Addictive Behaviors Reports 10 (2019) 100224

Contents lists available at ScienceDirect

Addictive Behaviors Reports

journal homepage: www.elsevier.com/locate/abrep

Pilot study to inform young adults about the risks of electronic cigarettes through text messaging

Karen S. Calabro[a,*], Georges E. Khalil[b], Minxing Chen[c], Cheryl L. Perry[d], Alexander V. Prokhorov[b]

[a] Department of Behavioral Science, The University of Texas (UT) MD Anderson Cancer Center, Houston, TX, United States
[b] Department of Behavioral Science, UT MD Anderson Cancer Center, Houston, TX, United States
[c] Department of Biostatistics, UT MD Anderson Cancer Center, Houston, TX, United States
[d] School of Public Health at Austin, The University of Texas Health Science Center at Houston, Austin, TX, United States

ARTICLE INFO

Keywords:
E-cigarettes
Young adults
Text messaging
Perceived risk

ABSTRACT

Introduction: Young adults are rapidly adopting electronic cigarette (e-cigarette) use. The popularity of e-cigarettes among young people can be attributed to heavy industry advertising and misleading health claims. Data indicate that young e-cigarette users who have never used conventional cigarettes may transition toward smoking combustible cigarettes. Communicating e-cigarette risks via text messaging is limited. This pilot study assessed the impact of exposure to 16 text messages on e-cigarette knowledge and risk perception. The short text messages delivered to participants conveyed e-cigarette use may lead to addiction to nicotine and explained the latest health-related findings.

Methods: A two-group randomized pretest and posttest study was conducted among 95 racially, ethnically diverse young adults recruited from vocational training programs. Fifty percent of participants were randomized to receive either gain- or loss-framed messages. Knowledge and risk perceptions about e-cigarettes and tobacco use were assessed pre- and post-message exposure.

Results: Participants had a mean age of 20.8 years, $SD = 1.7$. Current use of e-cigarettes was reported by 10.5% (10/95) and 27.4% (26/95) used a variety of other tobacco products. Findings revealed significant increases in knowledge about e-cigarettes after exposure to the messages (range for *ps*: $p < 04$ to $p < 0.0001$). A statistically significant increase in perceived e-cigarette risk was found post-exposure ($p = 0.002$). Participants randomized to gain-framed messages reported a significantly higher perceived risk of using e-cigarettes post-exposure than did those who received loss-framed messages ($p = 0.02$).

Conclusions: This was a small-scale pilot requiring additional evidence to support the effectiveness of text messaging for increasing e-cigarette knowledge and risk perception. Future research may apply text messages to test new ways to educate young populations about tobacco use and consider addressing these messages to specific subgroups at high risk of use such as non-college bound young adults.

1. Introduction

Electronic cigarettes, also known as e-cigarettes, and vaping devices are a diverse group of products delivering aerosolized liquid nicotine, flavors, and other chemicals (National Academies of Sciences, 2018; US Department of Health and Human Services, Public Health Service, Office of the Surgeon General, 2016). Trials are underway seeking to establish whether using e-cigarettes promotes sustained abstinence from combustible cigarettes among nicotine-addicted adult smokers (Brown, Beard, Kotz, Michie, & West, 2014; Carpenter et al., 2017; Ghosh & Drummond, 2017; Guillaumier et al., 2018; Rigotti et al., 2018; Warner & Mendez, 2019; Zawertailo et al., 2017).

Nicotine exposure is related to dependence and neurobiological changes in brains of young adults still in development (Bi et al., 2017; Li et al., 2015; Morales, Ghahremani, Kohno, Hellemann, & London, 2014). Support for e-cigarettes use as a risk factor for progressing to smoking conventional cigarettes among never-smoking young adults (YAs) is mounting (Loukas, Marti, Cooper, Pasch, & Perry, 2018; Primack et al., 2018; Primack, Soneji, Stoolmiller, Fine, & Sargent, 2015; Soneji et al., 2017). Recently an outbreak investigation about

Abbreviations: YAs, Young Adult; NAS, National Academies of Science; FDA, Food and Drug Administration; TREC, Texting Risk about Electronic Cigarettes; MDACC, UT-MD Anderson Cancer Center

* Corresponding author.
E-mail address: kscalabr@mdanderson.org (K.S. Calabro).

https://doi.org/10.1016/j.abrep.2019.100224
Received 26 October 2018; Received in revised form 10 September 2019; Accepted 22 September 2019
Available online 16 October 2019

vaping risk was issued by the Centers for Disease Control, FDA and other public health partners. This was in response to hundreds of cases of serious lung illnesses frequently found among adolescents and YA related to using components of electronic cigarettes (Centers for Disease Control & Food and Drug Administration, 2019). Informing YAs about the potential harm of e-cigarette use is a logical target for decreasing risk of early nicotine dependence, preventing use of combustible tobacco and avoiding serious lung illnesses.

Shifting to the prevalence of e-cigarette use among young populations, nationally representative US samples of YAs revealed that 5.1% to 8.9% had used e-cigarettes in the past 30 days (Hu et al., 2016; Mazurek & England, 2016; Phillips et al., 2017). College students in the United States reported higher prevalence rates. For instance, current use of e-cigarettes on campus was 8.3% in Texas, 13.6% in Oregon and 14.9% in New York, (Cooper, Loukas, Case, Marti, & Perry, 2018; Hampson, Andrews, Severson, & Barckley, 2015; Saddleson et al., 2015). Reports of YAs not attending college indicated they were recipients of heavy industry marketing and claims that e-cigarettes are less harmful and less addictive than cigarettes (Cheney, Gowin, & Wann, 2016; Gowin, Cheney, & Wann, 2017). Thus, YAs not attending college and training for vocational positions may benefit from learning about the risks of e-cigarettes.

The US FDA Center for Tobacco Products (FDA's CTP) regulates manufacturing, distribution and marketing of tobacco products. A regulatory priority of FDA-CTP is to protect the health of the public by conveying accurately and clearly hazards about tobacco products (Akl et al., 2011; Ashley, Backinger, van Bemmel, & Neveleff, 2014). Attributed to successful communications, data show knowledge of the health hazards of *smoking combustible cigarettes* and importance of quitting on reducing risk is widely known among US adults (Kaufman, Coa, & Nguyen, 2017). There is limited communication of health messages warning about risks of other tobacco products (Wackowski, Hammond, O'Connor, Strasser, & Delnevo, 2016).

Research about product warning labels is the most frequently studied form of tobacco health messaging (Noar, Cappella, & Price, 2019). Because of e-cigarettes being a relatively new tobacco product, few investigations of strategies for communicating health risks and outcomes are available (Noar et al., 2019). Five studies of messaging designed to increase risk perception were located. Two were experiments testing single exposures to messages warning about e-cigarettes among YAs. In the first experiment which involved assessing the impact of e-cigarette warning labels and advertisements, a statistically significant increase in health risk of e-cigarettes and addictiveness of nicotine was found ($p < 0.001$) (Mays, Smith, Johnson, Tercyak, & Niaura, 2016). In the second experiment, warning labels on e-cigarette packages revealed how the label was designed increased attention to the warning and increased recall ($p < 0.001$) (Mays, Villanti, Niaura, Lindblom, & Strasser, 2019). Also in another account, two messages communicated health risk of e-cigarettes among college students. No impact on risk about informing participants of consequences of e-cigarettes was reported (Keating, 2018). With so few studies about e-cigarettes available, an expansion in development and testing of health messaging is needed.

Text messaging has the potential to be a powerful tool for informing the public about risks. It is one of the most frequently used communication methods in the United States (US Federal Communications Commission, 2017). Since most (98%) of YAs in the United States own smartphones (Nielsen's Electronic Mobile Measurement, 2016; Rainie, 2017) and can check text communications 100 times daily, text messages may be an ideal mode of message delivery (Lepp, Li, Barkley, & Salehi-Esfahani, 2015).

Message framing to influence views of consumer recipients about health decisions is used in health communication (Updegraff, Brick, Emanuel, Mintzer, & Sherman, 2015). The concept of message framing is a dimension of Prospect theory (Tversky & Kahneman, 1981). It suggests individuals can be influenced by how a problem and its consequences are communicated. Accordingly, individuals prefer a course of action based on their views of its advantages or disadvantages. Inconsistent results have been found when using message framing to influence message recipients on decisions and behaviors about screening, prevention, treatment, risk perception and other health-related factors (Akl et al., 2011; Covey, 2014; Van't Riet et al., 2016).

Investigations testing messages designed to impact perceived risk of e-cigarettes are just beginning to be published. One pilot study was located about testing three text messages via phones for educating adolescents about harms of e-cigarettes (Noar et al., 2019). Post-exposure to messages, both knowledge about the potential harm of using e-cigarettes increased ($p \leq 0.001$) as well as risk perception ($p < 0.004$). Messages based on content from the scientific literature and tested to fit young populations are needed to correct misinformation. Expansions in communication regulatory science are critical for the FDA to fulfill its mission in regulating tobacco products (Noar et al., 2019).

The aim of this study was to explore whether exposing YAs to messages using framing improves knowledge and risk perception about e-cigarettes. Guided by the results from the literature about framing (Akl et al., 2011; Ashley et al., 2014; Van't Riet et al., 2016), we propose the following hypothesis: exposure to gain-framed messages about e-cigarettes will be equally effective at influencing risk perception as exposure to loss-framed messages. Results may contribute to efforts of FDA regulators when communicating health risk of e-cigarettes (Noar et al., 2019).

2. Materials and methods

2.1. Study design

This study used a two-group randomized pretest and posttest design with text messages distributed to all participants. This approach allowed examination of data prior to conducting a full-scale main study, thus no control group was used. Prior to implementation of full-scale studies, small-scale pilots using randomization between treatment groups are beneficial to assess whether study components work together (Blatch-Jones, Pek, Kirkpatrick, & Ashton-Key, 2018; Cooper, Whitehead, Pottrill, Julious, & Walters, 2018). Ethical approvals and written consent to participate were obtained by institutional review boards at MDACC (2013-0474) and the participating community college.

2.2. Population and setting

Participants were ages 18–24 years of age. They were seeking sub–associate degree credentials at a community college campus. The community college has 15,000 students enrolled who are earning both vocational credentials and associate degrees. The majority of students are female (57%), of Hispanic ethnicity (61%), and tend to be in the early of stage young adulthood (59% were ≤21 years of age) (Office of Institutional Effectiveness, 2018).

2.3. Recruitment

A convenience sample of YAs not enrolled in academic coursework and training for automotive, electrical, welding, cosmetology, and fire protection careers was recruited. Instructors offered investigators opportunities to make announcements about the study during classes. Investigators informed students of the study purposes, risk, tasks, and time commitment. The inclusion criteria were being 18–24 years of age, pursuing a vocational credential, owning a smartphone, being able to read and speak English and providing written consent. Participants could be users or non-users of tobacco products. After the initial briefing and securing of informed consent in person, phones were used

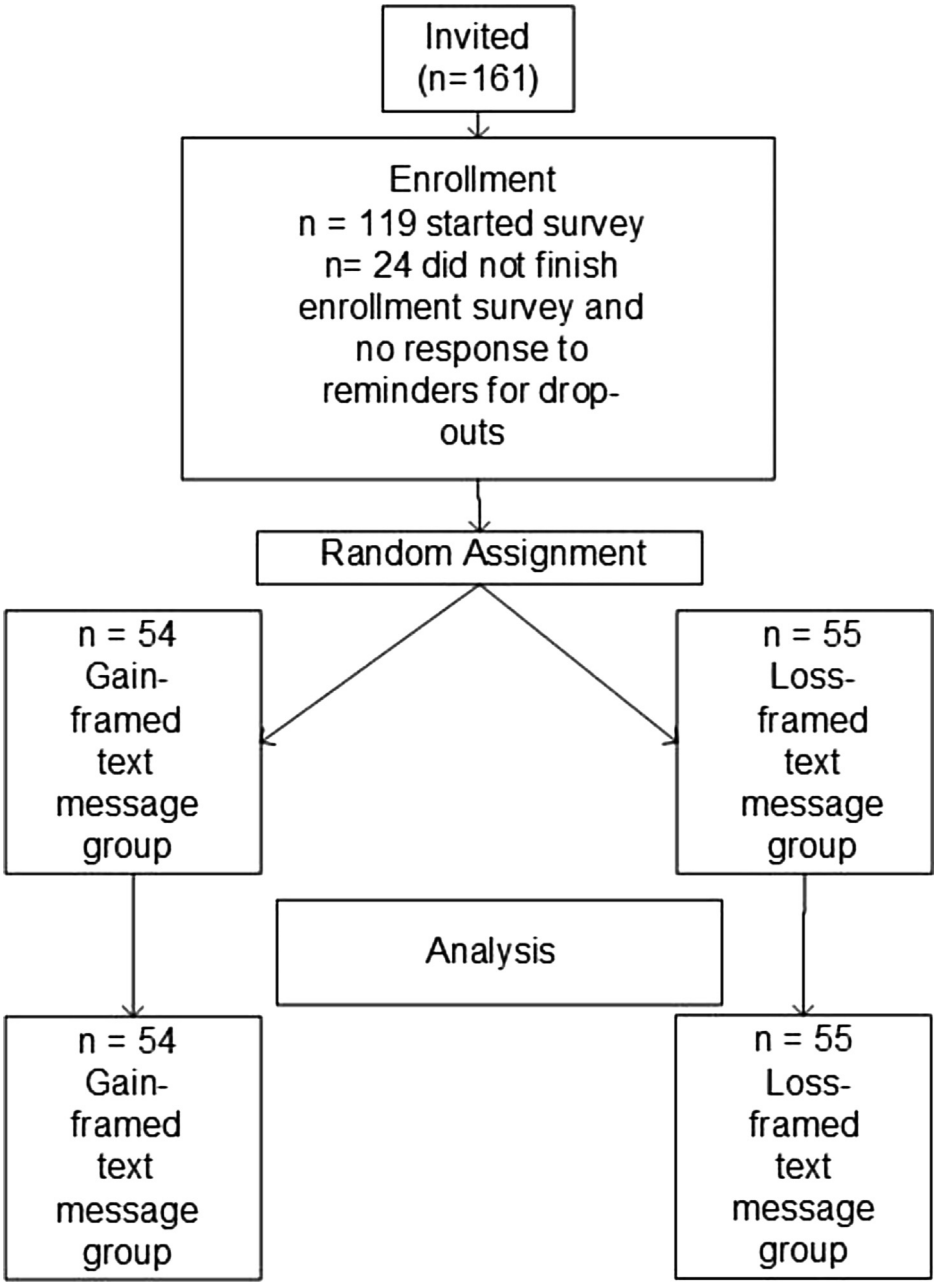

Fig. 1. CONSORT Chart. Shows recruitment, randomization, and analysis.

to facilitate the remaining contacts with participants.

See Fig. 1 for a CONSORT chart displaying participant flow. Rolling recruitment took place between September 2, 2016, and October 4, 2016. Compensation was provided with two US $30 gift cards received, one after completing the pre-test and one after the post-test. As many as seven reminders to complete post-test surveys were texted. Reasons for not wanting to participate were lack of time and interest.

2.4. Procedures

2.4.1. Overview of text message development

Development of the e-cigarette text messages used in the current pilot study titled "Texting Risk about Electronic Cigarettes" (TREC) are described in reports of the randomized trial for Project Debunk (Prokhorov et al., 2017). Project Debunk uses a crossover design. It is being conducted as a 6-month randomized trial comparing eight arms, based on the combination of framing, depth, and appeal message structures. The objective of Project Debunk is to identify certain types of message combinations that are more effective than others in increasing perceived risk of tobacco use. Text messages composed for the main study (which includes messages of e-cigarettes tested in the pilot) were reviewed for validity by YAs and experts in tobacco control (Khalil et al., 2018). Message writers in Project Debunk used two techniques from the marketing and public health literature to compose the texts. The first technique was message framing where messages were designed to highlight the positive aspects of engaging in a behavior (gain-framed) or constructed to highlight the benefits of avoiding the behavior (loss-framed) (Wong, Haardorfer, Windle, & Berg, 2016). The second technique used was designing messages using appeals. Emotional appeals were designed to evoke joy, fear, sarcasm, anger, sympathy, and humor about e-cigarettes. Emoticons were inserted to add emotional content into messages. Rational appeals were designed to present logical facts about e-cigarettes derived from science (Biener & Siegel, 2000; Latimer et al., 2012; Steward, Schneider, Pizarro, &

Table 1
Examples of educational messages about using electronic cigarettes.

Topic	Message Structures			
	Gain-framed rational	Loss-framed rational	Gain-framed emotional	Loss-framed emotional
Nicotine addiction	Ppl who don't vape avoid nicotine addiction. Nonusers stay nicotine-free.	Vaping e-cigs can lead to nicotine addiction. Users are at risk of lifelong nicotine dependence.	Avoid vaping e-cigs and nasty nicotine cravings will never take over your life. Nonusers live free from the addiction demon! ☺	Ppl who vape e-cigs are haunted by nasty nicotine cravings that can take over their life! They are chained to an addiction demon! ☹
Secondhand vapor	Ppl who don't use vapes don't expose others to secondhand vapor.	Ppl who use vapes expose others to nicotine from secondhand vapor.	Wanna save bae from nicotine? Not using vapes keeps bae safe from its secondhand vapor & super addictive nicotine ☺ #ProtectBae	Think using vapes will save bae from nicotine? Think again. Vapes expose ppl to its secondhand vapor & super addictive nicotine. ☹ #SaveBae
Dermal absorption of nicotine	Nonusers are safe from e-juice spills on the skin that can cause serious heart problems since not using e-cigs lowers the risk of nicotine poisoning.	When e-juice is spilled on the skin it can cause serious heart problems. Using e-cigs raises the risk of nicotine poisoning.	Nonusers don't have to worry about e-juice spills on skin which can lead to nasty heart problems. Using e-cigs means less risk of being poisoned! ☺	Users have to worry about e-juice spills on the skin which can cause nasty heart problems. Using e-cigs means more risk of being poisoned!

Note. Texts contain intentional misspellings, abbreviations, and symbols. Ppl = people; e-cigs = electronic devices delivering nicotine, flavors, and other chemicals; vaping = terminology for using an electronic cigarette; e-juice = liquid used in e-cigarettes often containing nicotine, flavors and other chemicals; Bae = term for someone significant in text sender's life.

Salovey, 2003; Toll et al., 2008). In the pilot project, text messages written with emotional or rational constructs were alternated weekly.

2.4.2. Message distribution

For the current pilot, participant commitment was 30 days. A software vendor facilitated distribution of the 16 educational text messages, surveys, reminders and compensation by smartphones. Participants were distributed 4 texts weekly (1 message Monday to Thursday) at 12 PM. Messages covered risks of e-cigarettes/vaping (see Table 1 for examples). Participants were randomized to receive either gain-framed messages or loss-framed messages (Fig. 1). Messages communicated contained similar content for each participant but the exact wording varied, depending on the assigned message structures.

2.4.3. Randomization

Randomization of participants was performed using an internal resource called Assessment, Intervention, and Measurement (MD Anderson Cancer Center Core Resource, 2019). We captured sociodemographic characteristics at baseline (Rath, Villanti, Abrams, & Vallone, 2012).

2.4.4. Message character count and data collection via phones

The character count (with spaces) for the text messages was (M = 130 characters, SD = 23). The surveys were tested with young adult community college students and modified as needed before implementation (Prokhorov et al., 2017). Eighty-five items were used for the pre-test and post-tests. On average, participants took 15 min to complete the pretest.

2.5. Measures

2.5.1. Tobacco use

This question asked: During the past 30 days, did you use "blank" with the specific products listed: cigarettes, cigars, pipes (with tobacco), dip or snuff, little cigars/cigarillos/bidis, chewing tobacco, snus, hookah, and e-cigarettes.

2.5.2. Knowledge about e-cigarettes

The knowledge survey about electronic cigarette knowledge using a true and false response format used another measure in the literature (Mark, Farquhar, Chisolm, Coleman-Cowger, & Terplan, 2015). It served as a basis for appending items relevant to and information conveyed in the messages. The knowledge items in the pilot survey are: (1) Switching to e-cigarettes is a proven and safe way to quit. (2) E-cigarettes are regulated by the government (FDA). (3) Can using e-cigarettes lead to nicotine addiction? (4) Using e-cigarettes may lead people to try other products, including regular cigarettes. (5) When you smoke an e-cigarette you don't know how much nicotine you are getting. (6) If e-cigarette liquid comes in contact with your skin it can be absorbed and cause health problems. (7) There can be risks to other nonusers if exposed to nicotine vapor exhaled by persons using e-cigarettes. The correct answers for items 1 and 2 are "no," with the remainder (items 3 to 7) being "yes." No (FDA) regulation for e-cigarettes was in effect at the time of data collection. The correct answers for the items are based on communication from the FDA and citations from peer-reviewed scientific research. Knowledge scores reflect the percentage of correct answers.

2.5.3. Perceived risk of tobacco products

A 5-point Likert scale (1 = "no risk", 2 = "slight risk", 3 = "moderate risk", 4 = "great risk", 5 = "can't say") was used to represent perceived risk of using e-cigarettes and other tobacco products (Tomar & Hatsukami, 2007). The item was "How much do you think people risk harming themselves (physically or in other ways) if they use "product" every day?" Respondents choosing the response "can't say" were excluded from data analysis.

2.5.4. Manipulation check

The survey assessed how interesting, believable, coherent, persuasive, difficult to understand the messages and whether they were based on feeling or facts. This survey was distributed was at the end of each week of text messages (Holbrooke, 1978; Vidrine, Simmons, & Brandon, 2007).

2.6. Statistical analysis

Descriptive statistics were used to analyze demographic characteristics (age, sex, ethnicity, race, and financial status) and current-use data regarding tobacco products in the past 30 days. *Mean* and *SD* were used for continuous outcomes. Frequencies and percentages were used for categorical outcomes. We examined changes in responses in loss- and gain-framed groups, tobacco product use, knowledge about e-cigarettes, perception of risk, and perception of the messages. The sample size was 95 participants, with data analysis based on those who completed surveys both pre- and post-exposure to the messages. McNemar tests, a statistical approach was used on paired binary data. This strategy is applied to 2 X 2 contingency tables with a dichotomous trait with matched pairs of participants to determine whether the row and column frequencies were equal (McNemar, 1946). This approach allowed comparisons for knowledge items pre- and post-exposure to the messages. A comparison of differences pre- and post-exposure to the messages for risk perception was conducted using a paired Student's *t*-test. The two-sided alpha level was 0.05. Because this study was exploratory, the sample size was based on practical considerations (Kraemer, Mintz, Noda, Tinklenberg, & Yesavage, 2006).

3. Results

3.1. Participant retention

Among the 119 baseline participants, 78.9% ($N = 95/119$) were retained post-exposure to the messages. Respondents who stopped participating ($n = 24$) were not statistically different from those who remained for age, gender, ethnicity, tobacco use, knowledge and risk perception. Table 2 shows results for selected characteristics.

3.2. Participant characteristics

Participants were ($M_{age} = 20.8$ years, $SD = 1.8$), with 64.9% reporting their ethnicity as Hispanic/Latino. The majority of participants were men (54.3%). When asked to select their race (i.e., white, Asian, black, or American Indian/Native Alaskan), 68.1% identified as white, 5.3% as Asian, 8.4% as black, and 13.7% as American Indian/Native Alaskan (see Table 3). More than half (54.3%) perceived their financial situation as constrained ("just meets needs" or "cannot meet basic expenses"). Most were employed (60.7%), part or full time. More than 20% lived with smokers, and cigarette smoking was permitted in 11.6% of residences. Seven percent were parents. At pretest, 10.5% currently used e-cigarettes; this number decreased to 7.4% at post-exposure. The hookah use rate was 7.4% and 8.4% pre- and post-exposure to the messages. Smokeless tobacco (i.e., chewing tobacco, dip or snuff) was used by 5.3% at pre- and post-exposure to the messages. Only two participants were exclusively cigarette users.

Table 2
Characteristics of dropouts vs. completers.

Characteristic	Dropped out $n = 24$	Completed $n = 95$	p
Age, *M* (*SD*)	20.67 (2.4)	20.79 (1.8)	0.8
Sex: male, *n* (%)	15 (62.5)	51 (53.7)	0.4
Ethnicity: Hispanic/Latino, *n* (%)	18 (75.0)	61 (64.2)	0.3
Pre-test nicotine/tobacco use, *n* (%)	9 (37.5)	26 (27.4)	0.3

Table 3
Demographics and tobacco use at baseline for total sample and groups of text message recipients randomized by framing.

Characteristic	Total sample ($n = 95$)	Gain-framed group ($n = 45$)	Loss-framed group ($n = 50$)	p [a]
Age, *M years (SD)*	20.8 (1.8)	20.9 (1.9)	20.7 (1.6)	0.5
Gender: male, *n* (%)	51 (54.3)	27 (60.0)	24 (48.0)	0.2
Ethnicity: Hispanic/ Latino, *n* (%)	61 (64.9)	29 (64.4)	32 (64.0)	1.0
Race, *n*. (%)				0.1
Asian	5 (5.3)	5 (11.1)	0	
Pacific Islander	4 (4.2)	2 (4.4)	2 (4.0)	
Black	8 (8.4)	2 (4.4)	6 (12.0)	
White	65 (68.0)	30 (66.8)	35 (75.0)	
American Indian/ Alaskan Native	13 (13.7)	6 (13.3)	7 (14.0)	
Perceived financial status, *n* (%)				0.6
Lives comfortably	17 (18.1)	9 (20.0)	8 (16.0)	
Adequate	27 (28.4)	10 (22.2)	17 (34.0)	
Just meets needs	47 (50.0)	24 (53.3)	23 (46.0)	
Cannot meet basic expenses	4 (4.3)	2 (4.2)	2 (4.0)	
Work status, *n* (%)				0.8
Full-time	15 (15.8)	8 (17.8)	7 (14.0)	
Part-time	43 (45.3)	18 (40.0)	25 (50.0)	
Volunteering	2 (2.1)	1 (2.2)	1 (2.0)	
Not working	35 (36.8)	18 (40.0)	17 (17.0)	
Lives with tobacco users, *n* (%)	19 (20.2)	8 (17.8)	11 (22.0)	0.6
Smoking inside home, *n* (%)	11 (11.6)	6 (13.3)	5 (10.0)	0.6
Has children, *n* (%)	7 (7.4)	3 (6.7)	4 (8.0)	0.8
Any 30-day tobacco use, *n* (%)	26 (27.4)			
Conventional cigarettes	15 (15.8)	6 (19.4)	9 (30.0)	0.3
Cigars	7 (7.4)	2 (5.6)	5 (14.7)	0.2
Pipe	1 (1.1)	0 (0.0)	1 (2.1)	0.4
Dip or snuff	2 (2.1)	1 (2.4)	1 (2.3)	1.0
Little cigars, cigarillos, bidis	3 (3.2)		3 (7.7)	1.0
Chewing tobacco	3 (3.2)	1 (2.4)	2 (4.6)	0.6
Hookah	7 (7.4)	1 (3.3)	6 (18.8)	0.05
E-cigarettes	10 (10.5)	5 (14.7)	5 (15.2)	1.0
Dual users,[b] *n* (%)	6 (6.3)	4 (8.9)	2 (4.0)	0.3
Poly users,[c] *n* (%)	5 (5.3)	1 (2.2)	4 (8.0)	0.2

Note. p[a] Comparisons between characteristics of message recipients randomized to gain-framed or loss-framed groups. Dual users[b] reported use of two of the listed tobacco products concurrently. Poly users[c] reported use of ≥3 products.

3.3. Randomization

Chi-square tests were used to compare categorical characteristics between the gain-framed and loss-framed groups (Table 3). After statistical comparisons including age, sex, race, children, and financial status were run, no statistically significant differences were found suggesting successful randomization. The exception was in the loss-frame group, more participants were using hookah than for the gain-framed group.

3.4. Knowledge about e-cigarettes

Fig. 2 displays findings of significant increases in knowledge items about e-cigarettes after exposure to the messages (range for *ps*: $p < 0.04$ to $p < 0.0001$). Fig. 2 displays the abbreviations for each knowledge survey item. Pre-post-test means and significant *p*-values are presented for items 1–7: (1) "Switch" ([pre] 60.2.1% to [post] 84.2%) $p < 0.0001$, (2) "FDA" ([pre] 55.9% to [post] 67.4%) $p = 0.03$, (3)

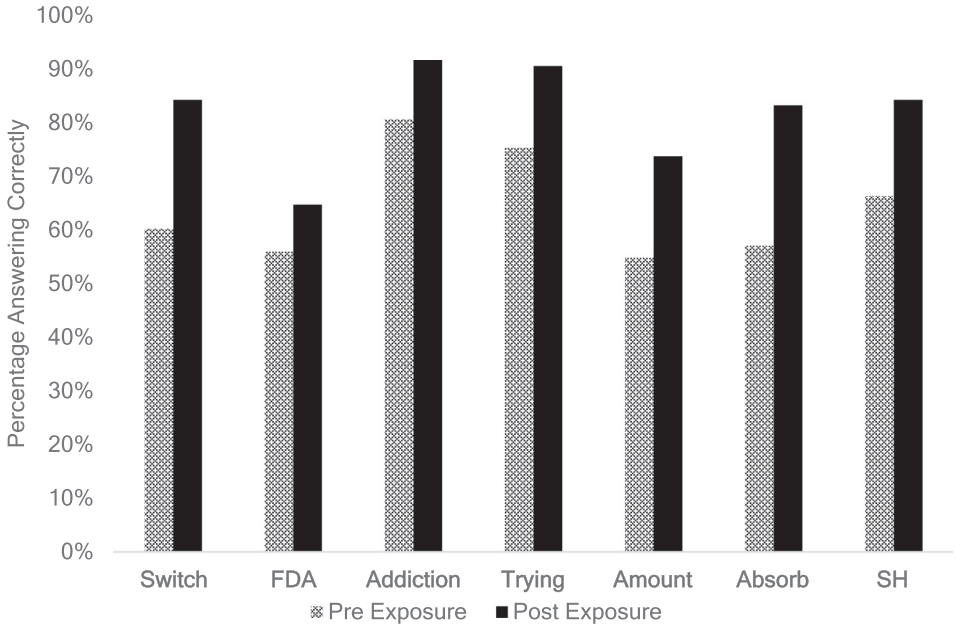

Fig. 2. Percentage of correctly answered knowledge survey items before and after text message exposure. See Section 2.5.2 for the survey item list and correct answers. See Section 3.4 Knowledge about e-cigarettes. This lists abbreviations for the knowledge items and detail on statisticial findings.

"Addiction" ([pre] 80.6% to [post] 91.6%) $p = 0.04$, (4)"Trying" ([pre] 75.3% to [post] 90.5%) $p = 0.007$, (5) "Amount" ([pre] 54.8% to [post] 73.7%) $p = 0.01$, (6) "Absorb" ([pre] 57.0% to [post] 83.2%) $p < 0.0001$, (7) "SH" ([pre] 66.3% to [post] 84.2%) $p = 0.004$.

3.5. Perceived risk of using e-cigarettes and other tobacco products

A statistically significant increase in perceived e-cigarette risk was found post-exposure ($p = 0.002$). Perceived hookah risk also increased post-exposure to the messages ($p = 0.02$). Fig. 3 displays these findings. This was followed by results indicating no change in perceived risk for conventional tobacco products (data not shown). Post-exposure to the messages, the group receiving the gain-framed messages showed significantly greater perceived risk of e-cigarette use ($M = 3.7$, $SD = 0.6$) than did the loss-framed group ($M = 3.4$, $SD = 0.6$; $p = 0.02$) (see Fig. 4).

For the manipulation check, results indicated participants found the information in the text messages as interesting, they understood the texts, texts were believable, and texts presented new information. Response rates for the perceptions survey by pilot project participants fluctuated from one-fourth to two thirds responding weekly (data not shown). Readers interested in additional information may contact the author.

4. Discussion

Risk perception of e-cigarettes increased significantly post-exposure to all the messages. The hypothesis that gain and loss framed messages would have a similar impact on perceived risk was not supported. No other studies were located that have investigated the impact of message framing on risk of e-cigarettes among YA. More research is needed to learn whether message framing may impact perceived risk of e-cigarettes (Akl et al., 2011; Covey, 2014; Van't Riet et al., 2016). This study found an increase in knowledge of e-cigarettes post-exposure to text messages. Gaining an understanding that e-cigarettes contain nicotine and can lead to addiction can be a prerequisite to helping individuals

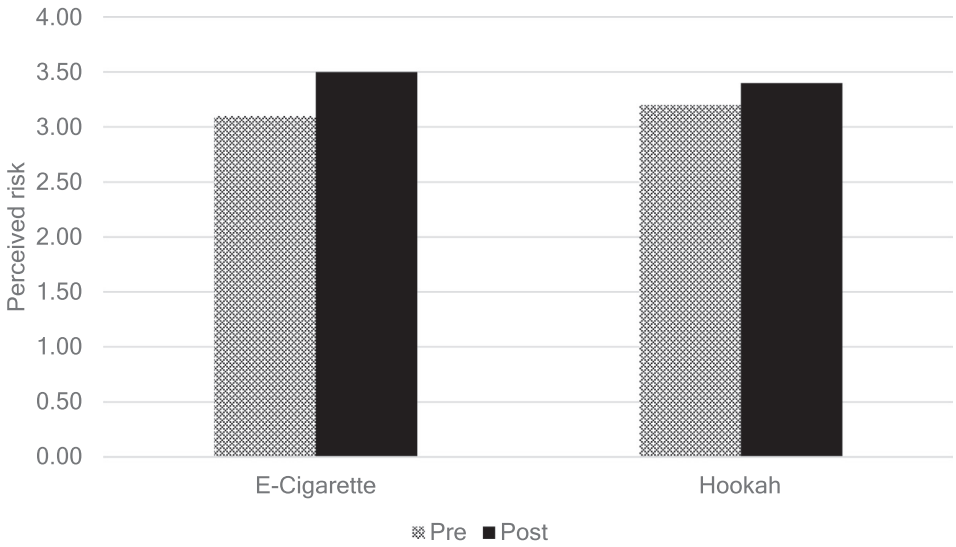

Fig. 3. Pre-post-exposure of perceived risk of e-cigarettes and hookah. See Section 3.5 for statistically significance of the findings.

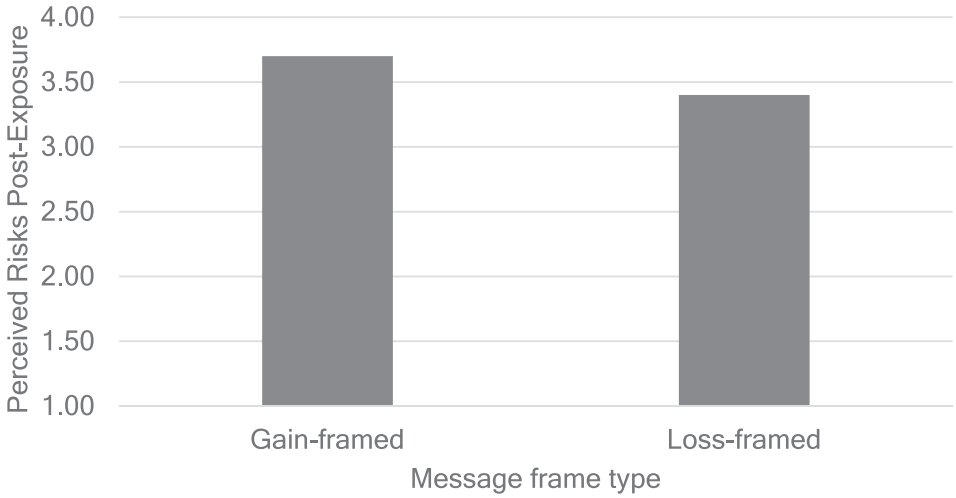

Fig. 4. Perception of risk of e-cigarettes by text message framing group post-exposure to text messages. $M = 3.7$, $SD = 0.6$; $M = 3.4$ $SD = 0.6$ ($p = 0.018$). Mean scores and *SDs* provided for risk perception for gain-framed and loss-framed message groups, respectively.

arrive at a decision to avoid unsafe tobacco products. Acknowledgement of risk by individuals is important in influencing health actions. Not experimenting with e-cigarettes may decrease development of nicotine dependence and transition to conventional cigarette use.

An unexpected significant increase in perceived risk of smoking hookah (i.e., waterpipe tobacco) by message recipients was identified post-exposure to the text messages. The general public holds beliefs that waterpipe use is safe (Lipkus & Mays, 2018). We offer this explanation about the increase in perceived risk of smoking hookah despite no exposure to messages about hookah. Because both e-cigarettes and waterpipe tobacco are emerging products, participants may have felt that hookah use is somewhat similar to e-cigarette use. Development of nicotine addiction is a major focus in the texts. The increase in perception of hookah risk, therefore could be the result of a spillover effect from the messages. The most recent estimate of current hookah use among YAs in the US was 10.7% (Kasza et al., 2017). Both waterpipe tobacco and e-cigarettes are included in the deeming rule and under regulatory authority by the FDA (Food & Administration, 2016). Increased educational efforts to convey risks and reduce misperceptions among YAs are needed.

This study delivered 16 texts to vocational YA received tobacco risk communication via their personal smartphones. This is an untraditional channel of delivery for education of tobacco risk. The text message content was supported by scientific references to ensure the message was factual and truthful. New text messages should be generated and tested to warn YA about severe lung disease and deaths associated with e-cigarette and vaping devices (Centers for Disease Control & Food and Drug Administration, 2019). Further, other investigators may be interested in incorporating the contents of the messages into other health communication research (e.g., testing e-cigarette product warning labels, educational websites, and national tobacco education campaigns for adolescents and YA) (Dobbs, Clawson, Gowin, & Cheney, 2019; Duke et al., 2018; Lazard, Byron, Peters, & Brewer, 2019).

This pilot had many limitations. First participants were a convenience sample of young adults attending one community college campus. Selection bias was a potential limitation because students with favorable views of e-cigarettes may have been less likely to participate. Also, findings from this study in Texas with responses from mostly male and Hispanic participants are not representative of vocational students living in many other states. Expanding efforts to test the messages in other geographical locations will increase generalizability.

Second, using more than one measure of risk perception is desirable. A range of scales and approaches to assess risk perception in tobacco regulatory science have recently been published (Katz, Erkinnen, Lindgren, & Hatsukami, 2019; Kaufman, Persoskie, Twesten, & Bromberg, 2018). Thus, the reliability of the assessment of risk perception in TREC could have been increased using multiple items with a range of measures.

Third, unlike conventional cigarettes having a standard terminology, aerosolized nicotine devices are changing, frequently using product-related synonyms, thereby reducing the accuracy in assessing use. Ideally, survey respondents should be presented with tobacco product images to allow participants a visual for the product being measured by investigators. The software messaging service administering the surveys and text messages in TREC did not have the capability to project images on the survey, thus the methodology used for this project was vulnerable to misclassification bias leading to under- and over-estimations in tobacco product use.

5. Conclusions

Health messages delivered via phones increased knowledge about the potential for nicotine addiction related to e-cigarettes among YAs, which may influence future intentions and reduce e-cigarette use. Future research directions may include testing these messages as part of investigations of product warning labels, educational websites, and national tobacco education campaigns for adolescents and YA. Expansions in efforts could include generating campaigns that target specific subgroups at high risk such as non-college bound YAs.

Acknowledgements

We are grateful to campus leadership at San Jacinto Community College for supporting our research activities and recognizing their importance to the health and safety of students. We appreciate students who volunteered to participate in this study. Also, we acknowledge the work of Mosio for Research, our mHealth vendor and the core resource at MD Anderson's Assessment, Intervention, and Measurement Facility. We are especially grateful for the valuable edits and expertise provided for this paper by the Department of Scientific Publications at MD Anderson.

Funding

This pilot project was funded by the Tobacco Centers of Regulatory Science (5P50CA180906). It was supported in part by the National Institutes of Health/National Cancer Institute under award number P30CA016672 (Assessment, Intervention, and Measurement Facility, a

core resource at MD Anderson).

Author contributions

A.V.P. and K.S.C. conceptualized the initial study with valuable contributions by G.E.K. K.S.C. managed recruitment and follow-ups. K.S.C. wrote the preliminary manuscript draft with contributions by G.E.K. M.C. conducted the statistical analysis. M.C., G.E.K., A.V.P., and C.P. contributed to drafts of the manuscript. K.S.C. approved the final manuscript.

Declaration of Competing Interest

No conflicts of interest are declared.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.abrep.2019.100224.

References

Akl, E. A., Oxman, A. D., Herrin, J., Vist, G. E., Terrenato, I., Sperati, F., ... Schunemann, H. (2011). Framing of health information messages. *Cochrane Database Syst, Rev(12)*, CD006777. https://doi.org/10.1002/14651858.CD006777.pub2.

Ashley, D. L., Backinger, C. L., van Bemmel, D. M., & Neveleff, D. J. (2014). Tobacco regulatory science: Research to inform regulatory action at the food and drug administration's center for tobacco products. *Nicotine & Tobacco Research, 16*(8), 1045–1049. https://doi.org/10.1093/ntr/ntu038.

Bi, Y., Yuan, K., Guan, Y., Cheng, J., Zhang, Y., Li, Y., ... Tian, J. (2017). Altered resting state functional connectivity of anterior insula in young smokers. *Brain Imaging Behavior, 11*(1), 155–165. https://doi.org/10.1007/s11682-016-9511-z.

Biener, L., & Siegel, M. (2000). Tobacco marketing and adolescent smoking: More support for a causal inference. *American Journal of Public Health, 90*(3), 407–411. https://doi.org/10.2105/Ajph.90.3.407.

Blatch-Jones, A. J., Pek, W., Kirkpatrick, E., & Ashton-Key, M. (2018). Role of feasibility and pilot studies in randomised controlled trials: A cross-sectional study. e022233 *BMJ Open, 8*(9), https://doi.org/10.1136/bmjopen-2018-022233.

Brown, J., Beard, E., Kotz, D., Michie, S., & West, R. (2014). Real-world effectiveness of e-cigarettes when used to aid smoking cessation: A cross-sectional population study. *Addiction, 109*(9), 1531–1540. https://doi.org/10.1111/add.12623.

Carpenter, M. J., Heckman, B. W., Wahlquist, A. E., Wagener, T. L., Goniewicz, M. L., Gray, K. M., ... Cummings, K. M. (2017). A naturalistic, randomized pilot trial of e-cigarettes: Uptake, exposure, and behavioral effects. *Cancer Epidemiology, Biomarkers & Prevention, 26*(12), 1795–1803. https://doi.org/10.1158/1055-9965.epi-17-0460.

Centers for disease control, & food and drug administration. (September 9. 2019). Center for disease control outbreak of lung illness associated with using electronic cigarette products: investigational notice issued. Retrieved from www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html.

Cheney, M. K., Gowin, M., & Wann, T. F. (2016). Electronic cigarette use in straight-to-work young adults. *American Journal of Health Behavior, 40*(2), 268–279. https://doi.org/10.5993/AJHB.40.2.12.

Cooper, M., Loukas, A., Case, K. R., Marti, C. N., & Perry, C. L. (2018). A longitudinal study of risk perceptions and e-cigarette initiation among college students: Interactions with smoking status. *Drug and Alcohol Dependence, 186*, 257–263. https://doi.org/10.1016/j.drugalcdep.2017.11.027.

Cooper, C. L., Whitehead, A., Pottrill, E., Julious, S. A., & Walters, S. J. (2018). Are pilot trials useful for predicting randomisation and attrition rates in definitive studies: A review of publicly funded trials. *Clinical Trials, 15*(2), 189–196. https://doi.org/10.1177/1740774517752113.

Covey, J. (2014). The role of dispositional factors in moderating message framing effects. *Health Psychology, 33*(1), 52.

Dobbs, P. D., Clawson, A. H., Gowin, M., & Cheney, M. K. (2019). Where college students look for vaping information and what information they believe. *Journal of American College Health, 1–10*. https://doi.org/10.1080/07448481.2018.1549557.

Duke, J. C., Farrelly, M. C., Alexander, T. N., MacMonegle, A. J., Zhao, X., Allen, J. A., ... Nonnemaker, J. (2018). Effect of a national tobacco public education campaign on youth's risk perceptions and beliefs about smoking. *American Journal of Health Promotion, 32*(5), 1248–1256. https://doi.org/10.1177/0890117117720745.

Ghosh, S., & Drummond, M. B. (2017). Electronic cigarettes as smoking cessation tool: Are we there? *Current Opinion in Pulmonary Medicine, 23*(2), 111–116. https://doi.org/10.1097/mcp.0000000000000348.

Gowin, M., Cheney, M. K., & Wann, T. F. (2017). Knowledge and beliefs about e-cigarettes in straight-to-work young adults. *Nicotine & Tobacco Research, 19*(2), 208–214. https://doi.org/10.1093/ntr/ntw195.

Guillaumier, A., Manning, V., Wynne, O., Gartner, C., Borland, R., Baker, A. L., ... Bonevski, B. (2018). Electronic nicotine devices to aid smoking cessation by alcohol- and drug-dependent clients: Protocol for a pilot randomised controlled trial. *Trials, 19*(1), 415. https://doi.org/10.1186/s13063-018-2786-1.

Hampson, S. E., Andrews, J. A., Severson, H. H., & Barckley, M. (2015). Prospective predictors of novel tobacco and nicotine product use in emerging adulthood. *Journal of Adolescent Health, 57*(2), 186–191. https://doi.org/10.1016/j.jadohealth.2015.04.015.

Holbrooke, M. B. (1978). Beyond attitude structure: Toward infomational determinants of attitude. *Journal of Marketing, 15*, 545–556.

Hu, S. S., Neff, L., Agaku, I. T., Cox, S., Day, H. R., Holder-Hayes, E., & King, B. A. (2016). Tobacco product use among adults - United States, 2013–2014. *MMWR Morbidity and Mortality Weekly Report, 65*(27), 685–691. https://doi.org/10.15585/mmwr.mm6527a1.

Kasza, K. A., Ambrose, B. K., Conway, K. P., Borek, N., Taylor, K., Goniewicz, M. L., Hyland, A. J., et al. (2017). Tobacco-product use by adults and youths in the United States in 2013 and 2014. *The New England Journal of Medicine, 376*(4), 342–353. https://doi.org/10.1056/NEJMsa1607538.

Katz, S. J., Erkinnen, M., Lindgren, B., & Hatsukami, D. (2019). Beliefs about e-cigarettes: A focus group study with college students. *American Journal of Health Behavior, 43*(1), 76–87. https://doi.org/10.5993/AJHB.43.1.7.

Kaufman, A. R., Coa, K. I., & Nguyen, A. B. (2017). Cigarette smoking risk-reducing beliefs: Findings from the United States Health Information National Trends Survey. *Preventive Medicine, 102*, 39–43. https://doi.org/10.1016/j.ypmed.2017.06.025.

Kaufman, A. R., Persoskie, A., Twesten, J., & Bromberg, J. (2018). A review of risk perception measurement in tobacco control research. *Tobacco Control*. https://doi.org/10.1136/tobaccocontrol-2017-054005.

Keating, D. M. (2018). Extending efforts to move cigarette and e-cigarette beliefs: Message exposure and belief structures. *Journal of Health Communication, 23*(10–11), 956–966. https://doi.org/10.1080/10810730.2018.1548670.

Khalil, G. E., Calabro, K. S., Machado, T. C., Crook, B., Perry, C. L., & Prokhorov, A. V. (2018). Validation of mobile phone text messages for tobacco risk communication among college students: A content analysis. *Tobacco Prevention and Cessation: The Official Journal of the European Network of Smoking and Tobacco Prevention, 4*(7), https://doi.org/10.18332/tpc/84866.

Kraemer, H. C., Mintz, J., Noda, A., Tinklenberg, J., & Yesavage, J. A. (2006). Caution regarding the use of pilot studies to guide power calculations for study proposals. *Arch Gen Psychiatry, 63*(5), 484–489. https://doi.org/10.1001/archpsyc.63.5.484.

Latimer, A. E., Krishnan-Sarin, S., Cavallo, D. A., Duhig, A., Salovey, P., & O'Malley, S. A. (2012). Targeted smoking cessation messages for adolescents. *Journal of Adolescent Health, 50*(1), 47–53. https://doi.org/10.1016/j.jadohealth.2011.04.013.

Lazard, A. J., Byron, M. J., Peters, E., & Brewer, N. T. (2019). Communicating about chemicals in cigarette smoke: Impact on knowledge and misunderstanding. *Tob Control*. https://doi.org/10.1136/tobaccocontrol-2018-054863.

Lepp, A., Li, J., Barkley, J. E., & Salehi-Esfahani, S. (2015). Exploring the relationships between college students' cell phone use, personality and leisure. *Computers in Human Behavior, 43*, 210–219. https://doi.org/10.1016/j.chb.2014.11.006.

Li, Y., Yuan, K., Cai, C., Feng, D., Yin, J., Bi, Y., ... Tian, J. (2015). Reduced frontal cortical thickness and increased caudate volume within fronto-striatal circuits in young adult smokers. *Drug and Alcohol Dependence, 151*, 211–219. https://doi.org/10.1016/j.drugalcdep.2015.03.023.

Lipkus, I. M., & Mays, D. (2018). Comparing harm beliefs and risk perceptions among young adult waterpipe tobacco smokers and nonsmokers: Implications for cessation and prevention. *Addictive Behaviors Reports, 7*, 103–110. https://doi.org/10.1016/j.abrep.2018.03.003.

Loukas, A., Marti, C. N., Cooper, M., Pasch, K. E., & Perry, C. L. (2018). Exclusive e-cigarette use predicts cigarette initiation among college students. *Addictive Behaviors, 76*, 343–347. https://doi.org/10.1016/j.addbeh.2017.08.023.

Mark, K. S., Farquhar, B., Chisolm, M. S., Coleman-Cowger, V. H., & Terplan, M. (2015). Knowledge, attitudes, and practice of electronic cigarette use among pregnant women. *Journal of Addiction Medicine, 9*(4), 266–272. https://doi.org/10.1097/ADM.0000000000000128.

Mays, D., Smith, C., Johnson, A. C., Tercyak, K. P., & Niaura, R. S. (2016). An experimental study of the effects of electronic cigarette warnings on young adult non-smokers' perceptions and behavioral intentions. *Tobacco Induced Diseases, 14*, 17. https://doi.org/10.1186/s12971-016-0083-x.

Mays, D., Villanti, A., Niaura, R. S., Lindblom, E. N., & Strasser, A. A. (2019). The effects of varying electronic cigarette warning label design features on attention, recall, and product perceptions among young adults. *Health Communication, 34*(3), 317–324. https://doi.org/10.1080/10410236.2017.1372050.

Mazurek, J. M., & England, L. J. (2016). Cigarette smoking among working women of reproductive age-United States, 2009–2013. *Nicotine & Tobacco Research, 18*(5), 894–899. https://doi.org/10.1093/ntr/ntv292.

McNemar, Q. (1946). Opinion-attitude methodology. *Psychological Bulletin, 43*(4), 289–374.

Morales, A. M., Ghahremani, D., Kohno, M., Hellemann, G. S., & London, E. D. (2014). Cigarette exposure, dependence, and craving are related to insula thickness in young adult smokers. *Neuropsychopharmacology, 39*(8), 1816–1822. https://doi.org/10.1038/npp.2014.48.

National Academies of Sciences. (2018). Public health consequences of e-cigarettes. (Publication no. 10.17226/24952). Retrieved April 5, 2019, from National Academies Press.

Nielsen's electronic mobile measurement. (2016). Millenials are top smartphone users. Retrieved from http://www.nielsen.com/us/en/insights/news/2016/millennials-are-top-smartphone-users.html.

Noar, S. M., Cappella, J. N., & Price, S. (2019). Communication regulatory science: Mapping a new field. *Health Communication, 34*(3), 273–279. https://doi.org/10.1080/10410236.2017.1407231.

Noar, S. M., Rohde, J. A., Horvitz, C., Lazard, A. J., Cornacchione Ross, J., & Sutfin, E. L. (2019). Adolescents' receptivity to E-cigarette harms messages delivered using text

messaging. *Addictive Behaviors, 91*, 201–207. https://doi.org/10.1016/j.addbeh.2018.05.025.

Phillips, E., Wang, T. W., Husten, C. G., Corey, C. G., Apelberg, B. J., Jamal, A., ... King, B. A. (2017). Tobacco product use among adults - United States, 2015. *MMWR Morbidity and Mortality Weekly Report, 66*(44), 1209–1215. https://doi.org/10.15585/mmwr.mm6644a2.

Primack, B. A., Shensa, A., Sidani, J. E., Hoffman, B. L., Soneji, S., Sargent, J. D., Fine, M. J., et al. (2018). Initiation of traditional cigarette smoking after electronic cigarette use among tobacco-naive US young adults. *The American Journal of Medicine, 131*(4), 443.e441–443.e449. https://doi.org/10.1016/j.amjmed.2017.11.005.

Primack, B. A., Soneji, S., Stoolmiller, M., Fine, M. J., & Sargent, J. D. (2015). Progression to traditional cigarette smoking after electronic cigarette use among US adolescents and young adults. *JAMA Pediatrics, 169*(11), 1018–1023. https://doi.org/10.1001/jamapediatrics.2015.1742.

Prokhorov, A. V., Machado, T. C., Calabro, K. S., Vanderwater, E. A., Vidrine, D. J., Pasch, K. P., Russell, S. C., et al. (2017). Developing mobile phone text messages for tobacco risk communication among college students: a mixed methods study. *BMC Public Health, 17*(1), 137.

Rainie, L. (2017, April 3, 2018). About 6 in 10 young adults in U.S. primarily use online streaming to watch TV. Retrieved from http://www.pewresearch.org/fact-tank/2017/09/13/about-6-in-10-young-adults-in-u-s-primarily-use-online-streaming-to-watch-tv/.

Rath, J. M., Villanti, A. C., Abrams, D. B., & Vallone, D. M. (2012). Patterns of tobacco use and dual use in US young adults: The missing link between youth prevention and adult cessation. 679134 *International Journal of Environmental Research and Public Health, 2012*. https://doi.org/10.1155/2012/679134.

Rigotti, N. A., Chang, Y., Tindle, H. A., Kalkhoran, S. M., Levy, D. E., Regan, S., ... Singer, D. E. (2018). Association of E-cigarette use with smoking cessation among smokers who plan to quit after a hospitalization: A prospective study. *Annals of Internal Medicine, 168*(9), 613–620. https://doi.org/10.7326/m17-2048.

Saddleson, M. L., Kozlowski, L. T., Giovino, G. A., Hawk, L. W., Murphy, J. M., MacLean, M. G., ... Mahoney, M. C. (2015). Risky behaviors, e-cigarette use and susceptibility of use among college students. *Drug and Alcohol Dependence, 149*, 25–30. https://doi.org/10.1016/j.drugalcdep.2015.01.001.

Soneji, S., Barrington-Trimis, J. L., Wills, T. A., Leventhal, A. M., Unger, J. B., Gibson, L. A., Sargent, J. D., et al. (2017). Association between initial use of e-cigarettes and subsequent cigarette smoking among adolescents and young adults: A systematic review and meta-analysis. *JAMA Pediatrics, 171*(8), 788–797. https://doi.org/10.1001/jamapediatrics.2017.1488.

Steward, W. T., Schneider, T. R., Pizarro, J., & Salovey, P. (2003). Need for cognition moderates responses to framed smoking-cessation messages. *Journal of Applied Social Psychology, 33*(12), 2439–2464. https://doi.org/10.1111/j.1559-1816.2003.tb02775.x.

Toll, B. A., Salovey, P., O'Malley, S. S., Mazure, C. M., Latimer, A., & McKee, S. A. (2008). Message framing for smoking cessation: The interaction of risk perceptions and gender. *Nicotine & Tobacco Research, 10*(1), 195–200. https://doi.org/10.1080/14622200701767803.

Tomar, S. L., & Hatsukami, D. K. (2007). Perceived risk of harm from cigarettes or smokeless tobacco among U.S. high school seniors. *Nicotine & Tobacco Research, 9*(11), 1191–1196. https://doi.org/10.1080/14622200701648417.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*, 453–458.

Updegraff, J. A., Brick, C., Emanuel, A. S., Mintzer, R. E., & Sherman, D. K. (2015). Message framing for health: Moderation by perceived susceptibility and motivational orientation in a diverse sample of Americans. *Health Psychology, 34*(1), 20–29. https://doi.org/10.1037/hea0000101.

US Department of Health and Human Services, Public Health Service, & Office of the Surgeon General (Eds.). (2016). E-cigarette use among youth and young adults. Office of Surgeon General. Rockville MD.

US federal communications commission. (2017). Twentieth mobile wireless competition report. Retrieved September 9, 2019, from US Congress https://apps.fcc.gov/edocs_public/attachmatch/DOC-346595A1.pdf.

US Food and Drug Administration. (2016). US food and drug administration's deeming regulations for E-cigarettes, cigars, and all other tobacco products. Retrieved April 5, 2019 http://www.fda.gov/TobaccoProducts/Labeling/RulesRegulationsGuidance/ucm388395.htm.

Van't Riet, J., Cox, A. D., Cox, D., Zimet, G. D., De Bruijn, G.-J., Van den Putte, B., & Ruiter, R. A. (2016). Does perceived risk influence the effects of message framing? Revisiting the link between prospect theory and message framing. *Health Psychology Review, 10*(4), 447–459.

Vidrine, J. I., Simmons, V. N., & Brandon, T. H. (2007). Construction of smoking-relevant risk perceptions among college students: The influence of need for cognition and message content. *Journal of Applied Social Psychology, 37*(1), 91–114. https://doi.org/10.1111/j.0021-9029.2007.00149.x.

Wackowski, O. A., Hammond, D., O'Connor, R. J., Strasser, A. A., & Delnevo, C. D. (2016). Smokers' and E-cigarette users' perceptions about E-cigarette warning statements. *International Journal of Environmental Research and Public Health, 13*(7), https://doi.org/10.3390/ijerph13070655.

Warner, K. E., & Mendez, D. (2019). E-cigarettes: Comparing the possible risks of increasing smoking initiation with the potential benefits of increasing smoking cessation. *Nicotine & Tobacco Research, 21*(1), 41–47. https://doi.org/10.1093/ntr/nty062.

Wong, E. C., Haardorfer, R., Windle, M., & Berg, C. J. (2016). Distinct motives for use among polytobacco versus cigarette only users and among single tobacco product users. *Nicotine & Tobacco Research*. https://doi.org/10.1093/ntr/ntw284.

Zawertailo, L., Pavlov, D., Ivanova, A., Ng, G., Baliunas, D., & Selby, P. (2017). Concurrent e-cigarette use during tobacco dependence treatment in primary care settings: Association with smoking cessation at three and six months. *Nicotine & Tobacco Research, 19*(2), 183–189. https://doi.org/10.1093/ntr/ntw218.