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Social media e-cigarette exposure and e-cigarette expectancies and use among young adults

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HIGHLIGHTS

- Social media e-cigarette exposure is associated with e-cigarette use.
- The association is independent of the effects of e-cigarette use in in-person social networks.
- The association is mediated by beliefs that e-cigarettes offer a better 'smoking' alternative.
- Findings draw attention to e-cigarette marketing content on social media.

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ABSTRACT

A vast majority of U.S. young adults use social media such as Facebook and Instagram daily. Research suggests that young adults are commonly exposed to e-cigarette-related marketing or user-generated content on the social media they use. Currently, however, there is limited empirical evidence as to how social media e-cigarette exposure is associated with e-cigarette use beliefs and behavior. In particular, limited evidence exists to support the proposition that social media e-cigarette exposure is uniquely associated with e-cigarette use, even after adjusting for the effects of e-cigarette use in young adults' in-person or 'offline' social networks. This study was conducted to test the hypotheses that 1) social media e-cigarette exposure is associated with e-cigarette use outcome expectancies and current e-cigarette use; and 2) the association between social media and e-cigarette use is linked via outcome expectancies. We collected cross-sectional data from a sample of 470 young adult college students in Hawaii. Hypotheses were tested by fitting a structural equation model to the data. The model accounted for the associations of demographic variables, cigarette smoking history, as well as e-cigarette use in individuals' actual social networks with expectancies and behavior. Results indicated that social media e-cigarette exposure was associated with current e-cigarette use indirectly through two of the four positive outcome expectancies examined, namely, positive "smoking" experience and positive sensory experience. We discuss the implications of the findings in the context of tobacco control efforts.

1. Introduction

Electronic or e-cigarette use prevalence is increasing rapidly across all age-groups but mainly among youth and young adults. Recent Monitoring the Future (MTF) survey data (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2016) indicates that among 8th, 10th, and 12th graders past-30-day e-cigarette use prevalence has surpassed the prevalence of past-30-day cigarette use: for example, 4% vs. 9% of 8th graders and 7% vs. 16% of 10th graders tend to report past-month cigarette vs. e-cigarette use, respectively. Current e-cigarette use (24%) is highest among young adults (18–24 year olds) (Hu et al., 2016). At present, the long- and short-term health consequences of e-cigarette use

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are not clearly understood (Dinakar & O'Connor, 2016). In vitro studies (Bahl et al., 2012; Misra, Leverette, Cooper, Bennett, & Brown, 2014; Romagna et al., 2013; Rubenstein, Hom, Ghebrehiwet, & Yin, 2015; Scheffler et al., 2015; Willershausen et al., 2014; Wu, Jiang, Minor, & Chu, 2014), animal in vivo studies (Schweitzer, Chen, Law, et al., 2015; Lerner, Sundar, Yao, et al., 2015; Husari et al., 2016; Lim & Kim, 2014) and studies with humans (Vardavas et al., 2012; Flouris, Poulianiti, Chorti, et al., 2012; Flouris, Chorti, Poulianiti, et al., 2013; Yan & D'Ruiz, 2015) suggest that various constituents of e-liquid or vapor may have adverse physiological or biological effects. Formaldehyde, a known carcinogen, has been associated with vaporization of e-liquids at a high temperature (Sleiman et al., 2016; Talih, Balhas, Salman, Karaoghlanian, & Shihadeh, 2016). In addition, flavorings in e-liquid are likely to include compounds such as diacetyl, 2, 3-pentanedione, and acetoin, inhalation of which has been previously associated with serious lung diseases (Allen et al., 2016).

Consistent with the social learning theory (Bandura, 1977), which posits that new attitudes and behaviors are partly learned by observing others, research indicates that social influence is a robust predictor of young adults' e-cigarette use and susceptibility (Barrington-Trimis, Berhane, Unger, et al., 2015; Pokhrel, Little, Fagan, Muranaka, & Herzog, 2014). In today's world, social influence among young people occurs both through in-person ("offline") or internet ("online") social networks (Huang et al., 2014). Over 90% of U.S. young adults actively use one or more types of online social networking media ("social media") daily (Perrin, 2015). The social media platforms most commonly used by young adults are Facebook, Instagram, Twitter, and Reddit. For example, approximately 71% and 52% U.S. young adults regularly use Facebook and Instagram, respectively (Perrin, 2015). Social media are interactive applications that enable users to 1) create personal profiles—labeled with names/pseudo-names—that express their identities, textually and visually, in terms of, for example, demographics and lifestyle; 2) articulate a social ("friend or follower") network; and 3) interact with streams of user-generated content (Ellison & Boyd, 2013). Network members can interact with each other by sharing, or reacting to, visual or textual posts.

Studies (Carrotte, Dietze, Wright, & Lim, 2016; D'Angelo, Kerr, & Moreno, 2014; Hoffman, Austin, Pinkleton, & Austin, 2016; Huang et al., 2014; Moreno & Whitehill, 2014) suggest that exposure to pro-substance use images and texts on social media may promote substance use among young people. There are two main types of such exposure (Salimian, Chunara, & Weitzman, 2014). The first is the exposure to pro-substance use content originated from members of one's social media networks. The second is the exposure to product advertisement or promotion initiated by manufacturers/vendors. Exposure through both peers and marketers can exert normative and informational social influence. Normative influence occurs as individuals conform to the thoughts and behaviors that they perceive to be widely socially accepted, and, informational influence occurs when individuals use others' thoughts and behaviors to inform their own (Myers, 2013).

If and how exposure to e-cigarettes on social media promotes e-cigarette use among young adults have not been clearly understood. E-cigarettes are known to be marketed as safer and more socially acceptable alternatives to conventional cigarettes (Grana & Ling, 2014). A number of studies have shown the presence of e-cigarette-related content on Twitter (e.g., Allem et al., 2016; Chu et al., 2015; Chu, Sidhu, & Valente, 2015; Dai & Hao, 2016), Instagram (Laestadius, Wahl, & Cho, 2016; Chu, Allem, Cruz, & Unger, 2017), and Facebook (Chu et al., 2015). This presence has been characterized mainly by vendors'/manufacturers' efforts to promote e-cigarettes and by comments and posts from e-cigarette users and enthusiasts (Chu et al., 2015; Chu et al., 2015;Dai & Hao, 2016; Laestadius et al., 2016). As a result, the prevalence of pro-e-cigarette messages appears to be highly prevalent on social media (Dai & Hao, 2016; Laestadius et al., 2016).

Increased knowledge about the cognitive mediators of the effects of exposure to social media e-cigarette posts may help inform social media-based e-cigarette counter-marketing or prevention efforts. In general, there has been a lack of studies that have investigated the unique impact of social media e-cigarette exposure on e-cigarette use beliefs and behavior after accounting for the effects of demographics, cigarette smoking experience, and the presence of e-cigarette users in one's in-person social network. In regard to adolescent cigarette smoking and alcohol use, Huang et al. (2014) showed that social media substance use exposure uniquely influences adolescents' substance use above and beyond the effects of substance use in their in-person peer networks.

The present study examined the association between social media e-cigarette exposure and current e-cigarette use in a sample of young adults that included current cigarette smokers, cigarette experimenters, and never cigarette smokers. We tested the hypothesis that social media e-cigarette exposure will have unique impact on e-cigarette use beliefs (i.e., outcome expectancies) and behavior beyond the impact of demographics, cigarette smoking, and presence of e-cigarette users in in-person social networks. Outcome expectancies refer to beliefs that certain outcomes will be experienced if the individual engages in a behavior (Brandon, Juliano, & Copeland, 1999). Negative outcome expectancies represent beliefs that certain negative outcomes will result if engaged in a behavior. Positive outcome expectancies often underlie the motivation to engage in a behavior.

Past research (Pokhrel et al., 2014) has linked positive e-cigarette outcome expectancies, including social enhancement, affect regulation, and positive sensory experience with e-cigarette use and use susceptibility among young adults. Also, negative outcome expectancies such as negative health consequences, addiction concern, and negative sensory experience have been concurrently associated with lower likelihood of e-cigarette use (Pokhrel et al., 2014). Social enhancement expectancies refer to the beliefs that e-cigarette use would result in being more popular, being liked by others, and appearing fashionable. Affect regulation expectancies include beliefs that use of e-cigarettes would result in feeling good and the relief of boredom and stress. Positive sensory experience expectancies represent beliefs that use of e-cigarettes would result in experiencing good tastes and smells. Positive "smoking" experience expectancies tap beliefs that e-cigarettes provide a safer, more convenient, and socially acceptable alternative to smoking.

The negative outcome expectancies we consider include negative health consequences, negative social consequences, addiction concern, and negative sensory experience. Negative health consequences represent beliefs are e-cigarette use will cause harm to health or body. Negative social consequences refer to beliefs that use of e-cigarette will elicit social disapproval. Addiction concern represents beliefs that use of e-cigarette use will result in increased addiction to e-cigarettes and negative sensory experience includes beliefs that use of e-cigarettes will lead to experiencing bad taste and smelling bad.

Thus, in summary, this study hypothesized that higher social media e-cigarette exposure would be associated with higher likelihood of current e-cigarette use and this relationship would be mediated by the following four positive outcome expectancies: social enhancement, affect regulation, positive "smoking" experience, and positive sensory experience. In addition, we expected that increased social media e-cigarette exposure would be associated with lower negative e-cigarette outcome expectancies, which in turn would be associated with lower current e-cigarette use. The support of our hypotheses would suggest that strategies countering the spread of e-cigarette use among young adults via social media may need to address the beliefs represented by the expectancy variables considered here.

2. Methods

2.1. Participants

Table 1 shows participants' demographic characteristics.

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