addictive, as smoking regular cigarettes.

[(Participant #20: 12 years old male, never-user)]

Peer influence

Talking with friends or observing those who vaped was another major source that ever-users and never-users of e-cigarettes felt influenced their thoughts about e-cigarettes. One participant described observing his friends quit smoking conventional cigarettes completely after switching to e-cigarettes, which consequently appeared to him as being helpful. Another expressed concern that seeing his friend decline in all aspects and areas that he used to thrive in after being "hooked" on e-cigarettes, and hence, was strongly against starting to use e-cigarettes. However, many adolescents explained that their peers were their major influencers and information source for initiating use, as one described,

It's definitely like a peer thing, I believe. A lot of kids started using them because friends had them. And maybe those friends have older siblings who would have easier access to them than they would. So, they're able to spread it around...it's less of a quit smoking type of habit that people would develop. It's more of just like they tried it once because their friends told them to. And they thought it was cool or something. And then they just developed the habit of using it.

[(Participant #9: 18 years old female, ever-user)]

Internet and social media

Most participants, including both ever-users and never-users of e-cigarettes reported seeing information on social media (i.e., Facebook, Instagram, Snapchat, and YouTube), as explained by one participant who stated: "I get a lot of my information from social media. So, as a heavy Instagram user, I see people vaping on there a lot. So, they talk about it." Participants also expressed frustration that when searching for information about e-cigarettes on the internet, different websites present contradictory information, which in turn gives no clear answers about the harmfulness or usefulness of e-cigarettes. Additionally, adolescents viewed the popular video channel as a particularly favorable resource for learning cool vape tricks or e-pen tutorials.

Classrooms

Only never-users mentioned that they obtained information e-cigarettes in classroom settings. For example, one student stated:

Yeah. Like, because we have like health class. We learn about what it contains in the vapors, what contains in cigarettes, and why people can't like stop, and how come, and that it, people, like people and money are going down that smoke cigarettes. Because, like you could get broke, because it's like – because they told me how much money, how much money that they spend each year. And I think it was like something in the thousands.

[(Participant #19: 11 years old male, never-user)]

In another example, a participant described how he learned about e-cigarette and vaping as one form of smoking while writing an essay assignment about the harms caused by smoking.

Discussion

This study identified unique perceptions among adolescents about e-cigarettes, which can be a predictive motivator for their future e-cigarette use (Amrock et al., 2015). In addition, important sources of information, which provide critical knowledge to inform future intervention and prevention efforts were identified. The current study, particularly, adds new insights by listening to both ever-users and never-users of e-cigarettes and extends our understanding of adolescent e-cigarette use. Some of the perceptions of users vs. never-users differed in meaningful ways that have important implications for interventions. The fact that never users were particularly concerned about the gateway effects compared to ever-users could be used in prevention programs to keep non-users from starting e-cigarette use. However, once adolescents have used e-cigarettes, pleasant and attractive features, such as flavors may need to be the most important aspects to be addressed in interventions to stop the use of e-cigarettes.

Both ever- and never-users acknowledged that e-cigarettes are popular among adolescents, which reflects the current emergence of extensive e-cigarette use among adolescents. This finding indicates that adolescents are at a greater risk, as adolescents may have easy access to e-cigarettes and the peer pressure to vape is high. In particular, JUUL was identified as one of the most commonly used devices and thus warrants special attention. JUUL, a type of electronic nicotine delivery system (ENDS), has become increasingly prevalent among youth, accounting for 76% of the dollar share of ENDS units in 2018 (Fadus

Table 2
Themes reflected in the assessment of adolescent information sources of electronic cigarettes.

Information source	E-cig ever user or never-user	Quotes
Advertisement and marketing	NU, EU	'We see a lot of like commercials that are like funded by like the companies but they don't highlight e-cigarettes they only highlight the bad and the harmful effects of the traditional cigarettes. They don't really highlight like vaping or like using an e-cigarette or like just like other methods of smoking. So it's more like kids will look at that like younger kids, people my age and be like oh they are not talking about the harms of it so there's probably not that many to it or some might think that there are no harms to it so why not do it?' (#2: 14 years old female, never-user) 'Converting from smoking actual cigarettes to e-cigarettes that would take tobacco companies down, get the commercials off, talking about a hurt lungs. I don't see commercials about e-cigarettes. Harm people, as long as I only see commercials about actual cigarettes harming people. I don't know and that's the problem (talking about chemicals inside ecig). Tying to convert from actual cigarettes to e-cigarettes. That would sway my opinion more'. (#24: 18 years old male, ever-user) 'There's all this advertisement about how e-cigs are better than cigarettes'. (#14: 15 years old male, ever-user)
Family influence	NU, EU	'My mom, like when I first found out about them I'd seen somebody smoking one and like that's kind of like what is it? My mom told me about it and I just learned more and more as time went on about them..... Well she (mom) didn't tell me that it was good or bad she just explained what it was' (#12: 14 years old female, never-user) 'My sister smoke e-cigarettes for a little bit and she smokes cigarettes and then went to e-cigarettes and then she didn't smoke at all. It helped her quit. I feel like the e-cigarettes are just a better thing completely' (#13: 16 years old male, ever-user)
Peer influence	NU, EU	'It's definitely like a peer thing. A lot of kids started using them because friends had them. And maybe those friends have older siblings who would have easier access to them than they would. So, they're able to spread it around. And I believe that's what makes it the most acceptable and accessible for youth...It's less of - it's less of a quit smoking type of habit (smoking cessation) that people would develop. And it's more of just like they tried it once because their friends told them to'. (#9: 18 years old female, ever-user) 'So like after school, I see the eighth graders at the back of the building vaping and smoking and stuff. I think it's because they think it's cool and that it's gonna make them popular' (#17: 13 years old male, never-user) 'Yeah, seeing friends do it. Peer pressure. I've been peer-pressured many times, but it's just so easy to get hooked on it' (#23: 15 years old male, never-user)
Internet and social media	NU, EU	'I watched like a few videos about people. I don't really like them. I just like them because it's cool to see people do tricks with it, like when they blow it out it goes into like a circle. There was another one where they do a huge circle and like move it with their hand and then they do something else it looks like. And then they blow something into it and it looks like a jellyfish. I don't really want to do it a lot. But, when I see the videos, it makes me want to do it more'. (#21: 11 years old male, never-user) 'I actually tried researching websites. And everything was different. I was being told it was worse. I was being told it was better. I'm like - so I just don't know what to believe anymore.' (#23: 15 years old male, never-user) 'I get a lot of my information from social media. So, as a heavy Instagram user, I see people vaping on there a lot. So, they talk about it.' (#9: 18 years old female, ever-user)
School (classroom)	NU	'We have like health class. We learn about what it contains in the vapors, what contains in cigarettes, and why people can't like like stop, and how come, and that it, people, like people and money are going down that smoke cigarettes. Because, like you could get broke, because it's like - because they told me how much money, how much money that they spend each year'. (#19: 11 years old male, never-user)

Note. EU = had ever used an e-cigarette product; NU = had never used an e-cigarette product.

et al., 2019). The JUUL delivers nicotine by heating a liquid, which produces an aerosol appealing sweet and fruity flavor, making it popular especially among younger people (Zernike, 2018). This device delivers nicotine at a concentration of 5%, has the appearance of a USB drive, and can fit in the palm of the user's hand, making it attractive and easy to conceal. The growing popularity of the JUUL among adolescents has caused serious concerns by the FDA and documents have been requested from JUUL Labs, Inc. related to their marketing practices, public health impact, adverse experiences, and complaints related to the device (Gottlieb, 2019).

Cognitively, both ever-users and never-users perceived e-cigarettes as making them look cool. This positive perception increases the risk of adolescent e-cigarette use (Kong et al., 2015). This image may be related to the vaping tricks that are demonstrated on the web and social media, as young people are often fascinated by new technology such as new devices and techniques and the new possibilities they bring (Pepper et al., 2017). Another potential reason for e-cigarette use was that e-cigarettes provide a healthier alternative compared to conventional cigarettes as well as smoking cessation benefits. E-cigarette ever-users identified benefits of e-cigarettes, such as pleasing and attractive features like their pleasant flavor, juice, and odor based on their own experiences. The positive perception about flavor can be particularly important in the light of an earlier study indicating that adolescent ever-e-cigarette users perceived that they are less harmful than non-flavored e-cigarettes (Cooper, Harrell, Pérez, Delk, & Perry, 2016). The findings of the current study are consistent with the primary motives for e-cigarette use experimentation, which include curiosity (54.4%), appealing flavors (43.8%), and peer encouragement (31.6%; Kong et al., 2015).

Reasons for not using e-cigarettes were related to major concerns about the potential harmfulness to health due to the chemicals involved, the risk of addiction, ambiguity, and the possible gateway effects for other substance use. Both ever-users and never-users perceived that e-cigarettes posed harms to health and risk of addiction although they remained unsure about the short-term and direct effects, as found similarly with other studies (Bernat, Gasquet, Wilson, Porter, & Choi, 2018; Kong et al., 2015). Although adolescents already know about the harmfulness of e-cigarettes to health and the addictive effect, these potential risks may not be imminent enough to become a critical reason for limiting or avoiding their e-cigarette use. However, only never-users expressed worry about the potential gateway effects. The concerns about the gateway effects may be important protective factors encouraging adolescents to remain never-users. They were scared about the possibility that e-cigarettes may lead them to become engaged in other risky behaviors, and thus, avoided using them. Another reason why the gateway effects were not particularly mentioned by ever-users could be related to the fact ever-users may already be using other substances. Previous studies indicate that e-cigarette use is associated with other substance use (Milicic & Leatherdale, 2017).

In addition, this study identified the major information sources for e-cigarette use as being advertisements, marketing, family, peers, and internet including social media. These are consistent with the findings of previous studies (CDC, 2018; Cho et al., 2011; Roditis & Halpern-Felsher, 2015). The CDC (2018) reports that risk factors for youth tobacco use are media and marketing exposure, followed by tobacco use by peers and parents, while another study indicated the internet, (46.4%), friends (27.9%), television (11.0%), books (9.3%), and others (5.4%) to be major routes of information for those who have used e-

cigarettes (Cho et al., 2011). While books were not mentioned by all participants of the current study, schools were uniquely identified as an important information source by never-users; these findings from the current study replicate information sources identified from other studies. Furthermore, the current study extended the findings in that those information sources are used by both ever-users and never-users of e-cigarettes.

Previous studies have indicated that adolescents are exposed to unregulated online sales and marketing (Mackey, Miner, & Cuomo, 2015; Paek, Kim, Hove, & Huh, 2014). This is of concern given that prior studies have shown, that there is a positive association between exposure to e-cigarette ads and attitudes and intent to use among adolescents, and that never-users perceived e-cigarettes as cool, more fun, healthier, and more enjoyable after watching the ads (Duke, Allen, Eggers, Nonnemaker, & Farrelly, 2016). Interestingly, some of the never-users in the current study were critical of the positive messages conveyed by marketing, which may thus be an important protective factor. Interventions designed to critically evaluate media messages may be effective in helping never-users to remain abstinent from e-cigarette use. Other studies have also found the internet and social media to be common sources, and this may indicate active information-seeking tendencies related to e-cigarettes, exposure to vaping adverts, a lack of knowledge, and a desire to acquire more information among adolescents (Cho et al., 2011; Emery, Vera, Huang, & Szczypka, 2014; Park & Kwon, 2018). An implication of this finding is that social media may be a platform for launching interventions to educate adolescents about the harms and risks associated with e-cigarette use.

In addition, family and friends were major direct sources of exposure of e-cigarettes for adolescents. Family members' e-cigarette use such as their siblings' experience not only lowers barriers to use but also provides easy access to e-cigarettes. A lack of communication with parents or parents' positive attitudes towards e-cigarettes could also be seen as a passive approval, which is known to be a risk factor for youth e-cigarette use (Camenga et al., 2015). Friends act as another important motive for adolescents. The desire to fit in with their peer group is a strong motivator for adolescents; hence, if e-cigarettes are seen as something that cool kids do, this can be a major incentive for them to adopt this behavior (Kong et al., 2015).

Limitations

Although we attempted to recruit a heterogeneous participant groups (i.e., age, race/ethnicity) to gather diverse perspectives, the participants in this study all lived in the same geographic area, which limits the findings' transferability to general population. In addition, it should be noted that 61.8% of participants in this study received free lunch. According to the National Center for Education Statistics, 50.1 to 75.0% of students who are eligible for free lunch are considered as mid-high poverty schools (National Center for Education Statistics, 2019). Given the cost of e-cigarette devices and cartridges, use may be even more prevalent in more affluent populations of adolescents. One limitation is that the study participants consisted of more never-users than ever-users and a relatively small number of adolescents who had experienced e-cigarettes were included. Another limitation to note is that both interviewees were female and non-smokers. This could have introduced a potential bias during the interviews.

Recommendation for future studies

Based on this study, future studies need to explore how adolescents decide whether or not to use e-cigarettes in more depth. Including both regular e-cigarette users and those who tried e-cigarettes but stopped, to compare their reasons to use e-cigarettes and information sources may be particularly valuable for gaining insight into adolescent e-cigarette use and to identify possible avenues for intervention. In addition, quantitative studies that can compare perceptions and information

sources between ever-users and never-users may shed light on which sources of information are the most influential. These sources could then be used as possible platforms for intervention studies.

Implications for pediatric nursing

The findings of this study indicate that adolescents still lack sufficient knowledge about e-cigarettes and their effects, in spite of their popularity. This emphasizes the need for effective education on the health consequences of e-cigarettes. Although adolescent e-cigarette use is an emerging problem, only a small percentage of healthcare providers assess adolescent e-cigarette use and provide treatment and most do not particularly feel comfortable providing appropriate advice to adolescents (Pepper, McRee, & Gilkey, 2014; Stepney, Aveyard, & Begh, 2019). This study, therefore provides important insights into the messages needed to be delivered to adolescents to prevent e-cigarette use. Emphasizing the gateway effects, risk of addiction, and harms to health are the most important messages to be addressed with non-users to reinforce their decisions to abstain from e-cigarette use. It is less clear what messages would work best for those who are already using e-cigarettes, but providing accurate information about e-cigarettes to users could be important, such as the harmful effects of flavored e-cigarettes. In addition, healthcare providers should make an effort to change social norms around the appearance and social desirability of e-cigarettes (e.g., "looks cool"). Healthcare providers can use cognitive behavior counseling or motivational interviewing for adolescent e-cigarette prevention, which can enhance knowledge about e-cigarettes and support the development of behavioral skills that help them to resist peer-pressure (Modesto-Lowe & Alvarado, 2017; Pepper et al., 2014). Given the popularity of e-cigarette use and potential concurrent use of other substances with e-cigarettes found in the current study, it is important for healthcare providers to screen e-cigarette use and other substance use among adolescents.

In addition, the key information sources identified should be taken into account in considering communication methods for interventions. For example, social media was identified as an important source of information, and it can be used to educate adolescents about the risks associated with e-cigarettes. Parents are another important factor associated with the reasons for adolescents to use or not use e-cigarettes, which indicates the importance of including parents in communication. Interestingly, healthcare providers were not mentioned in this study as providing support or information about e-cigarettes, as previously reported (Pepper et al., 2014). Given that healthcare providers are expected to be reliable experts on all health-related matters, it is important for them to understand this new phenomenon and provide an effective preventive effort.

Policy implications

The regulation of e-cigarettes for adolescents is important. Online marketing is one of the main sources of information for this population. Thus, it is important to make it mandatory to include appropriate warnings about e-cigarettes, particularly in advertisements and marketing campaigns targeted at adolescents. In particular, given that the flavor and its taste are important elements of the attractiveness of e-cigarettes for adolescents, regulating flavored e-cigarettes for adolescents may be a promising approach to prevention. At the local school level, policies that prevent adolescents from using e-cigarettes and mandatory education for e-cigarettes prevention can be an important way to change social norms for adolescent e-cigarette use. In addition, public health campaigns to change adolescent perceptions of e-cigarettes delivered using the internet and social media with consistent messages, including its harmfulness to youth health, addictive problems, and the gateway effects can be effective.

CRedit authorship contribution statement

Eunhee Park: Formal analysis, Funding acquisition, Project administration. **Misol Kwon:** Formal analysis.

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