Published in final edited form as:

Subst Use Misuse. 2018 December 06; 53(14): 2291–2298. doi:10.1080/10826084.2018.1473435.

Associations between Initial Subjective Experiences with Tobacco and Self-Reported Recent Use in Young Adulthood

Elizabeth K. Do, PhD^a, Elizabeth C. Prom-Wormley, PhD^b, Bernard F. Fuemmeler, PhD^{a,c},
Danielle M. Dick, PhD^d, Kenneth S. Kendler, MD^e, and Hermine H. Maes, PhD^{c,e,f}

^aDepartment of Health Behavior & Policy, Virginia Commonwealth University, Richmond, VA, USA

^bDivision of Epidemiology, Department of Family Medicine & Population Health, Virginia Commonwealth University, Richmond, VA, USA

^cMassey Cancer Center, Virginia Commonwealth University, Richmond, VA, USA

^dDepartments of Psychology; Human & Molecular Genetics; College Behavioral and Emotional Health Institute, Virginia Commonwealth University, Richmond, VA, USA

^eDepartment of Psychiatry; Virginia Institute for Psychiatric and Behavioral Genetics, Virginia Commonwealth University, Richmond, VA, USA

^fDepartment of Human & Molecular Genetics, Virginia Commonwealth University, Richmond, VA, USA

INTRODUCTION

Subjective experiences during initial exposure to tobacco are believed to reflect the physiological and pharmacological effects of nicotine (Emily Craig Zabor et al., 2013), the primary psychoactive component of tobacco (Mantey et al., 2017). Existing literature suggests that experiences during first tobacco use may be indicative of an individuals' sensitivity to nicotine (O. F. Pomerleau, Pomerleau, & Namenek, 1998) and vulnerability to dependence (O. F. Pomerleau, Collins, Shiffman, & Pomerleau, 1993), which could influence the maintenance of tobacco use behaviors over time (Eissenberg & Balster, 2000).

Generally, individuals who are more sensitive to the effects of nicotine exposure often experience more positive effects and develop tolerance more rapidly, leading to subsequent smoking behavior and dependence (O. F. Pomerleau et al., 1998). Meanwhile, individuals experiencing aversive initial reactions to tobacco are more likely to become non-users (Kozlowski & Harford, 1976; O. F. Pomerleau et al., 1993). However, experiencing unpleasant reactions to tobacco use is not necessarily protective against subsequent tobacco use (De Wit & Phillips, 2012; DiFranza, Saveau, & Fletcher, 2004; Eissenberg & Balster, 2000). Low rates of negative subjective experiences during initiation of mentholated cigarettes during adolescence is associated with increased likelihood of sustained use of

Corresponding author information: Elizabeth K. Do; Department of Health Behavior and Policy, Virginia Commonwealth University, P.O. Box 980212, Richmond, VA 23298; elizabeth.do@vcuhealth.org.

Declaration of Interests

The authors declare no conflicts of interest.

conventional cigarettes in adulthood and switching to non-menthol cigarettes (Nonnemaker et al., 2013).

These conflicting findings suggest the need for a better understanding of what the most common initial subjective experiences are across different tobacco products, and which initial subjective experiences are likely to increase risk for continued tobacco use. The expanding literature has heavily focused on addressing the latter point: identifying initial subjective experiences associated with continued tobacco use. However, prior studies have focused primarily on cigarette use – which does not reflect the changing landscape of tobacco products available to current users.

According to the National College Health Assessment survey (NCHA-II), within the past 30 days: 14.8% of college students have used cigarettes, 8.5% have used hookah or water pipe, 7.8% have used cigars, little cigars, or clove cigarettes, and 3.9% have used smokeless tobacco (American College Health Association, 2011). These numbers reflect both the diversity of product availability, as well as current trends in tobacco use among university students. Similar trends are found within younger adolescents. While the use of cigarettes is declining, the use of other tobacco products is increasing in prevalence (Singh et al., 2016).

To better understand the factors associated with the initiation and sustained use of tobacco products over time, we need to investigate how initial subjective experiences with other tobacco products influences the initiation and maintenance of tobacco use behaviors over time. Yet, to our knowledge, only three other studies currently exist investigating how initial subjective experiences to other tobacco products, aside from cigarettes, influence later tobacco use (Mantey et al., 2017; Wackowski, Bover Manderski, Delnevo, Giovenco, & Lewis, 2016; E.C. Zabor et al., 2013). These studies differ from the current study in regards to the age of the sample population. While the other studies focus on either middle school adolescents or adults (aged 18 to 60+ years), the current study focuses on the critical period of transition between adolescence and emerging adulthood – a period marked by major changes in individual freedoms, responsibilities, and living conditions, as well as increased risk of substance use/abuse (Cho et al., 2015).

Thus, the current study builds upon existing research by focusing on this important population, while also: (1) determining the prevalence of initial subjective experiences across a variety of tobacco products, (2) evaluating the factor structure of initial subjective experiences with tobacco by first tobacco product used, and (3) examining how these initial subjective experiences are associated with self-reported recent use of each tobacco product across time, using a university sample.

METHODS

Sample

Spit for Science (S4S) is a longitudinal cohort study of 9,889 college students aged 18 to 35 years. Participants are ascertained as incoming freshman, across five cohorts, and followed throughout their time at the institution as undergraduate students. After providing written consent, participants provide self-reported responses to broad-based measures on health and

substance use during freshman year in the fall, and again during the spring semester. Additional waves of data are collected annually during the spring semester. All study data are collected and managed using REDCap (Research Electronic Data Capture) hosted at Virginia Commonwealth University (Harris et al., 2009). REDCap is a secure, web-based application designed to support data capture for research studies, providing: (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads to common statistical packages; and (4) procedures for importing data from external sources.

The analytic sample reflects the responses of 2,254 individuals in S4S, from the Fall 2017 data release. Responses regarding subjective experiences with tobacco products were only available for a subset of participants from cohorts 2 (n=631), 3 (n=645), and 4 (n=978). Individuals who provided answers to questions about subjective experiences with tobacco and recent tobacco use are included in the analytic sample. Participants who did not provide information on subjective experiences with tobacco were excluded from analyses, as were individuals whose self-identified race category was “Native Hawaiian or Other Pacific Islander”, “American Indian or Alaskan Native”, and “Unknown” due to small sample size (n <100).

Measures

Initial subjective experiences to tobacco products—The independent variable, initial sensitivity, was measured using the Early Smoking Experience questionnaire (O. F. Pomerleau et al., 1998), which asks about sensations experienced when the participant first used tobacco. The eight items asked about feeling pleasant sensations, unpleasant sensations, nausea, relaxation, dizziness, pleasurable rush or buzz, coughing, and difficulty inhaling, with each worded “how much [insert sensation here] ... did you feel?” with potential responses being: none, slight, moderate, or intense. These ordinal variables were summed to make a scale ranging from 1 (none) to 4 (intense) for each item.

Recent use of tobacco products—Recent use of tobacco products was treated as binary variables. Participants were asked how frequently, within the past 30 days, they had used cigarettes, cigars/cigarillos/little cigars (“cigars”), hookah/waterpipe (“hookah”), and/or e-cigarettes. For each of these measures, if the participant indicated ‘I choose not to answer’, the answer was coded as missing. If the participant indicated that he/she had not used the tobacco product, the answer was coded as 0 (no); otherwise, if the participant had indicated that he/she had used the tobacco product at least once, the answer was coded as 1 (yes).

Potential covariates—Covariates included sex (male/female), race/ethnicity (American Indian/Alaska Native, Asian, Black/African American, Hispanic/Latino, More than one race, Native Hawaiian/Other Pacific Islander, Unknown, White, or I choose not to answer), cohort (enrolled in either Fall 2012, 2013, or 2014), what their first tobacco product used was (cigarettes, cigars, hookah, e-cigarettes), and age at initiation. Age at initiation was a continuous variable, measured by the following question: “How old were you when you smoked a cigarette or used tobacco for the first time (including just one or two puffs)?”

Statistical Analysis

Means and standard deviations are provided for each of the initial subjective experiences during first tobacco use. Exploratory factor analyses (EFA) were conducted to empirically identify latent factors present with respect to items measuring initial subjective experiences with tobacco, separately by tobacco product (e.g. cigarettes, cigars, hookah, e-cigarettes). The Kaiser-Meyer Olkin measure and Bartlett's Test of Sphericity were evaluated to determine if items were intercorrelated and shared a common factor. Following EFA, factor scores for positive and negative experiences were calculated, separately by first tobacco product used. Multiple logistic regression analyses were conducted to examine the association between initial subjective experiences (e.g. positive and negative factor scores) and recent use of each tobacco product, adjusted for by age at first tobacco use, sex, race/ethnicity, and cohort. All statistical analyses were conducted using SAS 9.4 (SAS Institute; Cary, NC).

RESULTS

Sample characteristics

Sample characteristics are shown on Table 1. The analytic sample (n=2254) was predominantly female (n=1500; 66.6%) and nearly half identified as White/Caucasian (n=1070; 47.5%). The mean age at first tobacco use was different across first tobacco product used. However, on average, participants reported using tobacco prior to age 15 years across all tobacco products (range mean: 12.3 to 14.4 years). Among respondents who reported recent use at any time during their time at university (e.g. freshman, sophomore, junior, and/or senior year), the highest proportion of participants reported using cigarettes (39.3%), followed by e-cigarettes (21.65), hookah (19.6%), and cigars (17.7%).

Exploratory factor analysis

Results of exploratory factor analyses (EFA) are presented by first tobacco product used, in Table 2. The Kaiser criterion and Cattell scree test plots were used to determine how many factors to include in each model. Subsequently, two-factor models using varimax rotation were fit to the data and showed that across all tobacco products, one factor was related to "positive" experiences (e.g. pleasant sensations, relaxation, pleasurable rush/buzz) and the second factor was related to "negative" experiences (e.g. coughing, difficulty breathing). Factor analyses on initial subjective experiences among individuals indicating that e-cigarettes were the first tobacco product used showed that unpleasant sensations, dizziness, nausea, coughing, and difficulty inhaling loaded onto positive and negative factors. This factor structure differed from that found for cigarettes, hookah, and cigars. Among individuals indicating that cigarettes were the first tobacco product used dizziness loaded on both positive and negative factors, while nausea, coughing, and difficulty inhaling loaded on the negative factor. As for individuals indicating that either hookah or cigars were their first tobacco product used, both dizziness and nausea loaded on positive and negative factors, while coughing and difficulty inhaling loaded on the negative factor. Across each of EFA, pleasant sensations, relaxation, and pleasurable rush/buzz loaded on the positive factor.

Subjective Experiences at First Use

The mean and standard deviations of initial subjective experiences are shown by first tobacco product used in Table 3, as well as the percentage of participants endorsing moderate/intense levels of each initial subjective experience. Experiencing feelings of relaxation, pleasurable buzz and coughing was the most common regardless of their first tobacco product used. Pleasant sensations were rated the highest among individuals who indicated that their first tobacco product used was cigars, hookah, or e-cigarettes, while unpleasant sensations was more often endorsed by individuals using cigarettes first. Of note was that the intensity of endorsing both positive and negative feelings was higher for using cigarettes and cigars first versus those who used hookah and e-cigarettes first.

Subjective Experiences at First Use and Current Product Use, Across Time

Table 4 shows associations between initial subjective experiences (e.g. factor scores for positive and negative experiences) and recent use of specific tobacco products, separated by first tobacco product used across year. Results are not reported for individuals who used e-cigarettes as their first tobacco product, due to inadequate sample size to conduct analyses ($n = 85$). Generally, continued use of the first product used was stronger across all first tobacco products used. For example, those using cigarettes first were likely to continue using cigarettes throughout college (e.g. sophomore/junior/senior year) and the association seemed to be driven by positive initial experiences. Similar patterns were seen across cigars and hookah, with the exception being that negative experiences were also associated with recent use of cigars among seniors, who indicated that their first tobacco product used was cigars.

There also appeared to be shifts in the effect of the first tobacco product used on the continued use of other tobacco products. For example, those who used cigarettes first show increased likelihood of using other tobacco products (e.g. cigars, hookah, e-cigarettes) in early college years (e.g. freshman/sophomore year). Those who used cigars first show increased likelihood of using hookah and e-cigarettes in middle college years (e.g. sophomore/junior year) and those who use hookah first show increased likelihood of using cigars and cigarettes later college years (e.g. junior/senior year).

DISCUSSION

This study is one of only a few studies investigating the relationship between initial subjective experiences with tobacco with recent tobacco use, and to our knowledge, the only study looking at this relationship in a university sample. Previous research has focused predominantly on initial subjective experiences with cigarettes and investigating associations with later cigarette use. Our study contributes to the existing literature by examining initial subjective experiences with tobacco across a variety of tobacco products – which has only been done across three other studies (Mantey et al., 2017; Wackowski et al., 2016; E.C. Zabor et al., 2013) focused on adolescence or adults, compared to college students in our study.

Our results demonstrate that initial subjective experiences differ by the first tobacco product used, which is consistent with findings from other studies examining initial subjective

experiences and tobacco use. What differs, however, is which initial subjective experiences are commonly reported across the different samples. Within our study, the experience of relaxation, a pleasurable buzz, and coughing are common across all first tobacco products used. Meanwhile, the study of Texas adolescents finds that the prevalence of negative experiences (e.g. coughing, nausea) and dizziness were the highest among ever cigar and ever cigarette users (Mantey et al., 2017), and the Swedish Twin Study of Adults: Genes and Environment, finds that smokers (e.g. cigarettes only, snus only, and combination of cigarettes and snus) experience higher prevalence of pleasant sensations, relaxation, pleasurable buzz, and dizziness (Emily Craig Zabor et al., 2013).

Despite these differences in reported initial subjective experiences, we do find that initial subjective experiences can be divided up into two factors: positive and negative experiences, with some initial subjective experiences loading on both factors, depending on the first tobacco product used. Our findings are similar to a study conducted by Baggio et al. (2013), investigating initial subjective experiences with cigarettes. However, unlike our study, Baggio et al. (2013) reports on both two and three-factor models for the initial subjective experiences with tobacco. Like our study, Baggio et al. (2013) identified a positive experiences factor (e.g. like the experience and felt relaxed) and a negative experiences factor (e.g. did not feel very well, headache, stomach upset, heart pounding, nauseous, dizzy/lightheaded, coughed, and irritation eyes, bad taste) using a two-factor model. Our findings are also similar to results from a construct validity analysis conducted on data from 10th graders, which identifies a two-factor (e.g. pleasant and unpleasant) model of initial subjective experiences (Rodriguez & Audrain, 2004).

Initial subjective experiences with tobacco are believed to reflect the physiological and pharmacological effects of nicotine, as well an individual's sensitivity to and tolerance for nicotine. Nicotine dependence symptoms are complex and can vary in timing of onset, level of escalation, duration, and remission of symptoms (Hu, Greisler, Schaffran, Wall, & Kandel, 2012). Generally, those who become regular users experience greater positive and negative reactions to nicotine compared to nonsmokers, while positive experiences may play a stronger role than unpleasant experiences in the transition to regular use (E.C. Zabor et al., 2013). A small proportion of current e-cigarette users/tryers have a negative first experience, and compared to former users, current e-cigarette users have higher positive perceptions about first use (Wackowski et al., 2016), similar to our results.

In line with previous study findings (Baggio et al., 2014; DiFranza et al., 2004; O. F. Pomerleau et al., 1993), our study provides support for the relationship between initial subjective experiences and recent tobacco use. Specifically, we found that positive initial experiences were predictive of recent tobacco use, while also showing that negative initial experiences might be less important for predicting recent tobacco use. These findings were similar to those of Buchmann et al. (2011), who finds that the pleasure experienced from cigarette use predicts smoking at age 22 (Buchmann et al., 2011). However, we also found that the strength of these associations differed by the first tobacco product used, since individuals were likely to continue using the first tobacco product they report using over time and that the likelihood of using other tobacco products varied over time - potentially due to accessibility, availability, and/or tobacco product trends. Together, these findings

suggest that initial subjective experiences with tobacco, as well as the first tobacco product used, should be considered in tobacco use interventions.

Much like other studies investigating initial subjective experiences with later tobacco use, the current study is limited by its use of retrospective self-report measures. Retrospective self-reported measures of initial subjective experiences may be affected by recall bias – especially if recollection of initial experiences is influenced by current or continuous use. Previous studies demonstrate that current smokers have a generally more positive recollection of their first tobacco use than former smokers (DiFranza et al., 2004; C. S. Pomerleau, Pomerleau, Namenek, & Marks, 1999; O. F. Pomerleau et al., 1998). Additionally, since we only had information on initial experiences for three of the four cohorts, it is unclear how missing data impacts the results. However, study findings are consistent with prior research and expand upon it through the assessment of multiple products. Even more importantly, our findings highlight the need for more expansive research on initial experiences with tobacco and alternative tobacco products.

Although not explicitly addressed in the current study, unmeasured behavioral, social, and environmental factors might also play a role in shaping initial reactions to nicotine and the subsequent adoption of regular use of tobacco (Okoli, Richardson, & Johnson, 2008). Social influences of peers and family may have an effect on initial subjective experiences with tobacco use (Baggio et al., 2014), as individuals with higher levels of smoke exposure from peers and family members are more likely to report positive initial subjective experiences (Okoli et al., 2008). Exposure to peer and family member smoking is also associated with individual reports of feeling: dizzy, relaxed, good, and high upon initial use of tobacco. Additionally, social perceptions surrounding tobacco use may also play role in normalizing opinions regarding patterns of tobacco use, which could lead some individuals to be less resistant to experiment with tobacco (Klein et al., 2013). Thus, initial subjective experiences of individuals exposed to smoking may be influenced by socially mediated expectancies, derived from others' experiences (Brown, 1993).

Individual differences in the response to nicotine are likely influenced by genetic variants affecting brain neurophysiology (Haberstick, Ehringer, Lessem, Hopfer, & Hewitt, 2011). Genetic variants encoding nicotinic receptors have previously been associated with enhanced pleasurable responses to initial cigarette use among regular (Sherva et al., 2008) and current users (O. F. Pomerleau & Pomerleau, n.d.). Individuals with the G-variant of *OPRM1* A118G SNP are more likely to report liking initial smoking, though findings are inconsistent (Verhagen, Kleinjan, & Engels, 2012). Adolescents homozygous for the C-variant *D4D2* Taq1A polymorphism report a lower number of unpleasant symptoms during initial smoking, indicating lower sensitivity to nicotine (Perkins et al., 2008). Those homozygous for the T-variant show stronger perceptions of nicotine effects, indicating higher nicotine sensitivity among T-allele carriers which may also be associated with reduced feelings for reward due to reduced receptor availability (Nobel, 2003; Schuck, Otten, Engles, & Kleinjan, 2014). Thus, initial sensitivity to effects of smoking may reflect sensitivity to reinforcing effects encouraging future smoking (O. F. Pomerleau et al., 1993).

CONCLUSIONS

This study is one of only a few that focuses on initial subjective experiences across multiple tobacco products, and the first to examine this among a university sample. Results highlighted differences in initial subjective experiences by tobacco product, while also suggesting potential differences in categories of initial subjective experiences. Associations between initial subjective experiences and recent (30-day) tobacco use were found across a variety of tobacco products (e.g. cigarettes, cigars, hookah, and e-cigarettes). Further research is needed to identify genetic and biological pathways and social contexts influencing initial subjective experiences with tobacco use, in efforts to potentially delay the initiation for tobacco use and reduce risk for continued use.

Acknowledgements

We would like to thank the Virginia Commonwealth University students, as well as the many VCU faculty, students, and staff who contributed to the design and implementation of the Spit for Science project.

Funding

The Spit for Science project is supported by P20AA017828, R37AA011408, K02AA018755, and P50AA022537 from the National Institute on Alcohol Abuse and Alcoholism; UL1TR000058, from the National Center for Advancing Translational Studies; and UL1RR031990 from the National Center for Research Resources and National Institutes of Health Roadmap for Medical Research. Additional funding for this research was provided by R01DA025109, R25DA026119–08, and UL1TR000058.

References

- American College Health Association. (2011). American College Health Association - National College Health Assessment II: Reference Group Data Report Fall 2010. Linthicum, MD, USA: American College Health Association.
- Baggio S, Studer J, Deline S, Mohler-Kuo M, Daeppen J, & Gmel G (2013). Factor structure of early smoking experiences and associations with smoking behavior: valence or sensitivity model? *International Journal of Environmental Research and Public Health*, 10, 6305–6318. [PubMed: 24287854]
- Baggio S, Studer J, Deline S, Mohler-Kuo M, Daeppen J, & Gmel G (2014). The relationship between subjective experiences during first tobacco and cannabis and the effect of substance experienced first. *Nicotine and Tobacco Research*, 16(1), 84–92. [PubMed: 23929590]
- Brown SA (1993). Drug effect expectancies and addictive behavior change. *Experimental and Clinical Psychopharmacology*, 1(1), 55–67.
- Buchmann AF, Blomeyer D, Jennen-Steinmetz C, Schmidt MH, Esser G, Banaschewski T, & Laucht M (2011). Early smoking onset may promise initial pleasurable sensations and later addiction. *Addiction Biology*, 18(6), 947–954. [PubMed: 21966958]
- Cho SB, Llaneza DC, Adkins AE, Cooke M, Kendler KS, Clark SL, & Dick DM (2015). Patterns of Substance Use Across the First Year of College and Associated Risk Factors. *Frontiers in Psychiatry*, 6 10.3389/fpsyt.2015.00152
- De Wit H, & Phillips TJ (2012). Do initial responses to drugs predict future use or abuse? *Neuroscience and Biobehavioral Reviews*, 36(6), 1565–1575. [PubMed: 22542906]
- DiFranza JR, Saveau JA, & Fletcher K (2004). Recollections and repercussions of the first inhaled cigarette. *Addictive Behaviors*, 29, 261–272. [PubMed: 14732415]
- Eissenberg T, & Balster RL (2000). Initial tobacco use episodes in children and adolescents: current knowledge, future directions. *Drug and Alcohol Dependence*, 59(Supplement 1), S41–S60. [PubMed: 10773437]

- Haberstick BC, Ehringer MA, Lessem JM, Hopfer C, & Hewitt JK (2011). Dizziness and the genetic influences on subjective experiences to initial cigarette use. *Addiction*, 106(2), 391–399. [PubMed: 20955488]
- Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, & Conde JG (2009). Research Electronic Data Capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*, 42(2), 377–381. 10.1016/j.jbi.2008.08.010 [PubMed: 18929686]
- Hu M, Greisler PC, Schaffran C, Wall MM, & Kandel DB (2012). Trajectories of criteria of nicotine dependence from adolescence to early adulthood. *Drug and Alcohol Dependence*, 125(3), 283–289. [PubMed: 22513378]
- Klein H, Sterk CE, & Elifson KW (2013). Initial smoking experiences and current smoking behaviors and perceptions among current smokers. *Journal of Addiction*, 2013 10.1155/2013/491797
- Kozlowski LT, & Harford MR (1976). On the significance of never using a drug: an example from cigarette smoking. *Journal of Abnormal Psychology*, 85(4), 433–434. [PubMed: 956512]
- Mantey DS, Harrell MB, Case K, Crook B, Kelder SH, & Perry CL (2017). Subjective experiences at first use of cigarette, e-cigarettes, hookah, and cigar products among Texas adolescents. *Drug and Alcohol Dependence*, 173, 10–16. 10.1016/j.drugalcdep.2016.12.010 [PubMed: 28182981]
- Nobel EP (2003). D2 dopamine receptor gene in psychiatric and neurologic disorders and its phenotypes. *American Journal of Medical Genetics (Neuropsychiatric Genetics)*, 11B, 103–125.
- Nonnemaker J, Hersey J, Homsy G, Busey A, Allen J, & Vallone D (2013). Initiation with menthol cigarettes and youth smoking uptake. *Addiction (Abingdon, England)*, 108(1), 171–178. 10.1111/j.1360-0443.2012.04045.x
- Okoli CTC, Richardson CG, & Johnson JL (2008). An examination of the relationship between adolescents' initial smoking experience and their exposure to peer and family member smoking. *Addictive Behaviors*, 33(9), 1183–1191. [PubMed: 18554820]
- Perkins KA, Lerman C, Coddington S, Jetton C, Karelitz JL, Wilson A, Benowitz NL (2008). GENE AND GENE BY SEX ASSOCIATIONS WITH INITIAL SENSITIVITY TO NICOTINE IN NONSMOKERS. *Behavioural Pharmacology*, 19(5–6), 630–640. 10.1097/FBP.0b013e32830c3621 [PubMed: 18690117]
- Pomerleau CS, Pomerleau OF, Namenek RJ, & Marks JL (1999). Initial exposure to nicotine in college-age women smokers and never smokers: a replication and extension. *Journal of Addictive Disorders*, 18, 13–19.
- Pomerleau OF, Collins AC, Shiffman S, & Pomerleau CS (1993). Why some people smoke and others do not: new perspectives. *Journal of Consulting and Clinical Psychology*, 61, 723–731. [PubMed: 8245270]
- Pomerleau OF, & Pomerleau CS (n.d.). Dizziness upon initial experimentation with cigarettes: implications for smoking persistence. *Addiction*, 106(2).
- Pomerleau OF, Pomerleau CS, & Namenek RJ (1998). Early experiences with tobacco among women smokers, ex-smokers, and never smokers. *Addiction*, 93(4), 595–599. [PubMed: 9684398]
- Rodriguez D, & Audrain J (2004). Construct validity analysis of the early smoking experience questionnaire for adolescents. *Addictive Behaviors*, 29, 1053–1057. [PubMed: 15219357]
- Schuck K, Otten R, Engles RCME, & Kleinjan M (2014). Initial responses to the first dose of nicotine in novel smokers: the role of exposure to environmental smoking and genetic predisposition. *Psychology & Health*, 29(6), 698–716. [PubMed: 24446757]
- Sherva R, Wilhelmsen K, Pomerleau CS, Chasse SA, Rice JP, Snedecor SM, Pomerleau OF (2008). Association of a single nucleotide polymorphism in neuronal acetylcholine receptor subunit alpha 5 (CHRNA5) with smoking status and with “pleasurable buzz” during early experimentation with smoking. *Addiction*, 103(9), 1544–1552. [PubMed: 18783506]
- Singh T, Arrazola RA, Corey CG, Husten CG, Neff LJ, Homa DM, & King BA (2016). Tobacco Use Among Middle and High School Students--United States, 2011–2015. *MMWR. Morbidity and Mortality Weekly Report*, 65(14), 361–367. <https://doi.org/10.15585/mmwr.mm6514a1> [PubMed: 27077789]

- Verhagen M, Kleinjan M, & Engels RC (2012). A systematic review of the A118G (Asn40Asp) variant of OPRM1 in relation to smoking initiation, nicotine dependence and smoking cessation. *Pharmacogenomics*, 13(8), 917–933. 10.2217/pgs.12.76 [PubMed: 22676196]
- Wackowski OA, Bover Manderski MT, Delnevo CD, Giovenco DP, & Lewis MJ (2016). Smokers' Early E-cigarette Experiences, Reasons for Use, and Use Intentions. *Tobacco Regulatory Science*, 2(2), 133–145. <https://doi.org/10.18001/TRS.2.2.4> [PubMed: 27042688]
- Zabor EC, Li Y, Thornton LM, Shuman MR, Bulik CM, Lichtenstein P, Furberg H (2013). Initial reactions to tobacco use and risk of future regular use. *Nicotine and Tobacco Research*, 15(2), 509–517. [PubMed: 22949572]
- Zabor Emily Craig, Li Y, Thornton LM, Shuman MR, Bulik CM, Lichtenstein P, Furberg H (2013). Initial Reactions to Tobacco Use and Risk of Future Regular Use. *Nicotine & Tobacco Research*, 15(2), 509–517. 10.1093/ntr/nts180 [PubMed: 22949572]

Table 1.

Sample Characteristics

Spit For Science Sample (N = 2254)			
	N	%	
Sex			
Male	752	33.4	
Female	1500	66.6	
Race/Ethnicity			
White/Caucasian	1070	47.5	
Black/African American	490	21.7	
Asian	375	16.6	
Hispanic/Latino	162	7.2	
More than one race	157	7.0	
Cohort			
Fall 2012	631	28.0	
Fall 2013	645	28.6	
Fall 2014	978	43.4	
	N Responses	Mean	SD
Age at First Tobacco Use (Overall)			
	1241	13.3	3.4
Age at First Tobacco Use by Product			
Cigarettes	767	13.0	3.3
Cigars	154	13.6	3.2
Hookah	225	14.4	3.6
E-cigarettes	25	12.3	3.4
	N Responses	N	%
Recent Tobacco Use (Overall)			
Cigarettes	1513	594	39.3
Cigars	1936	342	17.7
Hookah	2149	421	19.6
E-cigarette	1280	277	21.6

Table 2.

Factor Analyses of Initial Subjective Experiences by First Tobacco Product Used

	n	POSITIVE	NEGATIVE
CIGARETTES			
Pleasant Sensations	933	0.86	−0.16
Relaxation	937	0.85	−0.16
Pleasurable Rush or Buzz	938	0.87	−0.07
Unpleasant Sensation	934	0.09	0.73
Dizziness	939	0.50	0.56
Nausea	937	0.26	0.72
Coughing	942	0.08	0.60
Difficulty Inhaling	940	0.12	0.62
Alpha for scales		0.91	0.82
HOOKAH			
Pleasant Sensations	723	0.84	−0.20
Relaxation	727	0.81	−0.22
Pleasurable Rush or Buzz	725	0.83	−0.15
Unpleasant Sensation	721	0.29	0.73
Dizziness	727	0.53	0.44
Nausea	723	0.38	0.62
Coughing	727	0.21	0.39
Difficulty Inhaling	726	0.20	0.40
Alpha for scales		0.90	0.77
CIGARS			
Pleasant Sensations	317	0.85	−0.19
Relaxation	318	0.85	−0.22
Pleasurable Rush or Buzz	316	0.86	−0.11
Unpleasant Sensation	317	0.23	0.74
Dizziness	318	0.56	0.47
Nausea	315	0.42	0.60
Coughing	317	0.18	0.47
Difficulty Inhaling	313	0.19	0.54
Alpha for scales		0.91	0.79
E-CIGARETTES			
Pleasant Sensations	85	0.92	−0.22
Relaxation	84	0.87	−0.08
Pleasurable Rush or Buzz	84	0.88	−0.08
Unpleasant Sensation	84	0.47	0.39
Dizziness	84	0.66	0.43
Nausea	84	0.53	0.63
Coughing	84	0.48	0.52
Difficulty Inhaling	84	0.51	0.61

	n	POSITIVE	NEGATIVE
Alpha for scales		0.95	0.81

Boldface denotes factor loadings 0.30

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 3.

Mean and SD of Initial Subjective Experiences by First Tobacco Product

Subjective Experience	Cigarettes				Hookah				First Tobacco Product Used				Cigars				E-cigarettes			
	N	Mean (SD)	% Endorsed	N	Mean (SD)	% Endorsed	N	Mean (SD)	% Endorsed	N	Mean (SD)	% Endorsed	N	Mean (SD)	% Endorsed	N	Mean (SD)	% Endorsed	N	% Endorsed
Pleasant Sensations	933	1.99 (0.98)	30.9	723	1.88 (0.90)	28.4	317	1.99 (0.97)	33.8	85	1.70 (0.94)	23.5								
Relaxation	937	2.02 (1.01)	34.6	727	2.00 (0.95)	31.1	318	2.08 (0.96)	34.9	84	1.77 (0.99)	22.6								
Pleasurable Buzz	938	2.09 (1.07)	34.2	725	1.83 (0.95)	25.9	316	1.95 (1.00)	29.8	84	1.67 (1.00)	22.6								
Unpleasant Sensations	934	2.06 (0.99)	34.6	721	1.66 (0.89)	19.7	317	1.81 (0.97)	24.9	84	1.60 (0.92)	17.9								
Dizziness	939	1.95 (1.02)	30.0	727	1.79 (0.92)	22.8	318	1.68 (0.94)	20.1	84	1.60 (0.95)	15.5								
Nausea	937	1.76 (0.97)	23.0	723	1.55 (0.87)	17.0	315	1.68 (0.93)	22.5	84	1.49 (0.84)	13.1								
Coughing	942	2.18 (1.00)	34.6	727	2.01 (0.93)	28.5	317	2.12 (0.94)	32.8	84	1.82 (0.91)	21.4								
Difficulty Inhaling	940	1.94 (0.98)	28.5	726	1.63 (0.86)	16.1	313	1.71 (0.90)	19.5	84	1.52 (0.86)	11.9								

NOTE: 1 = none, 2 = slight, 3 = moderate, 4 = intense; N indicates the number of participants who responded to the indicated initial subjective experience item; % endorsed indicates the percentage of participants endorsing moderate/intense levels of the indicated initial subjective experience. The top four initial subjective experiences (as determined by mean) are **bolded** across each tobacco product.

Table 4.
Associations between Initial Subjective Experiences and Recent Use of Tobacco Products by College Year

First Product	Recent Product	Subjective Experience	Freshmen	Sophomore	Junior	Senior
Cigarettes (N = 950)	Cigarettes	N	573	578	715	286
		Positive Factor Score	2.07 (1.69, 2.54)	2.58 (2.07, 3.21)	2.15 (1.80, 2.57)	2.59 (1.89, 3.56)
		Negative Factor Score	1.08 (0.89, 1.31)	0.95 (0.77, 1.17)	1.02 (0.85, 1.23)	0.98 (0.72, 1.34)
Cigars	Cigars	N	674	489	502	209
		Positive Factor Score	1.44 (1.20, 1.72)	1.56 (1.20, 2.02)	1.19 (0.94, 1.52)	0.97 (0.84, 1.12)
		Negative Factor Score	1.19 (0.99, 1.44)	1.28 (0.98, 1.67)	1.13 (0.88, 1.45)	1.10 (0.99, 1.21)
Hookah	Hookah	N	712	557	649	266
		Positive Factor Score	1.37 (1.16, 1.61)	1.28 (1.02, 1.60)	1.22 (0.99, 1.50)	1.19 (0.82, 1.71)
		Negative Factor Score	1.17 (0.99, 1.38)	1.05 (0.83, 1.34)	0.86 (0.69, 1.09)	1.04 (0.71, 1.52)
E-Cigarettes	E-Cigarettes	N	181	333	389	181
		Positive Factor Score	1.12 (0.81, 1.53)	1.39 (1.06, 1.83)	1.15 (0.90, 1.48)	1.14 (0.75, 1.76)
		Negative Factor Score	1.13 (0.80, 1.60)	1.01 (0.75, 1.36)	1.30 (0.99, 1.70)	1.06 (0.66, 1.71)
Cigarettes (N=319)	Cigarettes	N	93	97	118	49
		Positive Factor Score	1.82 (1.09, 3.03)	1.15 (0.70, 1.91)	1.23 (0.78, 1.93)	0.80 (0.37, 1.75)
		Negative Factor Score	1.54 (0.93, 2.55)	1.47 (0.82, 2.62)	0.94 (0.56, 1.58)	1.30 (0.54, 3.13)
Cigars	Cigars	N	236	188	236	81
		Positive Factor Score	1.52 (1.11, 2.07)	1.76 (1.23, 2.52)	1.94 (1.38, 2.72)	1.65 (0.87, 3.12)
		Negative Factor Score	1.52 (1.08, 2.14)	1.23 (0.81, 1.85)	0.96 (0.65, 1.43)	2.04 (1.01, 4.10)
Hookah	Hookah	N	213	175	196	77
		Positive Factor Score	1.23 (0.90, 1.69)	1.69 (1.13, 2.51)	1.47 (1.00, 2.15)	0.78 (0.33, 1.85)
		Negative Factor Score	1.27 (0.90, 1.78)	1.56 (1.01, 2.41)	1.08 (0.68, 1.70)	0.83 (0.33, 2.08)
E-Cigarettes	E-Cigarettes	N	46	68	94	39
		Positive Factor Score	0.70 (0.31, 1.61)	2.96 (1.29, 6.81)	1.63 (0.92, 2.90)	Not Available
		Negative Factor Score	0.75 (0.38, 1.50)	1.01 (0.43, 2.41)	1.67 (0.86, 3.24)	Not Available

First Product	Recent Product	Subjective Experience	Freshmen	Sophomore	Junior	Senior
Hookah (N=731)	Cigarettes	N	96	118	145	81
		Positive Factor Score	1.08 (0.62, 1.89)	1.47 (0.85, 2.52)	1.76 (1.10, 2.81)	1.33 (0.73, 2.43)
		Negative Factor Score	0.79 (0.44, 1.42)	1.07 (0.62, 1.84)	1.16 (0.71, 1.89)	1.32 (0.63, 2.76)
	Cigars	N	412	278	171	104
		Positive Factor Score	1.05 (0.75, 1.48)	1.31 (0.84, 2.07)	1.43 (0.85, 2.42)	2.54 (1.18, 5.47)
		Negative Factor Score	1.06 (0.74, 1.52)	1.06 (0.64, 1.78)	2.01 (1.12, 3.60)	0.94 (0.41, 2.15)
	Hookah	N	520	495	593	271
		Positive Factor Score	1.40 (1.12, 1.74)	1.86 (1.45, 2.39)	2.28 (1.80, 2.89)	1.72 (1.18, 2.52)
		Negative Factor Score	1.17 (0.92, 1.49)	0.98 (0.74, 1.30)	1.03 (0.79, 1.33)	0.95 (0.61, 1.50)
	E-Cigarettes	N	59	107	137	91
		Positive Factor Score	1.08 (0.53, 2.19)	1.47 (0.77, 2.82)	1.74 (0.91, 3.32)	1.05 (0.21, 5.21)
		Negative Factor Score	0.78 (0.36, 1.68)	1.01 (0.50, 2.02)	1.39 (0.76, 2.54)	1.29 (0.32, 5.21)

Note: Statistically significant associations (p-value 0.05) are **bolded**.