



Association of pleasant sensations at cigarette smoking initiation with subsequent tobacco product use among U.S. adolescents

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HIGHLIGHTS

- Adolescents who reported higher unpleasant sensation at cigarette smoking initiation were less likely to currently use any tobacco products
- Adolescents who reported higher pleasant sensations at cigarette smoking initiation were more likely to currently use any tobacco products
- Smoking education and further surveillance should target those adolescents who reported higher pleasant sensations at cigarette smoking initiation.

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ABSTRACT

Approximately 20% of high school students and 7% of middle school students in the United States used tobacco products in 2016. One factor that may contribute to tobacco use is pleasant sensations – typically characterized as physiological reinforcement such as a dopamine response, or as social reinforcement such as social acceptance. In the present study, the Wave 1 (2013–2014) of the Population Assessment of Tobacco and Health (PATH) Study was analyzed to examine the influence of pleasant sensations at cigarette smoking initiation on current use of other tobacco products among adolescents. While those who reported higher unpleasant sensations at cigarette smoking initiation were less likely to report current use of any tobacco product(s) (Odds Ratio [OR] = 0.70), those who reported higher pleasant sensations at cigarette initiation were more likely to report current use of any tobacco product(s) (OR = 2.12) – including: cigarettes (OR = 2.09), cigars (OR = 1.58), hookah (OR = 1.37), and e-cigarettes (OR = 1.37). Based on these findings, interventions for smoking education and further surveillance may benefit adolescents who report higher pleasant sensations at cigarette smoking initiation.

1. Introduction

According to the Centers for Disease Control and Prevention (CDC) (2017), 7.2% of middle school students and 20.2% of high school students were current users of tobacco products in 2016 (Jamal et al., 2017). The most frequently used tobacco products were electronic cigarettes (11.3% among high school students; 4.3% of middle school students), followed by combustible cigarettes (8.0% among high school students; 2.2% among middle school students). Tobacco use can negatively affect physical and mental health among adolescents. Tobacco initiation at an early age increases the risk for tobacco-related cancers

and cardiovascular diseases (Mishra et al., 2015). Nicotine exposure during adolescence is negatively associated with brain development and brain function in both the short-term and long-term (Goriounova & Mansvelde, 2012). Tobacco product use among adolescents is also related to an increased risk of psychiatric disorders. Dupont, Han, Shea, and Madras (2018) found that youth who reported current cigarette smoking showed higher prevalence of marijuana use, illicit drug use and alcohol use (Dupont et al., 2018). Early onset of tobacco use is also associated with depression later in life (Breslau, Peterson, Schultz, Chilcoat, & Andreski, 1998).

One factor that may influence consistent tobacco use among

Abbreviations: PATH, Population Assessment of Tobacco and Health; PSU, Primary Sampling Units; CI, Confidence Interval; AOR, Adjusted Odds Ratio

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adolescents is a reported “pleasant sensations” when tobacco is first smoked. If someone enjoys their first experience, this may predict later enjoyment and thus continuation as well as the development of physiological dependence. Physiologically, nicotine exposure among all ages increases dopaminergic neuron activity that can lead to conditioning and addiction (Volodymyr, Pidoplichko, DeBiasi, Williams, & Dani, 1997; Di Chiara, 2000). Furthermore, because their brains are still developing, adolescents may be more sensitive and vulnerable to the effect of nicotine exposure (Yuan, Cross, Loughlin, & Leslie, 2015). This may be true for social as well as physiological reasons. Adolescents are more sensitive to the need for social acceptance; adolescents are focused on their relationships with their peers. Dolcini and Adler (1994) found when adolescents perceived themselves more popular among peer groups (higher social acceptance), they reported a higher likelihood of having ever smoked cigarettes (Dolcini & Adler, 1994).

In the present study, population-based U.S. national survey data were analyzed to examine the association between experiencing a pleasant sensations during their first smoking episode and current use of tobacco products among adolescents. We hypothesized that those who reported experiencing a higher pleasant sensations when they tried to smoke a cigarette for the first time were more likely to currently use any tobacco product, including cigarettes and e-cigarettes. We also included harm perception level (Wang et al., 2018) and parental smoking history (Gilman et al., 2009) as potential factors that may be associated with subsequent tobacco use among adolescents.

2. Methods

2.1. Participants

Wave 1 youth data from the Population Assessment of Tobacco and Health (PATH) study were used (Hyland et al., 2017). Wave 1 of PATH was collected from September 2013 to December 2014. Sampling was conducted in multiple stages stratified geographically across primary sampling units (PSUs), segment sampling, then address sampling and within-household sampling. For the interview, audio-computer-assisted self-interviewing and computer-assisted personal interviews were conducted in English and Spanish.

Among the household sample, a total of 13,651 youth ages 12 to 17 completed Wave 1; one later asked to be removed leaving a sample of 13,650 responses. The overall weighted response was 78.4% for the youth interview. For the purpose of these analyses, the sample was restricted to those who had ever reported cigarette smoking ($n = 1838$).

2.2. Measures

2.2.1. Pleasant/unpleasant sensations at cigarette smoking initiation

Participants who reported ever having tried cigarette smoking, even one or two puffs, were asked “how much did you experience pleasant sensations the first time you smoked a cigarette?” and “how much did you experience unpleasant sensations the first time you smoked a cigarette?” The response options were coded as follows: “not at all,” “a little,” “somewhat,” or “a lot.”

2.2.2. Current use of tobacco products

Current use of tobacco products was defined as reporting using some types of tobacco product (i.e., cigarette, any types of cigar, pipe, hookah, bidi, kretek, e-cigarette, snus, smokeless tobacco, dissolvable tobacco) in the past 30 days. Combustible tobacco products included cigarettes, cigar products (i.e., cigars, cigarillos, and filtered cigars), pipes, hookah, bidis, and kreteks (e.g., clove cigarettes), while non-combustible tobacco products included e-cigarettes, snus, smokeless tobacco, and dissolvable tobacco products.

2.2.3. Sociodemographic measure

Sociodemographic variables included age (12–14 years old or 15–17 years old), gender/sex (male or female), race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, or other), U.S. census region (Northwest, Midwest, South or West), and parental education (less than high school, high school graduate or equivalent, some college or associates degree, bachelor's degree or advanced degree).

2.2.4. Harm perception level

Harm perception level was assessed using the question “How much do you think people harm themselves when they smoke cigarettes?” The response options included “no harm,” “little harm,” “some harm,” and “a lot of harm.”

2.2.5. Parental smoking history

Parental smoking history was constructed based on those who responded “yes” to the following questions: “In the past 30 days have you smoked a cigarette, a cigar, or a pipe, even one or two puffs?” “In the past 30 days have you used smokeless tobacco, such as chewing tobacco, snuff, snus, or dip, even one or two times?” or “In the past 30 days have you used e-cigarettes, a hookah, or dissolvable tobacco, even one or two times?”

2.3. Data analysis

Descriptive analysis was conducted for the characteristics of the youth population in PATH and the prevalence of current use of tobacco products using unweighted counts, weighted percentage, and 95% CI for the weighted percentage. A logistic regression model was conducted with “pleasant/unpleasant sensations experienced while first-time cigarette smoking” as a predictor and “current use of any tobacco product” as the outcome. The age, sex, race/ethnicity, U.S. census region, parental education, harm perception level and parental smoking history variables were utilized as control variables. P -value < 0.05 was used as cut-off for statistical significance. Data were analyzed using Stata/SE 15.1 (StataCorp., 2017).

3. Results

Table 1 shows the demographic characteristics of youth participants who have ever tried cigarette smoking in the PATH study. Among those sample ($n = 1838$), 77.4% were in the age group of 15–17, 53.5% were male, 39.2% lived in the South, and the majority of the sample was non-Hispanic white (75.6%). Further, 81.2% of those who have ever tried cigarette smoking reported their parental education as less than “some college or associates degree”. The majority of adolescents who have ever tried cigarette smoking perceived cigarette smoking as causing “some harm” (27.0%) and “a lot of harm” (66.0%).

Table 2 shows the experienced pleasant/unpleasant sensations at cigarette smoking initiation. Among those who tried cigarette smoking in their life time, 385 (21.3%) participants reported pleasant sensations at cigarette smoking initiation (i.e., “somewhat” or “a lot”), and 844 (45.7%) reported unpleasant sensations at cigarette smoking initiation (i.e., “somewhat” or “a lot”).

As shown in Table 3 among adolescent participants who have ever tried cigarette smoking, 905 (51.3%) reported current uses of any type of tobacco product at the time of the survey. Specifically, 776 (43.6%) participants were current users of any type of combustible tobacco products (e.g., cigarettes, cigars, pipe) and 428 (24.2%) of adolescents reported current use of any type of non-combustible tobacco products (e.g., e-cigarette, smokeless tobacco).

Table 4 shows the adjusted odds ratios (AORs) of unpleasant/pleasant sensations at cigarette smoking initiation on current use of tobacco products, after controlling for age, sex, race/ethnicity, U.S. census region, parental education, harm perception, and parental

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