The relationships between sensation seeking and a spectrum of e-cigarette use behaviors: Cross-sectional and longitudinal analyses specific to Texas adolescents

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ABSTRACT

Introduction: Sensation seeking is strongly associated with cigarette use in adolescents. However, few studies have investigated its relationship with adolescent e-cigarette use. This study examined cross-sectional and longitudinal associations between sensation seeking and a variety of e-cigarette use behaviors among Texas adolescents.

Methods: This study utilized two waves of data collected 6 months apart through the Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS) in 2014–2015 (n = 2,488/N = 461,069). TATAMS employs a complex probability-sampling design and is representative of students in 6th, 8th and 10th grades from five counties surrounding the four largest cities in Texas (Houston, Dallas/Ft. Worth, San Antonio, Austin). Weighted multivariable logistic regression was used to examine the cross-sectional and longitudinal associations between sensation seeking and susceptibility to e-cigarette use, ever e-cigarette use, and current (past 30 day) e-cigarette use.

Results: In the cross-sectional analyses, higher mean sensation seeking scores were associated with higher odds of both susceptibility to e-cigarette use and ever e-cigarette use (AOR = 1.25, 95% CI = 1.07, 1.47; AOR = 1.24, 95% CI = 1.08, 1.43, respectively). For the longitudinal analyses, only the association between higher mean sensation seeking scores and transition to ever e-cigarette use remained statistically significant (AOR = 1.45, 95% CI = 1.01, 2.08). There were no significant associations between sensation seeking and current e-cigarette use in either the cross-sectional or longitudinal analyses.

Conclusions: Higher sensation seeking scores were consistently and significantly related to experimentation with e-cigarette use among Texas adolescents. Future interventions (e.g., communication campaigns) should target high sensation seeking adolescents to reduce initiation of e-cigarette use among this population.

1. Introduction

E-cigarette use among adolescents has increased rapidly in recent years, with research finding that the prevalence of both ever and current, or past 30-day, e-cigarette use now exceeds that of cigarette use among U.S. middle and high school students (Arrazola et al., 2015; Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2015; Kann, 2016; Singh, 2016). Such increases are alarming, particularly given concerns that e-cigarette users may transition to other tobacco products, such as cigarettes or other combustible tobacco products (Barrington-Trimis et al., 2016; Dutra & Glantz, 2014; Leventhal et al., 2015; Primack, Soneji, Stoolmiller, Fine, & Sargent, 2015; Wills et al., 2016). Emerging longitudinal research seems to support this claim, with recent studies indicating that adolescents who report ever e-cigarette use are more likely to experiment with cigarettes and other combustible product use compared to non-users (Barrington-Trimis et al., 2016; Leventhal et al., 2015; Primack et al., 2015; Wills et al., 2016). Identifying factors associated with the onset and progression of e-cigarette use among adolescents will be critical for future prevention programs and communication campaigns designed to reduce the...
burden of e-cigarette and other tobacco product use.

Although the literature regarding factors associated with e-cigarette use in adolescents is nascent, current research suggests certain factors such as older age, lower parental education, other tobacco product use, and family and peer tobacco/e-cigarette use, among others, are associated with increased e-cigarette use behaviors among adolescents (Camenga et al., 2014; Cooper, Case, & Loukas, 2015; Krishnan-Sarin, Morean, Camenga, Cavallo, & Kong, 2015; Wills, Knight, Williams, Pagano, & Sargent, 2015). In addition to demographic and psychosocial factors, personality factors that predispose adolescents to e-cigarette use are important to identify. One particularly relevant personality factor is sensation seeking. Sensation seekers desire stimulation and arousal, and thus, participate in activities that provide such experiences (Robert, 2004; Zuckerman, 1979). Research has found that sensation seeking is an important factor associated with cigarette use behaviors in adolescents, including: susceptibility to use, ever use, and transition to current use (Doran et al., 2011; Frankenberger, 2004; Kong et al., 2013; Thrasher, Niederdepe, Jackson, & Farrelly, 2006). Results from studies like these have been subsequently utilized to inform cigarette smoking prevention campaigns, such as the truth® campaign which employs high sensation-seeking messages to target youth at risk for cigarette smoking (Davis, Farrelly, Messeri, & Duke, 2009; Sargent, Tanski, Stolmiller, & Hanewinkel, 2010). Importantly, however, the truth® campaign does not currently address e-cigarette use.

To date, five studies have examined the association between sensation seeking and e-cigarette use behaviors, providing preliminary indication that high sensation seeking is associated with ever e-cigarette use in adolescents (Hampson, Andrews, Severson, & Barckley, 2015; Hanewinkel & Isensee, 2015; Primack et al., 2015; Thrasher et al., 2016; Wills et al., 2015). In a cross-sectional study of Hawaiian adolescents, Wills et al. (2015) found that mean sensation seeking scores were significantly higher for 1) ever e-cigarette only users as compared to non-users, and 2) ever dual users of both e-cigarettes and conventional cigarette users as compared to e-cigarette only users. In one of the only longitudinal studies to examine the association, researchers found that sensation seeking at fifth grade was associated with ever use of e-cigarettes at seventh grade among German adolescents (Hanewinkel & Isensee, 2015). Finally, in a recent study conducted by Hampson et al. (2015), researchers found that sensation seeking scores in adolescence were correlated with lifetime use of e-cigarettes in young adulthood using data from the Oregon Youth Substance Use Project.

Importantly, several gaps in the literature need to be addressed to further clarify the role of sensation seeking on e-cigarette use behaviors among adolescents. Namely, research is needed to examine the associations between sensation seeking and the continuum of e-cigarette use behaviors, including susceptibility to use, as well as current use. To date, all studies have only considered ever e-cigarette use, which is only a marker for experimentation. This continuum of use has been conceptualized as stages of behaviors including non-use, susceptibility to use, initiation of use, experimentation, and regular use (Pierce, Choi, Gilpin, Farkas, & Merritt, 1996; U.S. Department of Health and Human Services, 1994, 2012). As noted in the 2012 Surgeon General’s Report, it is important to examine factors associated with all stages of use as all experimenters do not necessarily progress to regular users (U.S. Department of Health and Human Services, 2012). Ultimately, in applying lessons learned from cigarette use in adolescents, it is necessary to identify factors associated with different stages of use to inform the development of future interventions.

This study examined the cross-sectional and longitudinal associations between sensation seeking and a spectrum of e-cigarette use behaviors among urban Texas adolescents. We hypothesized that high sensation seeking would be associated with higher odds of susceptibility to e-cigarette use, ever e-cigarette use, and current e-cigarette use.

2. Material and methods

2.1. Study design and participants

The present study examined data from baseline and the six month follow-up survey of the Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS). TATAMS is a three-year longitudinal study that measures use of tobacco products; personality, cognitive, affective, and social factors that may be associated with them; and exposure to marketing of tobacco products. Participants included adolescents in 6th, 8th and 10th grades at baseline from a representative sample of schools in five counties that surround the four largest cities in Texas, including Austin, San Antonio, Houston, and Dallas/Fort Worth. These major metropolitan areas are among the top five fastest growing cities in the United States at present and represent over 40% of the state’s population (Texas State Library and Archives Commission, 2015a, 2015b; U.S. Census Bureau, 2016). A description of the sampling design and school recruitment is provided elsewhere (Pérez et al., 2015).

Data collection occurred during 2014 and 2015; follow-up was staggered such that the time between surveys averaged 6 months. All analyses were conducted using sampling weights; the cross-sectional analyses utilized baseline sampling weights to generalize the findings back to the population from which it was drawn and to adjust for school-level clustering (Pérez et al., 2015). Sampling weights used in the longitudinal analyses were adjusted for non-response bias at follow-up, thus the final sample generalizes back to the entire population at baseline from which it was drawn (Pérez et al., 2015). At baseline and follow up, 3907 and 2488 adolescents participated in the study, respectively (weighted retention rate of 60.9%). After adjustment for non-response, the sampling frame for both surveys represented a total of 461,069 adolescents in Texas. Of the adolescents who completed both baseline and follow-up, 51.1% were male, 29.1% were White, non-Hispanic/other, 53.9% were Hispanic, and 17.0% were African American. The mean age of participants was 13.4 years; roughly two-thirds (66.9%) of the adolescents were in 6th (n = 699) or 8th grade (n = 807) at baseline. In addition, 81.7% of participants reported middle or high subjective economic status (includes “living comfortably” and “very well off”).

2.2. Measures

2.2.1. Outcome variables

2.2.1.1. Susceptibility to e-cigarette use. Susceptibility to e-cigarette use was measured using the following three questions: “Do you think you will use the following products (e-cigarettes) in the next 12 months?”; “If one of your close friends were to offer you one of the following products (e-cigarettes), would you use it?”; and “Have you ever been curious about using an e-cigarette?” (Pierce, Distefano, Kaplan, & Gilpin, 2005; Strong et al., 2014). Response options were “definitely not (1),” “probably not (2),” “probably yes (3),” and “definitely yes (4).” Susceptibility to e-cigarette use was restricted to never users of e-cigarettes at baseline. Never users of e-cigarettes at baseline who responded “definitely not (1)” to all three of the questions regarding susceptibility to e-cigarette use were classified as non-susceptible, otherwise participants were classified as susceptible at baseline (Pierce et al., 1996). For the longitudinal analyses, non-susceptible adolescents at baseline were classified as non-susceptible or susceptible at follow-up, replicating the procedure described above. Thus, change in susceptibility to use was operationalized as a dichotomous variable corresponding to participants who were non-susceptible at both baseline and follow-up versus those participants who were non-susceptible at baseline who became susceptible at follow-up.

2.2.1.2. Ever e-cigarette use. Ever e-cigarette use was assessed using the question: “Have you ever used an e-cigarette, even one or two puffs?”
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