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The Association between Sensation Seeking and E-cigarette Use in Texas Young Adults: A Cross-Sectional Study

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Abstract

Objective—To examine the associations between sensation seeking and ever and current e-cigarette use in Texas young adults (18–29 years old). Current cigarette use was examined as a potential effect modifier of the associations.

Participants—Participants included college students enrolled in four-year and two-year colleges in four metropolitan areas in Texas (n=5,418) who completed the survey between November 2014 and February 2015.

Methods—This cross-sectional study utilized mixed effects logistic regression to determine the associations between mean sensation seeking scores and ever and current e-cigarette use after controlling for covariates.

Results—After controlling for covariates, significant associations between sensation seeking and both ever and current e-cigarette use were observed, however, these associations were significant for non-current smokers only (AOR=1.55, 95% CI=1.39, 1.73; AOR=1.82, 95% CI=1.54, 2.15, respectively).

Conclusions—Sensation seeking is an important factor in identifying college students who may be at increased risk for e-cigarette use behaviors. Keywords: Electronic cigarettes, sensation seeking, current cigarette use

Electronic cigarette (“e-cigarette”) use in young adults has rapidly increased in the United States (U.S), with a recent study of Texas undergraduates indicating that current, or past 30 day, use of e-cigarettes doubled between 2012 and 2013 (3.7% versus 7.7%).¹ This increase in use has also been reported in national U.S.-based samples of young adults. In a nationally representative study of U.S. adults, researchers found that among young adults aged 18 to

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24, the overall prevalence of ever use of e-cigarettes increased from 4.1% in 2012 to 7.8% in 2013.² The escalation of use among U.S. college students is particularly concerning given that e-cigarettes are not yet subject to the many of the same restrictions as cigarettes, like limits on advertising.³ In a recent study, researchers found that exposure to e-cigarette television advertisements more than tripled from 2011 to 2013 among young adults aged 18 to 24.⁴

While there is considerable debate regarding the safety of e-cigarettes, preliminary research suggests that although e-cigarettes are likely less harmful than cigarettes, they are not harmless.⁵ Harmful carcinogens such as formaldehyde are generated as a by-product of the heating process.⁶ Additionally, Allen et al.⁷ found that a majority of the flavorings analyzed contained diacetyl, which has been previously implicated in lung disease (i.e., “Popcorn lung”) suffered by factory workers. These findings are particularly concerning given previous research suggesting that young adults hold incorrect perceptions regarding the constituents found in e-cigarettes.^{8–10} Specifically, Sanders-Jackson et al.⁸ reported that only 57.3% of young adults correctly responded “true” to the statement “some e-cigarettes contain nicotine;” while only 20.1% correctly responded “false” to the statement “e-cigarettes do not contain any of the toxic chemicals that can be found in combustible cigarettes.”

Given these findings, colleges should incorporate e-cigarettes into their anti-tobacco messaging and prevention programming to inform college students about the potentially harmful constituents found in e-cigarettes. Colleges are uniquely situated to provide this type of health education as many already have smoke- and tobacco-free initiatives, programming, and policies in place.¹¹ Importantly, the American College Health Association has incorporated e-cigarettes into their position statement encouraging colleges to be 100% tobacco-free.¹² To date, however, little is known about which subpopulations of college students should be targeted when developing effective health education messages specific to e-cigarettes.

Sensation Seeking and Conventional Cigarette Use

Identifying high-risk groups of college students, based on risk factors, such as personality factors, can help program designers target appropriate audiences with specific strategies tailored to their unique needs. Sensation seeking is one such personality factor that has been found to elevate the risk of conventional cigarette use in young adults,^{13,14} but has not been thoroughly examined with respect to e-cigarette use. Sensation seeking is defined by Zuckerman¹⁵ as, “the need for varied, novel and complex sensations and experiences.” Sensation seeking is associated with numerous problem behaviors in young adults ranging from cigarette smoking to risky sexual behaviors.^{13–17} Specific to cigarette smoking, research indicates that sensation seeking is associated with initiation of use, current, and regular use in young adults.^{13,14,18}

Sensation Seeking and E-cigarette Use

To date, only three studies have examined the association between sensation seeking and e-cigarette use in young adults.^{20–22} In research specific to college students who were current cigarette smokers, Sutfin et al.²¹ found no association between the mean sensation seeking score and ever e-cigarette use. However, in another study of college students, which included cigarette smokers and non-smokers, Sutfin et al.²⁰ found a significant association between the mean sensation seeking score and ever e-cigarette use, but this association became non-significant after controlling for age, sex, race/ethnicity, fraternity/sorority membership, residence location, smoking status, ever hookah use, current binge drinking, current marijuana use, ever use of other drugs, and harm perceptions. Finally, Primack et al.²² found that 16 to 26 year-old ever e-cigarette users reported significantly higher mean sensation seeking scores as compared to never e-cigarette users.

Importantly, the studies described above only investigated the specific association between sensation seeking and ever e-cigarette use and did not examine the role of sensation seeking in current e-cigarette use (e.g. past 30 day use). Past 30-day e-cigarette use is important to consider because it is a marker of sustained and more regular use, rather than simply experimentation, like “ever use” denotes. Furthermore, none of the studies that examined the association between sensation seeking and e-cigarette use in young adults included impulsivity as a covariate.^{20–22} Impulsivity is a related but distinct construct from sensation seeking and is defined by Steinberg et al.²³ as “a lack of self-control or deficiencies in response inhibition; it leads to hasty, unplanned behavior.” Research indicates that impulsivity and sensation seeking are differentially associated with cigarette use behaviors in college students.²⁴ In a study of college students, Spillane et al.²⁴ investigated the association between five impulsivity-related factors (positive urgency, negative urgency, sensation seeking, lack of planning, and lack of perseverance) and cigarette use and nicotine dependence. When all five factors were included in the model, along with other demographic covariates such as age and sex, only sensation seeking was significantly associated with current cigarette use. Conversely, when examining the association between the same factors and nicotine dependence, only positive urgency remained significant after controlling for the other four impulsivity-related factors and demographic characteristics.²⁴ Thus, it is important to include both of these personality factors when examining factors associated with e-cigarette use in order to gain a more complete picture of the association between risk-taking characteristics and e-cigarette use behaviors.

Study Purpose and Specific Aims

This study addresses gaps in the literature regarding the association between sensation seeking and e-cigarette use behaviors. The study examines the association between sensation seeking and ever and current e-cigarette use in Texas young adult college students, controlling for sex, race/ethnicity, age, college type, parental education, current alcohol use, and impulsivity. Current cigarette use was also explored as a potential effect modifier of both associations, as previous research indicates that cigarette smokers have higher levels of sensation seeking compared to non-smokers^{14,17}; therefore, the association between sensation seeking and e-cigarette use may be stronger for current smokers than non-current

smokers. The specific hypotheses tested were: 1) A higher mean sensation seeking score would be associated with higher odds of ever e-cigarette use after controlling for covariates, 2) A higher mean sensation seeking score would be associated with higher odds of current e-cigarette use after controlling for covariates, and 3) Current cigarette use would significantly modify the associations between higher mean sensation seeking score and ever and current e-cigarette use; higher mean sensation seeking scores would be associated with higher odds of both ever and current e-cigarette use for current smokers only after controlling for covariates.

METHODS

Study design and sampling frame

This study was a secondary cross-sectional data analysis of Wave 1 (November 2014–February 2015) of the Marketing and Promotions Across Colleges in Texas Project (Project M-PACT), a rapid response surveillance study. Participants included college students between the ages of 18 and 29 who were enrolled in four-year colleges and vocational/technical programs at two-year colleges in the five counties surrounding Austin, Dallas/Fort Worth, Houston, and San Antonio. To be eligible to participate individuals had to be enrolled as full-time or part-time degree or certificate-seeking undergraduate students attending a four-year college or a vocational/technical program at a two-year college (“two-year colleges”).

Project M-PACT included colleges with a minimum enrollment of 2,500 students and two-year colleges were required to have students enrolled in vocational/technical programs. Three colleges of each type (four-year and two-year) were selected from each of the four cities, for a total of 24 colleges (12 four-year colleges and 12 two-year colleges). Students who met the eligibility criteria were recruited to participate via e-mail and student consent was obtained online prior to study enrollment. Project M-PACT was reviewed and approved by the University of Texas at Austin Institutional Review Board (2013-06-0034).

Study participants

A total of 5,482 young adults participated in Wave 1 of Project M-PACT; however, 64 participants were excluded from the current study due to missing data, bringing the total to 5,418 participants. Overall, the mean age of participants was 20.5 years ($SD=2.36$, range=18 to 29), and 63.9% of participants were female. With respect to race/ethnicity, 36.6% of participants were non-Hispanic white, 31.2% were Hispanic/Latino, 8.1% were African-American/Black, 16.6% were Asian, and 7.5% reported other race or reported two or more races/ethnicities.

Measures

Outcome Variables

Ever and Current E-cigarette Use: Items measuring e-cigarette use were adapted from the Population Assessment of Tobacco and Health (PATH) Study.²⁵ Ever e-cigarette was measured using responses to the question, “Have you ever used an ENDS product (i.e. e-cigarette, vape pen or e-hookah) as intended (i.e. with nicotine cartridges and/or e-liquid/e-

juice), even one or two puffs?” Response options were “yes” and “no.” Participants who responded “no” to ever using e-cigarettes were classified as never users, those who responded “yes” were classified as ever users. With respect to current use of e-cigarettes, the specific question was, “During the past 30 days, have you used any ENDS product (i.e. an e-cigarette, vape pen, or e-hookah), even one or two puffs, as intended (i.e. with nicotine cartridges and/or e-liquid/e-juice)?” Response options were “yes” and “no.” Participants who responded “yes” were classified as current e-cigarette users, while those who responded “no” were classified as non-current users. Therefore, non-current users included both ever and non-users of e-cigarettes.

Exposure Variable

Sensation Seeking: Sensation seeking was measured using the 4-item Brief Sensation Seeking Scale 4 (BSSS-4): 1) “I would like to explore strange places;” 2) “I like to do frightening things;” 3) “I like new and exciting experiences, even if I have to break the rules;” and 4) “I prefer friends who are exciting and unpredictable.”²⁶ Response options for each of the four items were “strongly disagree (1),” “disagree (2),” “agree (3),” and “strongly agree (4).” A mean sensation seeking score was created by summing responses across all completed items and dividing by the number of completed items. Participants who completed at least two of the items were included in the analyses. Potential mean sensation seeking scores ranged from 1 to 4. The scale reliability coefficient for the M-PACT study indicated acceptable internal consistency ($\alpha=0.80$).

Covariates—Demographic characteristics including sex, race/ethnicity, college type (four-year versus 2-year colleges), age, and parental education served as covariates in the mixed effects logistic regression models.

Race/Ethnicity: For race/ethnicity, responses to two questions were examined. First, participants were classified based on their response to the question, “What race or races do you consider yourself to be?”; response options were “White,” “African American,” “Asian,” “American Indian/Alaska Native,” “Native Hawaiian or Pacific Islander” and “Other.” The second question was, “Are you Hispanic or Latino?”, with response options “No,” “Yes, I am Mexican, Mexican American or Chicano/a,” and “Yes, I am some other Hispanic or Latino not listed here.” From these two questions five different race/ethnicity categories were created: White, non-Hispanic; Hispanic; African American; Asian; and Other.

Parental Education: Parental education served as a proxy for socioeconomic status. For parental education, responses to two questions were examined. The questions included 1), “What is the highest level of education your mother/guardian completed?” and 2) What is the highest level of education your father/guardian completed?”, with response options including “No high school,” “Some high school,” “Graduated high school,” “Vocational or technical school,” “Some college,” “Associate’s degree,” “Bachelor’s degree,” “Graduate degree” and “I don’t know.” Based on the responses to the two questions a dichotomous variable was created corresponding to the highest educational level attained by either parent

(high school or less versus more than high school).^{27,28} Participants who selected “I don’t know” for both questions were excluded from the analyses.

Current Conventional Cigarette Use: The measure of current conventional cigarette use was adapted from the Youth Tobacco Survey²⁹ and assessed current or past 30 day use of cigarettes. To measure current use of cigarettes, responses to the following question were used: “On how many of the past 30 days did you smoke cigarettes?” Response options included 0 to 30 days. Participants who reported 0 days of use of cigarettes in the past 30 days were considered non-current smokers; participants who reported one or more days of use in the past 30 days were considered current smokers.

Current Alcohol Use: To measure current alcohol use, responses to the following question were used, “During the past 30 days, on how many days did you have at least one alcoholic drink?” Response options included “0 days,” “1 or 2 days,” “3 to 5 days,” “6 to 9 days,” “10 to 19 days,” “20 to 29 days,” and “All 30 days.” Current alcohol use was collapsed into two categories: participants who selected “0 days” were classified as non-users, participants who reported one or more days of alcohol use were classified as current users.

Impulsivity: Impulsivity was also included as a covariate in the analyses. Impulsivity was measured with three items from the Substance Use Risk Profile Scale (SURPS)³⁰: 1) “I often don’t think things through before I speak;” 2) “I usually act without stopping to think;” and 3) “Generally, I am an impulsive person.” Response options for each of the three items included: “strongly disagree (1),” “disagree (2),” “agree (3),” and “strongly agree (4).” A mean impulsivity score was created by summing responses across all completed items and dividing by the number of completed items. Mean impulsivity scores ranged from 1 to 4. Participants who completed at least two of items were included in the analyses. The reliability coefficient for project M-PACT indicated acceptable internal consistency ($\alpha=0.79$).

Statistical Analysis

First, descriptive statistics were generated for the two outcome variables (ever e-cigarette use and current e-cigarette use). Differences in the prevalence of e-cigarette use category (never versus ever users; non-current users versus current users) by sex, race/ethnicity, college type, parental education, current cigarette use, and current alcohol use were examined using the Chi-Square statistic. Independent t-tests were conducted to determine mean differences in age, sensation seeking, and impulsivity by e-cigarette use category. All analyses were conducted using Stata 14.0 (College Station, TX).

Mixed effects logistic regression analyses accounting for school-level clustering (college as random effect) were conducted to assess the primary research question and determine the association between mean sensation seeking score and the outcome variables of interest (ever and current e-cigarette use). Separate models were conducted for ever and current e-cigarette use. Unadjusted models were first conducted to determine the crude odds ratio for the association between mean sensation seeking score and each outcome. Additionally, the interaction between current cigarette use and mean sensation seeking score was included in

both models.³¹ Finally, adjusted models were conducted controlling for covariates described above. The Akaike information criterion (AIC) and Bayesian information criterion (BIC) fit statistics were examined to compare the fit of the adjusted and unadjusted models, with lower values indicating better model fit.³²

RESULTS

The descriptive statistics for ever and current e-cigarette use categories by sex, race/ethnicity, age, college type, parental education, current cigarette use, current alcohol use, mean sensation seeking, and mean impulsivity scores are presented in Table 1. A higher proportion of ever users were male, current cigarette smokers, and current alcohol users, as compared to never e-cigarette users. In addition, ever users reported significantly higher mean sensation seeking and impulsivity scores as compared to never users. There were similar differences between non-current and current (i.e., past 30 day) e-cigarette users. A higher proportion of current e-cigarette users were male, current cigarette smokers, and current alcohol users as compared to non-current e-cigarette users. Current users also reported significantly higher mean sensation seeking and impulsivity scores as compared to non-current e-cigarette users.

Results for the mixed effects logistic regression analyses examining ever e-cigarette use are presented in Table 2. The crude odds ratio indicates that young adults with higher mean sensation seeking scores had significantly higher odds of ever e-cigarette use as compared to young adults with lower mean sensation seeking scores (OR=1.94, 95% CI=1.78, 2.11, results not shown in table). After controlling for sex, race/ethnicity, age, college type, parental education, current cigarette use, current alcohol use, and mean impulsivity score, the association remained significant (AOR=1.47, 95% CI= 1.33, 1.63). The model fit statistics indicated that the adjusted model better fit the data as compared to the unadjusted model (Adjusted, AIC=6052.15, BIC=6144.52 versus Unadjusted, AIC=7222.81, BIC=7242.60). Importantly, there was a significant interaction for current cigarette use and mean sensation seeking score (AOR=0.73, 95% CI=0.56, 0.95, results not shown in table). Probing the interaction indicated that the association between sensation seeking and ever e-cigarette use was significant for non-current smokers (AOR=1.55, 95% CI=1.39, 1.73), but not for current smokers (AOR=1.13, 95% CI=0.89, 1.44, results not shown in table).

Results for the mixed effects logistic regression analyses for current e-cigarette use are presented in Table 3. The crude odds ratio indicates that young adults with higher mean sensation seeking scores had significantly higher odds of current e-cigarette use as compared to low sensation seekers (OR=1.86, 95% CI=1.66, 2.08, results not shown in table). The association remained significant after controlling for sex, race/ethnicity, age, college type, parental education, current cigarette use, current alcohol use, and mean impulsivity score (AOR=1.38, 95% CI=1.22, 1.57). The fit statistics indicated that the adjusted models better fit the data than the unadjusted model (Adjusted, AIC=4269.38, BIC=4361.74 versus Unadjusted, AIC=4829.44, BIC=4849.24). Similar to the results for ever e-cigarette use, there was a significant interaction for current cigarette use and mean sensation seeking score (AOR=0.56, 95% CI=0.44, 0.70, results not shown in table). Specifically, the association between sensation seeking and current e-cigarette use was significant for non-current

smokers (AOR=1.82, 95% CI=1.54, 2.15) but not for current smokers (AOR=1.01, 95% CI=0.85, 1.20, results not shown in table).

COMMENT

The purpose of the current study was to examine the associations between sensation seeking and e-cigarette use behaviors in Texas young adult college students. Results from the study indicate that college students with higher sensation seeking scores had significantly higher odds of ever and current e-cigarette use after controlling for covariates, including sex, race/ethnicity, age, college type, parental education, current cigarette use, current alcohol use, and impulsivity. Current cigarette use was a significant effect modifier of all associations, indicating that sensation seeking was associated with increased odds of both ever and current e-cigarette use for non-current smokers only. This study contributes to a limited, yet emerging, body of research investigating sensation seeking as a factor associated with e-cigarette use behaviors in young adults. Ultimately, the results from the present study suggest sensation seeking is an important factor to consider when developing health education messages about e-cigarette use for college students, particularly those who are not current cigarette smokers.

Contrary to our hypothesis, the current study found that the association between sensation seeking and e-cigarette use behaviors differed by current cigarette smoking status; sensation seeking was significantly associated with increased odds of both ever and current e-cigarette use for non-current smokers but not for current smokers. Our results provide preliminary support that sensation seeking may be an important contributor to the initiation and current use of e-cigarettes for non-current smokers, but may not be relevant for current smokers. One potential explanation for this finding is the role of nicotine dependence. For example, if college students are current smokers and, thus, already dependent on nicotine, this may be the driving factor in experimenting with other nicotine products such as e-cigarettes.^{33,34} Alternatively, for college students who have simply experimented with cigarettes (e.g. ever users but not current users) and are not dependent on nicotine, higher sensation seeking tendencies may influence the use of e-cigarettes. Since previous research has consistently found that current cigarette use is strongly associated with e-cigarette use behaviors in young adults,^{20,35–37} and that sensation seeking is linked to both e-cigarette and conventional cigarette use,^{13,14,17} future research is needed to further elucidate the role of sensation seeking in the etiology of both behaviors. Namely, one of the major public health concerns regarding e-cigarette use is the increased likelihood that e-cigarette users will transition to conventional cigarettes.^{22,38} Thus, given the findings of the current study, research examining factors associated with transition from e-cigarette to conventional cigarette use should examine sensation seeking as a possible factor contributing to this transition.

While the findings from the present study differ from those reported in previous research examining sensation seeking and e-cigarette use among college students,²⁰ our findings are consistent with prior research that relates sensation seeking with other tobacco use behaviors.^{13,39} Specifically, in a study with North Carolina college students, researchers found that while sensation seeking was associated with ever e-cigarette use in unadjusted

models, the relationship was not significant after controlling for a wide-range of covariates, including sociodemographic characteristics, other tobacco use, and harm perceptions.²⁰ Conversely, Song et al.¹³ found that higher mean sensation seeking scores were associated with increased odds of current conventional cigarette use among young adults aged 18 to 25. In addition, in a study of college students in the Southeast U.S., Enofe et al.³⁹ found that mean sensation seeking scores were associated with current use of alternative tobacco products, which was defined as using one or more of the following products in the past 30 days: chewing tobacco, snuff, dip, cigars, little cigars, cigarillos, hookah, or snus. In the Enofe et al.³⁹ study, higher sensation seeking was significantly associated with higher odds of current alternative tobacco product use after controlling for demographic and other psychosocial characteristics. Our findings are consistent with and extend the studies by Enofe et al.³⁹ and Song et al.¹³ by identifying a significant association between sensation seeking and e-cigarettes, specifically. It is important to note that none of the previous studies examined current cigarette use as an effect modifier of the association between sensation seeking and e-cigarette use behaviors.

Finally, it is noteworthy that sensation seeking was significantly and positively associated with both ever and current use of e-cigarettes after controlling for impulsivity and other important covariates. Interestingly, in the final adjusted models, while the associations between sensation seeking and both ever and current e-cigarette use remained significant after controlling for all other covariates, impulsivity was only significantly associated with ever use of e-cigarettes. As this is the first study to examine the association between sensation seeking and e-cigarette use behaviors in college students while controlling for impulsivity, future research is needed to determine the longitudinal associations between both constructs and e-cigarette use behaviors among college students. However, the present study provides preliminary indication that sensation seeking is an important correlate of e-cigarette use behaviors even after controlling for similar risk-taking characteristics such as impulsivity. Future studies that examine e-cigarette use among college students should include sensation seeking as a covariate.

Strengths and Limitations

Strengths of the current study include that it utilized a large, diverse sample of young adults enrolled in 24 four-year colleges and vocational/technical programs at 2-year colleges in the four largest cities in Texas. In contrast to previous research that included less ethnically diverse samples from a limited number of four-year public and private colleges,^{20,21} the current study examined the associations between sensation seeking and e-cigarette use behaviors among students in both two and four-year colleges. This is the first study to date to examine the associations between sensation seeking and e-cigarette use behaviors in a sample that included students at vocational/technical programs at 2-year colleges. Furthermore, the current study also controlled for impulsivity, which is related but distinct from sensation seeking.²³ Thus, this study clarifies the specific association between sensation seeking and e-cigarette use behaviors in young adults, after controlling for impulsivity.

There are several limitations to the current study that warrant discussion. First, given the cross-sectional nature of the study it is not possible to determine if sensation seeking is causally associated with e-cigarette use. Therefore, future longitudinal research is needed to further examine the temporal association between sensation seeking and e-cigarette use behaviors. Secondly, Project M-PACT did not randomly select colleges or participants, therefore, the results of the current study are not generalizable to all Texas college students residing in the four sampled cities (Austin, San Antonio, Houston, Dallas/Fort Worth). Finally, all items used in the survey were measured through self-report, which may lead to an inaccurate assessment of sensation seeking characteristics and e-cigarette use behaviors. For example, individuals may underreport their e-cigarette use behaviors thus biasing the results of the association between sensation seeking and e-cigarette use behaviors to the null. However, given that the survey was self-administered, it is unlikely that participants would underreport their use of e-cigarettes out of fear of judgment.

Conclusions

This study adds to the limited research examining sensation seeking and e-cigarette use in young adults. This is the first study to date to examine the association between sensation seeking and current e-cigarette use among college students; previous research has been limited to examining the association between sensation seeking and ever e-cigarette use.^{20–22} In addition, the current study contributes to a growing body of evidence that sensation seeking is an important factor associated with e-cigarette use among college students. Specifically, for non-current smokers, sensation seeking was directly associated with ever and current e-cigarette, above and beyond impulsivity and other covariates.

In order to meet the goal established by the American College Health Association¹² of educating college students about the harms and risks of all tobacco products, the results of this study suggest that colleges should target high sensation seekers with health education messages regarding e-cigarettes. As the associations between sensation seeking and e-cigarette use behaviors were significant for non-current smokers only, such health education messages should directly target non-smoking students. Namely, colleges should target those at-risk for e-cigarette use through programs already in place to address other substance abuse issues. For example, the Brief Alcohol Screen and Intervention in College Students (BASICS) is a program used by colleges across the U.S. to prevent alcohol and drug use.^{40–42} In addition to items related to alcohol and drug use, screening for these programs should include items related to sensation seeking to identify those who are most at risk for future substance use, including e-cigarette use. As high sensation seeking is associated with increased risk of numerous negative health behaviors, including alcohol and drug use,^{16,43} e-cigarette messaging incorporated into such existing programs would provide a good first step to addressing misconceptions about e-cigarettes among those most likely to use them.

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Table 1

Description of E-cigarette Use Category by Sex, Race/Ethnicity, Age, College Type, Parental Education, Current Cigarette Use, Current Alcohol Use, Sensation Seeking, and Impulsivity in Texas Young Adults; Project M-PACT Wave 1, 2014–2015 (n=5,418)

	Never Users n (%) (n=2,805)	Ever Users n (%) (n=2,613)	p-value ^a	Non-Current Users n (%) (n=4,486)	Current Users n (%) (n=932)	p-value ^b
Sex						
Male (n=1958)	942 (33.6)	1016 (38.9)	<.001	1556 (34.7)	402 (43.1)	<.001
Female (n=3460)	1863 (66.4)	1597 (61.1)		2930 (65.3)	530 (56.9)	
Race/Ethnicity						
White, non-Hispanic (n=1985)	986 (35.2)	999 (38.2)	<.001	1612 (35.9)	373 (40.0)	<.001
Hispanic (n=1690)	791 (28.2)	899 (34.4)		1383 (30.8)	307 (32.9)	
African American (n=437)	241 (8.6)	196 (7.5)		379 (8.5)	58 (6.2)	
Asian (n=901)	584 (20.8)	317 (12.1)		786 (17.5)	115 (12.4)	
Other (n=405)	203 (7.2)	202 (7.7)		326 (7.3)	79 (8.5)	
Age (m, sd)	20.3 (2.2)	20.7 (2.5)	<.001	20.5 (2.3)	20.7 (2.6)	.20
College Type						
Two-year (n=399)	201 (7.2)	198 (7.6)	.56	330 (7.4)	69 (7.4)	.96
Four-year (n=5,019)	2,604 (92.8)	2,415 (92.4)		4,156 (92.6)	863 (92.6)	
Parental Education						
High school or Less (n=889)	460 (16.4)	429 (16.4)	.99	740 (16.5)	149 (16.0)	.70
More than high school (n=4529)	2,345 (83.6)	2,184 (83.6)		3,746 (83.5)	783 (84.0)	
Current Cigarette Use						
Non-current smoker (n=4269)	2,651 (94.5)	1,618 (61.9)	<.001	3,829 (85.3)	440 (47.2)	<.001
Yes (n=1149)	154 (5.5)	995 (38.1)		657 (14.7)	492 (52.8)	
Current Alcohol Use						
Non-user (n=1807)	1,367 (48.7)	440 (16.8)	<.001	1,677 (37.4)	130 (13.9)	<.001
Current user (n=3611)	1,438 (51.3)	2173 (83.2)		2,809 (62.6)	802 (86.1)	
Sensation Seeking Score (m, sd)	2.55 (0.65)	2.85 (0.67)	<.001	2.65 (0.67)	2.92 (0.69)	<.001
Impulsivity Score (m, sd)	1.91 (0.63)	2.09 (0.67)	<.001	1.97 (0.64)	2.11 (0.70)	<.001

n=sample size; m=mean, sd=standard deviation

Chi-Square test statistics for differences in e-cigarette use categories by categorical variables; Independent t-test analyses for differences in age, sensation seeking, and impulsivity by e-cigarette use categories

^a p-value for difference between never and ever users

^b p-value for difference between non-current users and current users

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Table 2

Association between Mean Sensation Seeking Scores and Ever E-cigarette Use in Texas Young Adults, Project M-PACT Wave 1, 2014–2015 (n=5,418)

Ever E-cigarette Use		
	Adjusted Odds Ratio ^T	95% CI
Sensation Seeking Score	1.47	1.33, 1.63
Sex		
Female (reference)	1	–
Male	1.11	0.97, 1.27
Race/Ethnicity		
White, non-Hispanic (reference)	1	–
Hispanic	1.22	1.04, 1.43
African American	1.15	0.90, 1.47
Asian	0.80	0.66, 0.98
Other	1.15	0.90, 1.47
Age	0.99	0.96, 1.02
College Type		
Two-year (reference)	1	–
Four-year	0.88	0.59, 1.09
Parental Education		
High school or less (reference)	1	–
More than high school	0.95	0.79, 1.13
Current Cigarette Use		
Non-current smoker (reference)	1	–
Current smoker	7.81	6.46, 9.44
Current Alcohol Use		
Non-user (reference)	1	–
Current user	3.56	3.08, 4.11
Impulsivity Score	1.26	1.14, 1.39
Model Fit Statistics		
	Unadjusted	Adjusted
AIC	7222.81	6052.15
BIC	7242.60	6144.52

n=sample size; CI=confidence interval

^T adjusted for all other variables in the model

Table 3

Association between Mean Sensation Seeking Scores and Current E-cigarette Use in Texas Young Adults, Project M-PACT Wave 1, 2014–2015 (n=5,418)

Current E-cigarette Use		
	Adjusted Odds Ratio $\hat{\tau}$	95% CI
Sensation Seeking Score	1.38	1.22, 1.57
Sex		
Female (reference)	1	–
Male	1.17	1.0, 1.37
Race/Ethnicity		
White, non-Hispanic (reference)	1	–
Hispanic	0.91	0.75, 1.11
African American	0.86	0.62, 1.20
Asian	0.91	0.71, 1.17
Other	1.16	0.86, 1.56
Age	0.95	0.92, 0.99
College Type		
Two-year (reference)	1	–
Four-year	1.02	0.72, 1.46
Parental Education		
High school or less (reference)	1	–
More than high school	0.97	0.77, 1.20
Current Cigarette Use		
Non-current smoker (reference)	1	–
Current smoker	5.04	4.28, 5.93
Current Alcohol Use		
Non-user (reference)	1	–
Current user	2.58	2.08, 3.19
Impulsivity Score	1.06	0.94, 1.19
Model Fit Statistics		
	Unadjusted	Adjusted
AIC	4829.44	4269.38
BIC	4849.24	4361.74

n=sample size; CI=confidence interval

$\hat{\tau}$ adjusted for all other variables in the model