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Short Communication

Electronic cigarette use outcome expectancies among college students

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HIGHLIGHTS

- Little is known about e-cigarette use outcome expectancies.
- Multiple e-cigarette use expectancy dimensions were identified among young adults.
- Expectancies were associated with e-cigarette use and use susceptibility.

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ABSTRACT

Background: E-cigarette use outcome expectancies and their relationships with demographic and e-cigarette use variables are not well understood. Based on past cigarette as well as e-cigarette use research, we generated self-report items to assess e-cigarette outcome expectancies among college students. The objective was to determine different dimensions of e-cigarette use expectancies and their associations with e-cigarette use and use susceptibility.

Methods: Self-report data were collected from 307 multiethnic 4- and 2-year college students [*M* age = 23.5 (SD = 5.5); 65% Female; 35% current cigarette smokers] in Hawaii. Data analyses were conducted by using factor and regression analyses.

Results: Exploratory factor analysis among e-cigarette ever-users indicated 7 factors: 3 positive expectancy factors (social enhancement, affect regulation, positive sensory experience) and 4 negative expectancy factors (negative health consequences, addiction concern, negative appearance, negative sensory experience). Confirmatory factor analysis among e-cigarette never-users indicated that the 7-factor model fitted reasonably well to the data. Being a current cigarette smoker was positively associated with positive expectancies and inversely with negative expectancies. Higher positive expectancies were significantly associated with greater likelihood of past-30-day e-cigarette use. Except addiction concern, higher negative expectancies were significantly associated with lower likelihood of past-30-day e-cigarette use. Among e-cigarette never-users, positive expectancy variables were significantly associated with higher intentions to use e-cigarettes in the future, adjusting for current smoker status and demographic variables.

Conclusions: E-cigarette use expectancies determined in this study appear to predict e-cigarette use and use susceptibility among young adults and thus have important implications for future research.

1. Introduction

Electronic- or e-cigarette use is becoming increasingly popular in the U.S., especially among young adults, even though e-cigarettes are not currently regulated by the U.S. Food and Drug Administration (FDA). Approximately 8.1% of the U.S. adults are likely to have tried e-cigarettes and 1.4% are likely to be current users (Zhu et al., 2013). E-cigarette use prevalence is especially higher among adult cigarette smokers: 32% report having tried e-cigarettes and 6% report being current e-cigarette users. At present, little is known about the motivational factors related to e-cigarette use and e-cigarette use susceptibility among young adults.

Outcome expectancies concerning a behavior refer to the outcomes that are expected from engaging in the behavior. Outcome expectancies are central to the cognitive models explaining substance use behavior and are important in understanding the motivational antecedents of substance use (Abrams & Niaura, 1987; Brandon, Juliano, & Copeland, 1999). Positive or favorable outcomes associated with a behavior motivate individuals from engaging in the behavior whereas negative or unfavorable outcomes deter individuals from engaging in the behavior (Fishbein & Ajzen, 1975). Outcome expectancies have been widely studied in the context of cigarette smoking. For example, Brandon and Baker (1991) validated four types of smoking expectancy constructs: negative consequences (e.g., smoking results in heart disease and lung cancer), positive

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reinforcement/sensory satisfaction (e.g., smoking helps relax), negative reinforcement/negative affect reduction (e.g., cigarettes help deal with anger), and appetite/weight control (e.g., smoking helps control weight).

Cigarette smoking expectancies have been found to predict not only dependence and cessation among adult smokers (Kristjansson, Pergadia, Agrawal, et al., 2011; Wetter, Smith, Kenford, et al., 1994) but also initiation and escalation among adolescents and young adults (Heinz, Kassel, Berbaum, & Mermelstein, 2010; Wetter, Kenford, Welsch, et al., 2004). Thus far there has been no systematic research on e-cigarette use outcome expectancies. Hence, this study aimed to determine the dimensions of e-cigarette use outcome expectancies among young adult (18–40 year olds) college students and to initiate the development of a valid measurement instrument that would adequately assess such expectancies.

2. Methods

2.1. Recruitment, participants, and data collection

Participants were recruited at a 4-year college/university and two community or 2-year colleges in Oahu, Hawaii, using on-campus advertisements. Interested students were screened based on age (18–40 years) and smoking status: we intended to recruit almost equal proportions of current cigarette smokers, never smokers, and former smokers/experimenters. Data were collected online in September–October, 2013. Of the 326 eligible students who were invited via e-mail to participate in the main study survey, 307 (94%) completed the survey. Each participant who completed the survey was e-mailed a $15 Starbucks e-gift-card.

The mean age of the participants was 23.5 (SD = 5.5) and the participants represented 65% women, 64% 4-year college students, 36% 2-year college students, 25% Asian–Americans (e.g., Japanese, Chinese, Korean), 30% Filipino, 28% White, and 17% other ethnicities. Forty-three percent of the participants reported household income of less than $30,000/year. Thirty-five percent of the participants represented current cigarette smokers, 37% never-smokers, and 28% former smokers. Forty-three percent of the participants reported ever-using e-cigarettes and 28% had used e-cigarettes at least once in the past 30 days. E-cigarette ever-use was highest among current cigarette smokers (68.2%) than among former smokers/experimenters (47.7%) and never-smokers (18.4%).

2.2. Measures

2.2.1. Demographics

Data were collected on participants' age, gender, income, and ethnicity. To assess ethnicity, participants were asked two questions, each followed by a list of ethnic/racial categories common in the U.S. and in Hawaii (Kolonel et al., 2000): 1) "What is your ethnic/racial background? (Select all that apply)"; and 2) "If you selected more than one ethnic/racial category above, select one that defines you most." Certain racial/ethnic categories were combined to result in four broader categories: White, Asian–American (56% Japanese, 16% Chinese, 20% Korean, 8% other Asians), Filipino, and Other (75% Native Hawaiian/Pacific Islander).

2.2.2. Outcome expectancies

Participants rated 40 expectancy items on a 10-point scale. Twenty-eight of the 40 items were adapted from Hine, Honan, Marks, and Brettschneider (2007); the remaining 12 items were created based on past e-cigarette research (e.g., Etter, 2010; Etter & Bullen, 2011).

2.2.3. Cigarette smoking and e-cigarette use

Cigarette smoking was assessed in terms of self-reported lifetime cigarette use (0, <100, ≥100 cigarettes), past 30-day cigarette use frequency (0 days,…, all 30 days), and current smoking status ("I don't smoke," "I smoke sometimes," "I smoke daily"). E-cigarette use was assessed in terms of self-reported lifetime e-cigarette use (Yes/No) and past 30-day e-cigarette use ("How many times have you used e-cigarettes in the past 30 days?" assessed on a 12-point scale).

2.2.4. E-cigarette use susceptibility

E-cigarette use susceptibility was assessed by using two measures: intentions and willingness. Intentions were measured by using a version of a widely used 4-item measure of smoking susceptibility (Pierce, Choi, Gilpin, Farkas, & Merritt, 1996) adapted for e-cigarettes. Willingness is a less direct measure of susceptibility. A measure of willingness was adapted for e-cigarettes based on previous research (Gibbons, Gerrard, Blanton, & Russell, 1998; Gibbons et al., 2004).

2.3. Data analysis

Data were analyzed by using SAS and Mplus software. Exploratory Factor Analysis (EFA) on the 40e-cigarette outcome expectancy items was conducted among e-cigarette ever-users only, using an oblique rotation method (promax). The Kaiser–Guttman rule which recommends retention of factors with eigenvalues >1 was used to extract factors. Items that showed high loadings on more than one factor (i.e., cross-loadings) and items with small loadings on all factors (i.e., low communalities) were eliminated from further analyses (Brown, 2006). Given the relatively small sample size, a standardized factor loading of 0.35 or greater was considered salient. The items retained from the EFA were tested for construct validity among e-cigarette never-users by using Confirmatory Factor Analysis (CFA). A standardized factor loading of 0.50 or greater was considered meaningful in CFA. Provided the items that loaded on the same factor were adequately internally consistent (i.e., $\alpha \geq 0.70$), the items were summed to create an expectancy index. Next, a series of multiple logistic and linear regression models were run to determine the associations among demographic variables, expectancies and e-cigarette use and use susceptibility. In models testing the associations of demographic variables with e-cigarette use or expectancies, all demographic variables were included simultaneously in the model. Models testing the associations of expectancies with e-cigarette use or susceptibility included demographic variables as covariates.

3. Results

3.1. Characteristics of lifetime e-cigarette users

Lifetime e-cigarette users tended to be significantly younger than non-users, $t = -2.02$, $df = 305$, $p = 0.04$. Further, e-cigarette users and non-users tended to differ significantly in ethnic composition and cigarette smoking status. Lifetime e-cigarette users represented 20% Asian, 37% Filipino, 24% White, and 19% Other; non-users represented 29% Asian, 24% Filipino, 31% White, and 16% Other. Lifetime e-cigarette users represented 16% cigarette never smokers, 30% former smokers/experimenters, and 54% current smokers; non-users represented 54% never smokers, 26% former smokers/experimenters, and 20% current smokers. No significant differences were detected between lifetime e-cigarette users and non-users in terms of gender, annual household income, and 4- vs. 2-year college status.

3.2. Exploratory factor analysis among e-cigarette ever-users

Total 8 factors were extracted. However, the 8th factor was eliminated because all items that loaded highly on the 8th factor cross-loaded on other factors. In addition, of the 40 items, 8 items were selected for elimination because they loaded highly on more than one factor. The remaining 32 items were found to represent 7 factors, which were labeled as follows: social enhancement [10 items; eigenvalue (λ) =4.5], affect regulation (7 items; $\lambda = 3.8$), negative health consequences (4 items; $\lambda = 3.0$), addiction concern (3 items; $\lambda = 2.1$), positive