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Perceived Harm, Addictiveness, and Social Acceptability of Tobacco Products and Marijuana Among Young Adults: Marijuana, Hookah, and Electronic Cigarettes Win

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Abstract

Background—There has been an increase in non-daily smoking, alternative tobacco product and marijuana use among young adults in recent years.

Objectives—This study examined perceptions of health risks, addictiveness, and social acceptability of cigarettes, cigar products, smokeless tobacco, hookah, electronic cigarettes, and marijuana among young adults and correlates of such perceptions.

Methods—In Spring 2013, 10,000 students at two universities in the Southeastern United States were recruited to complete an online survey (2,002 respondents), assessing personal, parental, and peer use of each product; and perceptions of health risks, addictiveness, and social acceptability of each of these products.

Results—Marijuana was the most commonly used product in the past month (19.2%), with hookah being the second most commonly used (16.4%). The least commonly used were smokeless tobacco products (2.6%) and electronic cigarettes (4.5%). There were high rates of concurrent product use, particularly among electronic cigarette users. The most positively perceived was marijuana, with hookah and electronic cigarettes being second. While tobacco use and related social factors, related positively, influenced perceptions of marijuana, marijuana use and related social factors were not associated with perceptions of any tobacco product.

Conclusions/Importance—Marketing efforts to promote electronic cigarettes and hookah to be safe and socially acceptable seem to be effective, while policy changes seem to be altering perceptions of marijuana and related social norms. Research is needed to document the health risks and addictive nature of emerging tobacco products and marijuana and evaluate efforts to communicate such risks to youth.

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Declaration of Interest
The authors report no conflicts of interest.

Keywords

tobacco use; marijuana use; social norms; youth; health risk; addiction

INTRODUCTION

Tobacco use is the leading preventable cause of morbidity and mortality in the United States (US Department of Health and Human Services [USDHHS], 2001), causing 438,000 deaths annually (Centers for Disease Control and Prevention [CDC], 2005a, 2005b). All forms of tobacco are addictive (USDHHS, 2004). Cigarettes continue to be the main source of tobacco use in the United States among young adults (Rigotti, Lee, & Wechsler, 2000; Smith-Simone, Maziak, Ward, & Eissenberg, 2008). In recent years, however, a host of alternative tobacco products, including small cigars (i.e., little cigars, cigarillos), smokeless tobacco products (i.e., chew, snus, dissolvable tobacco products), and electronic cigarettes, have been introduced to the US market, while waterpipes or hookah have increased in popularity (Etter, 2010; Knishkowy & Amitai, 2005). From 1993 to 2006, small cigars were the fastest growing tobacco products in the market (USDA Economic Research Service, 2007), with unit sales of little cigars increasing from 37% to 47% and cigarillos increasing from 25% to 32%, while large cigars unit sales dropped from 37% to 22% (Kozlowski, Dollar, & Giovino, 2008). A national survey of US adults in 2010 found that 9% had tried hookah, 5.1% had tried snus, and roughly 2% had tried electronic cigarettes or dissolvables (McMillen, Maduka, & Winickoff, 2012).

Alternative tobacco products are marketed as safer alternatives to traditional cigarettes (Gray et al., 2005; Stepanov, Jensen, Hatsukami, & Hecht, 2008). These marketing efforts have been largely successful. Users of small cigars (Richter, Pederson, & O'Hegarty, 2006; Sterling, Berg, Thomas, Glantz, & Ahluwalia, 2013), smokeless tobacco (Tomar, 2007; Tomar & Hatsukami, 2007), hookah (Braun, Glassman, Wohlwend, Whewell, & Reindl, 2011; Eissenberg & Shihadeh, 2009; Primack et al., 2008), and electronic cigarettes (Pearson, Richardson, Niaura, Abrams, & Vallone, 2011) believe that the products they consume are less harmful to their health than cigarettes. In fact, some of these products may be safer than cigarettes. For example, some snus products may have lower concentrations of nitrosamines (Foulds & Furberg, 2008; Stepanov et al., 2008), making snus use (versus cigarette use) less harmful (Gray et al., 2005). However, some alternative tobacco products may have similar or greater risk than cigarettes if used at a similar rate. For example, small cigars, which can deliver sufficient amounts of nicotine to maintain dependence (Hoffmann & Hoffman, 1998), can cause several chronic diseases, including coronary heart disease, lung diseases, and several types of cancer (Hoffmann & Hoffman, 1998). In addition, hookah use produces carbon monoxide, nicotine, tar, and heavy metals at levels similar to or higher than cigarettes (Knishkowy & Amitai, 2005). Understanding the perceptions youth have regarding the health risks as well as the risk of addiction related to using these alternative tobacco products is important in order to inform educational programs and other venues for rectifying misconceptions about these products.

Moreover, many of these products have been marketed for use where smoking is not allowed (Gartner, Hall, Chapman, & Freeman, 2007), as smokeless tobacco, hookah, and electronic cigarettes are often not explicitly included in smoke-free policies, as policy makers did not anticipate these changes in product offerings from the tobacco industry. Moreover, electronic cigarettes have been marketed as an alternative to cessation (Etter, 2010). These marketing efforts foster concerns that current smokers may use these products as an alternative to cessation (Etter, 2010; Henningfeld, Rose, & Giovino, 2002) or may lead to relapse among former smokers (McMillen et al., 2012). Moreover, there is a growing concern that using these products in this way may also derail decades of efforts to denormalize tobacco use.

Finally, these products may especially appeal to youth due to their attractive packaging, flavoring, dissolvable delivery systems (McMillen et al., 2012), and social appeal (Klein, 2008; Martinasek, McDermott, & Martini, 2011; Smith et al., 2011). This may contribute to changing social norms around tobacco use. Unfortunately, non-smokers, particularly young adults, who experiment with these products may become regular or addicted users (DiFranza & Wellman, 2005; Henningfield et al., 2002; Wetter et al., 2004) or polytobacco users (Berg, Schauer, Asfour, Thomas, & Ahluwalia, 2011; Bombard, Pederson, Koval, & O'Hegarty, 2009; McMillen et al., 2012; Sterling et al., 2013; Wetter et al., 2004). Thus, there is concern about how these products are perceived and used, but limited data is available regarding the perceptions of young adults regarding the range of emerging tobacco products.

It is clear that youth are at the greatest risk for using alternative tobacco products (McMillen et al., 2012), undoubtedly due to continued efforts by the tobacco industry to exploit psychosocial characteristics of youth (Ling & Glantz, 2002, 2004). Young adulthood, particularly the transition to college, is a critical period for engaging in many health compromising behaviors, including smoking (Rigotti, Lee, & Wechsler, 2000; Substance Abuse and Mental Health Services Administration [SAMHSA], 2006), drinking (O'Malley & Johnston, 2002; Wechsler et al., 2002), and other high-risk behaviors (American College Health Association [ACHA], 2009; Anding, Suminiski, & Boss, 2001; Dinger & Waigandt, 1997; Evans, Sawyer-Morse, & Betsinger, 2000; Grace, 1997; Hiza & Gerrior, 2002; Huang et al., 2003; Melby, Femea, & Sciacca, 1986). Longitudinal research has found that most individuals who use tobacco in adolescence and into young adulthood become regular users (Orlando, Tucker, Ellickson, & Klein, 2004; USDHHS, 1994, 2012). Thus, tobacco industry marketing efforts capitalize on this high-risk period.

Of relevance to the current study, tobacco users are more likely to use marijuana as well (Pinsker et al., 2013; Sutfin et al., 2012). Moreover, users of hookah and small cigars may use the same materials (e.g., waterpipe, papers) to consume marijuana (Enofe, Berg, & Nehl, 2014). In general, marijuana has been the most common illicit substance used in the United States for several decades (Johnston, 2009; SAMHSA, 2009). It is especially common among young adults, with approximately 17.1% to 21.4% of young adults (aged 18 to 25 years) having used marijuana within the past month (SAMHSA, 2013). Unfortunately, marijuana use has several important negative implications such as increased risk for motor vehicle crashes (National Highway Traffic Safety Administration, 2001), adverse respiratory

and cardiovascular effects (Aryana & Williams, 2007; Mittleman, Lewis, Maclure, Sherwood, & Muller, 2001; Polen, Sidney, Tekawa, Sadler, & Friedman, 1993; Tashkin, 1990; Zhang et al., 1999), increased susceptibility to cancer (Hashibe et al., 2005), short- and long-term memory impairment (Pope & Yurgelun-Todd, 1996), increased risk for psychological disorders (Grech, Van Os, Jones, Lewis, & Murray, 2005; Hall, 2009), and lower educational performance and attainment (Brook, Kessler, & Cohen, 1999; Brook, Zhang, & Brook, 2011; Lynskey & Hall, 2000). However, little is known about perceptions of health risk, risk of addiction, or social acceptability of marijuana relative to other substances, particularly compared with tobacco products.

Given the aforementioned literature, the aims of the current study are to examine the favorable attitudes among young adults regarding tobacco products—specifically cigarettes, cigar-like products, smokeless tobacco products, hookah, and electronic cigarettes—and marijuana. In particular, we will examine the perceived harm to health, addictiveness, and social acceptability of each of these products among young adult college students. We will also examine concurrent use and correlates of perceptions of these products, particularly socio-demographics, social influence factors, and individual use of tobacco products and marijuana.

METHODS

Survey Participants and Procedures

In Spring 2013, students at two universities in the Southeastern United States were recruited to complete an online survey. We recruited 10,000 students (5,000 randomly selected students from each university), yielding 2,002 responses (20.0% response rate), with complete data from 1,966 students. Students received an e-mail describing the nature of the study (i.e., an online survey regarding college student health behaviors taking roughly 20 minutes to complete) and containing a link to the consent form with the alternative of opting out. Students who consented to participate were directed to the online survey. To encourage participation, students received up to three e-mail invitations to participate. As an incentive for participation, all students who completed the survey received a $10 gift card. The Emory University Institutional Review Board approved this study, IRB# 00059657.

Measures

Demographic Characteristics—We assessed students' age, gender, race/ethnicity, and parental education (as a proxy for socioeconomic status). Race/ethnicity was categorized as non-Hispanic White, non-Hispanic Black, and other due to the small proportion of participants reporting other races/ethnicities. Based on the distribution of the data, parental education was categorized as less than a Bachelor's degree versus Bachelor's degree or greater.

Social Influence—The participants were asked, "Does any one of your parental figures (select all that apply): use smoking tobacco (cigarettes, cigars, etc.); use smokeless tobacco (chew, snus, etc.); use electronic cigarettes; or use marijuana." They were also asked, "Out of your five closest friends, how many of them: smoke cigarettes; use cigars, little cigars, or

cigarillos; use smokeless tobacco; use hookah or waterpipes; use electronic cigarettes; or use marijuana."

Tobacco and Marijuana Use—To assess alternative tobacco product use, the participants were asked the following: "Have you ever tried, even just one time: regular cigarettes; roll-your-own cigarettes; flavored cigarettes, such as Camel Crush; clove cigars; flavored little cigars (such as Black and Milds); flavored cigarillos (such as Swisher Sweets cigarillos); large cigars; chewing tobacco, snuff, or dip, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen; snus, such as Camel or Marlboro Snus; dissolvable tobacco products, such as Ariva, Stonewall, Camel orbs, Camel sticks, or Camel strips; smoking tobacco from a hookah or a waterpipe; or electronic cigarettes or e-cigarettes such as Ruyan or NJOY." The participants were also asked to report the number of days they used each of these products in the past 30 days. These items were adapted from the CDC's (2011) National Youth Tobacco Survey. We also assessed marijuana use over the course of the past 30 days (ACHA, 2008; CDC, 1997). We also asked the participants, "Have you ever smoked marijuana with tobacco in it?" We categorized the participants who reported any use ever and any use in the past 30 days as users of each of the products respectively. We also created aggregate variables for cigarette use (regular, hand-rolled, flavored), cigar product use (clove cigars, little cigars, cigarillos, large cigars), and smokeless tobacco product use (chew, snus, dissolvables).

Perceived Harm to Health, Addictiveness, and Social Acceptability—The participants were asked the following questions: "How *harmful to your health* do you think each of the following products are?"; "How *addictive* do you think each of the following products are?"; and "How *socially acceptable among your peers* do you think each of the following products are?" in reference to each of the following substances: cigarettes; cigar-like tobacco products (e.g., cigars, clove cigars, little cigars, cigarillos); smokeless tobacco (e.g., chew, snus, dissolvables); hookahs or waterpipes; electronic cigarettes; and marijuana. Response options were 1 = not at all to 7 = extremely. We calculated an overall favorability index of each of the tobacco products and marijuana. This was calculated by subtracting the *perceived harm* and the *perceived addictiveness* scores from 7 respectively, and adding it to the *social acceptability* score, for a higher favorability score to reflect lower perceived harm and addictiveness and higher perceived social acceptability.

Data Analysis

Participant characteristics were summarized using descriptive statistics. We also examined concurrent use behaviors. Then we reported the overall ratings of perceived harm, addictiveness, and social acceptability of each of the products as well as the overall positive perception ratings for each. Finally, we examined socio-demographic factors, social influence factors, and tobacco and marijuana use in relation to overall positive perceptions for each of the products using ordinary least squares regression. SPSS 21.0 was used for all data analyses. Statistical significance was set at $\alpha = 0.05$ for all tests.

RESULTS

Participant Characteristics and Tobacco and Marijuana Use Factors

Table 1 displays results of descriptive statistics, specifically socio-demographics, social influence factors, and participant's history of tobacco and marijuana use. Participants were an average of 21.02 (SD = 2.02) years of age, 71.6% (*n* = 1,407) females, and 40.0% (*n* = 787) Black. The participants in this study were representative of the broader student bodies in terms of age, race/ethnicity, and other known factors regarding the general student population with the exception of gender; participants were more likely to be female versus male disproportionate to the representation of females among these college student populations (*p* = .001). In this sample, there were high rates of parental product use, including 24.4% (*n* = 496) of the participants reporting that their parents used combustible tobacco products.

In terms of substance use, nearly half (48.4%, *n* = 927) had tried cigarettes in the past, 45.7% (*n* = 898) had tried cigar products, 10.6% (*n* = 208) had tried smokeless tobacco products, 44.0% (*n* = 866) had tried hookah, 13.2% (*n* = 260) had tried electronic cigarettes, and 15.1% (*n* = 286) had tried marijuana with tobacco in it. In the past 30 days, 16.0% (*n* = 315) had used cigarettes, 14.9% (293) had used cigar products, 2.6% (*n* = 51) had used smokeless tobacco, 16.4% (*n* = 322) had used hookah, 4.5% (*n* = 88) had used electronic cigarettes, and 19.2% (*n* = 377) had used marijuana.

Table 2 highlights concurrent tobacco and marijuana use behaviors. Of note, the highest concurrent use behavior was that of cigarette use among electronic cigarette users (71.6%). Also, smokeless tobacco users had high rates of use of cigarettes (56.9%) and cigars (54.9%). We also examined the proportion of the sample that used products concurrently; 63.4% (*n* = 1,247) used no product in the past 30 days, 15.5% (*n* = 305) used one product, 10.7% (*n* = 211) used two, 6.2% (*n* = 121) used three, 2.8% (*n* = 56) used four, 1.2% (*n* = 24) used five, and 0.1% (*n* = 2) used all six products in the past 30 days.

Perceived Harm, Addictiveness, and Social Acceptability of Tobacco Products and Marijuana

Perceptions of harm and addictiveness and perceptions of harm and social acceptability were correlated across tobacco products and marijuana respectively (p values < .001). This also held true for perceptions of addictiveness and social acceptability for hookah and marijuana respectively (p values < .001). However, perceptions of addictiveness and social acceptability of cigarettes, cigar products, smokeless tobacco, and electronic cigarettes were not significantly associated.

Table 3 provides information regarding the ratings in relation to perceived harm, addictiveness, and social acceptability of each of the products. The products perceived to be least harmful to health were marijuana (4.14±2.14), electronic cigarettes (4.26±1.95), and hookah (4.56±1.78); those perceived to be the most harmful were cigarettes (6.47±1.00), cigar products (6.19±1.19), and smokeless tobacco (6.07±1.30). The products perceived to be the least addictive were hookah (3.66±2.12), electronic cigarettes (4.29±2.08), and marijuana (4.60±2.24); those perceived to be the most addictive were cigarettes (6.42±1.27),

smokeless tobacco (5.63±1.72), and cigar products (5.63±1.72). Those perceived to be the most socially acceptable were hookah (5.39±1.88), marijuana (5.13±2.06), and cigarettes (4.51±2.02); those perceived to be the least were smokeless tobacco (3.60±2.05), electronic cigarettes (4.12±2.03), and cigars (4.43±1.97). In summary, the most positively perceived products were marijuana(12.39±4.89), electronic cigarettes (11.56±4.22), and hookah (11.44±1.78); the least positively perceived products were cigarettes (7.62±2.79), smokeless tobacco (7.70±3.21), and cigars (8.62±3.27).

Table 4 presents the regression models for positive perceptions of each of the tobacco products and marijuana. Factors predicting higher positive perceptions of cigarettes included younger age ($p = .009$), more friends who smoke cigarettes ($p < .001$), fewer friends who smoke cigar products ($p = .03$), more friends who smoke electronic cigarettes ($p = .01$), and past 30-day cigarette use ($p < .001$). Factors predicting higher positive perceptions of cigar products were being younger ($p = .03$), being male ($p = .01$), being Black ($p < .001$), more friends who smoke cigarettes ($p = .002$), more friends who smoke cigars ($p = .01$), more friends who use hookah ($p = .04$), cigarette smoking in the past 30 days ($p = .005$), and cigar smoking in the past 30 days ($p < .001$). Factors predicting more favorable impressions of smokeless tobacco products were younger age ($p = .03$), being male ($p = .04$), more friends that smoke cigarettes ($p < .001$), more friends that use smokeless tobacco ($p < .001$), and any cigar use in the past 30 days ($p = .001$). Predictors of more favorable perceptions of hookah included more friends who smoke cigarettes ($p = .05$), more friends who use hookah ($p < .001$), recent cigarette smoking ($p = .009$), and recent cigar smoking ($p = .04$). Predictors of more favorable perceptions of electronic cigarettes included being male ($p = .03$), parental tobacco smoking ($p = .02$), more friends that smoke cigarettes ($p < .001$), more friends that use hookah ($p < .001$), more friends that use electronic cigarettes ($p = .04$), and recent cigarette smoking ($p < .001$). Finally, predictors of more favorable perceptions of marijuana included less likelihood of parents using smokeless tobacco ($p = .04$), more friends that smoke hookah ($p = .006$), more friends that use marijuana ($p < .001$), past 30-day cigarette use ($p < .001$), past 30-day cigar use ($p = .007$), and past 30-day marijuana use ($p < .001$).

DISCUSSION

The current study examined the favorability of tobacco products—specifically cigarettes, cigar products, smokeless tobacco products, hookah, and electronic cigarettes-–and marijuana. We found that marijuana was rated as the most favorable overall and the most commonly used in the past 30 days. Hookah and electronic cigarettes were the second most favorably perceived products, which may reflect the effective efforts to market these products as safe and socially acceptable. In addition, hookah was the second most commonly used product, while electronic cigarettes showed a relatively low prevalence of use in the past month. The least favorable perceived tobacco products were cigarettes and smokeless tobacco products.

Findings about the favorable perception of marijuana are not surprising, given that nationally representative data show a declining trend among those aged 18–25 years in the perceived risk of harm from monthly and weekly marijuana use (SAMHSA, 2013). Given the increased acceptability of marijuana use as medicinal and the implementation of policies

to legalize marijuana, the changing perceptions of marijuana and the increased prevalence of use most likely are iteratively influencing one another. Interestingly, factors associated with more positive perceptions of marijuana included cigarette, cigar, and marijuana use, and more friends that use hookah and marijuana. We also documented high rates of concurrent use rates among these products, in line with prior research (Enofe et al., 2014; Pinsker et al., 2013). Interestingly, there was a lack of influence of marijuana use and social factors related to marijuana use on perceptions of tobacco products. Other data from young adults who use both marijuana and tobacco suggests that marijuana use is not significantly associated with tobacco-related cognitions (Ramo, Delucchi, Hall, Liu, & Prochaska, 2013).

The lower overall positive perceptions of cigarettes, cigars, and smokeless tobacco, particularly in relation to health risks and risk of addiction, may reflect the longstanding history of research related to the harms of these tobacco products (USDHHS, 2000, 2010). In addition, well-known correlates of tobacco use (e.g., being male, younger age) (ACHA, 2012; CDC, 2011) and cigar use (e.g., being Black) (Sterling et al., 2013) were documented. However, hookah and electronic cigarettes have more recently emerged in the market, and efforts to market these products as safe and socially acceptable are proving to be effective. Hookah seems to have particularly high appeal among this population, with very high positive perceptions in terms of low perceived risk to health and addiction as well as high social acceptability. Furthermore, hookah was the most commonly used tobacco product in the past month.

Of note, one out of every six young adults in this sample had tried electronic cigarettes, and they were considered to be among the least addictive of the products we assessed. This prevalence of ever-use is substantially higher than recently published national data (6.2% in 2011 (King, Alam, Promoff, Arrazola, & Dube, 2013) and 8.1% in 2012 (Zhu et al., 2013)), suggesting that the college-aged population may be more prone to trying electronic cigarettes or a continually rapid increase in use rates in general. These findings may also indicate that efforts to market electronic cigarettes as relatively low risk to health and of addiction may be effective. Not only were electronic cigarettes perceived as low risk, but 71.6% of electronic cigarette users also were using cigarettes, which was the highest concurrent use rate documented in this study. Perhaps this indicates that electronic cigarette users are largely cigarette users hoping to quit or reduce the harm of nicotine use. Moreover, the regression analyses indicated that individuals with a great deal of cigarette smoking and related influence had more positive perceptions of electronic cigarettes. In addition, it was in this context where the only indication of parental cigarette use (or parental use of any tobacco product or marijuana, for that matter) influenced perceptions of any tobacco product. Perhaps the social network has been more actively engaged in discussing the potential of electronic cigarettes for harm reduction or cessation and potentially participant attempts at using this product for these reasons.

In addition, smokeless tobacco users were also concurrently using cigarettes (56.9%) and cigars (54.9%). Moreover, the use of these products individually and within their peer network was associated with more favorable perceptions of smokeless tobacco products. Smokeless tobacco may also be used to decrease the health risks of smoking; they may also be used in situations where smoking is not allowed or not socially acceptable. More research

is needed to understand how and why electronic cigarettes and smokeless tobacco are commonly used in the context of combustible tobacco use.

An important finding that warrants future research is that, while perceptions of harm and addictiveness and perceptions of harm and social acceptability were correlated across tobacco products and marijuana respectively, perceptions of addictiveness and social acceptability were only correlated in relation to hookah and marijuana respectively. Why perceptions of addictiveness and social acceptability of cigarettes, cigar products, smokeless tobacco, and electronic cigarettes were not significantly associated has not been examined previously. These disparate, and potentially spurious findings, warrant future research.

The current findings have implications for research and practice. Further research is needed to understand the potential health consequences and addictive nature of these various tobacco products, particularly hookah and electronic cigarettes, as well as marijuana, in both short- and long-term. In additionally, examining how to alter the social norms related to the use of these products is important. Moreover, the ways in which these products are used and adapted should be documented. For example, what are the components in the various types of juices and tobacco available in the market for electronic cigarettes and hookah? How are individual users adapting or altering the juices or tobacco? What combinations of tobacco and marijuana are used? This latter point is particularly interesting given the relatively high rate of prior use of marijuana with tobacco (15.1%).

In practice, campaigns designed to alter perceptions of these products may be effective in curtailing use and hopefully reducing the future morbidity and mortality related to tobacco and marijuana use. Moreover, healthcare providers should consider assessing use of these various tobacco products and marijuana in younger populations, particularly given that prevalence of use of these other products are rivaling the use of cigarettes and the perceptions of risk are lower for some of those used more commonly.

Limitations

This study has some limitations. First, the survey sample was largely female and drawn from Southeast colleges. As such, findings from this study may not generalize to other college populations. Second, the survey response rate may seem low and might suggest responder bias. We are unable to ascertain how many participants did not open the e-mail or had inactive e-mail accounts, which impacts what the true “denominator” for this response rate may have been. However, prior work has demonstrated that, in spite of lower response rates, internet surveys yield similar statistics regarding health behaviors compared with mail and phone surveys (An et al., 2007). Also, we did not assess lifetime use of marijuana. Finally, the cross-sectional nature of this study limits the extent to which we can make causal attributions.

CONCLUSIONS

The present study provided information regarding perceptions of harm to health, addictiveness, and social acceptability of various tobacco products and marijuana. Marijuana was generally perceived to be the least harmful, least addictive, and most socially

acceptable, with electronic cigarettes and hookah closely following. Cigarettes and smokeless tobacco were perceived as the most negatively across these dimensions. Future research is needed to document reasons for these perceptions as well as to document the true nature of the health risks and addictiveness of these products. Doing so will inform the development of public health campaigns and interventions to alter these perceptions as well as social norms related to the use of these tobacco products and marijuana.

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GLOSSARY

Cigarettes	Flavored, hand-rolled, and traditional cigarettes.
Cigar products	Clove cigars, large cigars, little cigars, and cigarillos.

Combustible tobacco	Cigarettes and cigar products.
Current tobacco use	Any use in the past 30 days of tobacco or of each of the tobacco products included.
Electronic cigarettes	Also known as a personal vaporizer (PV) or electronic nicotine delivery system (ENDS) a battery-powered vaporizer that generally uses a heating element known as an atomizer that vaporizes a liquid solution known as e-liquid.
Hookah	A single or multi-stemmed instrument for vaporizing and smoking flavored tobacco called shisha in which the vapor or smoke is passed through a water basin—often glass-based—before inhalation.
Smokeless tobacco	Chew, snus, dissolvable tobacco products.

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TABLE 1

Participant characteristics, social factors, and tobacco and marijuana use history

Variable	Total M (SD) or N (%)	
Socio-demographics		
Age (SD)	21.02 (2.02)	
Gender (%)		
Males	559 (28.4)	
Females	1, 407 (71.6)	
Ethnicity (%)		
White	773 (39.3)	
Black	787 (40.0)	
Other	406 (20.7)	
Parental education (%)		
< BA	1039 (52.8)	
≥ BA	927 (47.2)	
Parental use (%)		
Combustible tobacco	469 (24.4)	
Smokeless tobacco	82 (4.3)	
Electronic cigarette	43 (2.2)	
Marijuana	122 (6.3)	
Number of friends who use (SD)		
Cigarettes	1.05 (1.34)	
Cigar products	0.23 (0.70)	
Smokeless tobacco	0.69 (1.25)	
Hookah	1.70 (1.87)	
Electronic cigarettes	0.16 (0.50)	
Marijuana	1.92 (1.85)	
Substance use	Ever used (%)	Past 30 days (%)
Cigarettes	927 (48.4)	315 (16.0)
Hand-rolled	259 (13.2)	56 (2.8)
Flavored	427 (21.7)	161 (8.2)
Cigar products	898 (45.7)	293 (14.9)
Clove cigars	335 (17.0)	52 (2.6)
Little cigars	744 (37.8)	179 (9.1)
Cigarillos	546 (27.8)	164 (8.3)
Large cigars	335 (17.0)	58 (3.0)
Smokeless tobacco	208 (10.6)	51 (2.6)
Chew	180 (9.2)	43 (2.2)
Snus	90 (4.6)	17 (0.9)
Dissolvables	16 (0.8)	10 (0.5)
Hookah	866 (44.0)	322 (16.4)
Electronic cigarettes	260 (13.2)	88 (4.5)

Variable	Total M (SD) or N (%)	
Marijuana	–	377 (19.2)
Smoked marijuana with tobacco in it	286 (15.1)	–

TABLE 2

Concurrent use of tobacco products and marijuana

Product	Cigarettes *n* = 315 16.0%	Cigar products *n* = 293 14.9%	Smokeless tobacco *n* = 51 2.6%	Hookah *n* = 322 16.4%	Electronic cigarettes *n* = 88 4.5%	Marijuana *n* = 377 19.2%
Cigarettes	–	43.3%	56.9%	41.0%	71.6%	38.7%
Cigar products	40.3%	–	54.9%	39.8%	46.6%	47.5%
Smokeless tobacco	9.2%	9.6%	–	7.1%	17.0%	5.0%
Hookah	41.9%	43.7%	45.1%	–	54.5%	41.1%
Electronic cigarettes	20.0%	14.0%	29.4%	14.9%	–	12.5%
Marijuana	46.3%	61.1%	37.3%	48.1%	53.4%	–

Note: All chi-squared *p*-values < 0.001. To interpret, among users of column heading, % also using row heading in the past 30 days. Example: Of the 315 cigarette smokers, 40.3% also smoked cigar products in the past 30 days.

TABLE 3

Perceptions of harm, addictiveness, and social acceptability of various tobacco products and marijuana

Product	Harm to health	Addictiveness	Social acceptability	Positive perception
Cigarettes	6.47 (1.00)	6.42 (1.27)	4.51 (2.02)	7.62 (2.79)
Cigar products	6.19 (1.19)	5.63 (1.72)	4.43 (1.97)	8.62 (3.27)
Smokeless tobacco	6.07 (1.30)	5.81 (1.63)	3.60 (2.05)	7.70 (3.21)
Hookah	4.56 (1.78)	3.66 (2.12)	5.39 (1.88)	11.44 (1.78)
Electronic cigarettes	4.26 (1.95)	4.29 (2.08)	4.12 (2.03)	11.56 (4.22)
Marijuana	4.14 (2.14)	4.60 (2.24)	5.13 (2.06)	12.39 (4.89)

Note: Bonferroni post hoc tests indicated that cigarettes were perceived less favorable than cigar products, hookah, electronic cigarettes, and marijuana (p values < .001), but not smokeless tobacco ($p = .35$). Cigar products were perceived more favorable than smokeless tobacco ($p < .001$) but less favorable than hookah, electronic cigarettes, and marijuana (p values < .001). Smokeless tobacco was perceived less favorable than hookah, electronic cigarettes, and marijuana (p values < .001). Hookah and electronic cigarettes were perceived less favorable than marijuana (p values < .001) but there was no difference between hookah and electronic cigarettes ($p = .12$).

TABLE 4

Regression models for overall positive perception scores for each tobacco product and marijuana

Variable	Cigarettes OR (CI)	Cigar Products OR (CI)	Smokeless Tobacco OR (CI)	Hookah OR (CI)	Electronic cigarettes OR (CI)	Marijuana OR (CI)
Socio-demographics						
Age	−0.08[−0.14, −0.02]**	−0.08[−0.15, −0.01]*	−0.08[−0.15,-0.01]*	−0.01[−0.05, 0.03]	0.08[−0.20, 0.17]	−0.01[−0.09, 0.09]
Gender						
Male	Ref	Ref	Ref	Ref	Ref	Ref
Female	−0.13[−0.40, 0.14]	−0.42[−0.74, −0.10]**	−0.34[−0.67, −0.02]*	0.06[−0.13, 0.23]	−0.46[−0.88, −0.04]*	−0.35[−0.76, 0.06]
Ethnicity						
White	Ref	Ref	Ref	Ref	Ref	Ref
Black	0.08[−0.09, 0.24]	−0.33[−0.52, −0.13]***	0.19[−0.01, 0.39]	−0.05[−0.16, 0.06]	−0.08[−0.33, 0.18]	−0.17[−0.42, 0.08]
Other	0.06[−0.07, 0.14]	0.20[−0.10, 0.35]	0.14[−0.03, 0.37]	−0.08[−0.18, 0.04]	−0.05[−0.30, 0.21]	−0.10[−0.35, 0.10]
Parental education						
< BA	Ref	Ref	Ref	Ref	Ref	Ref
≥ BA	−0.12[−0.36, 0.12]	0.21[−0.07, 0.50]	0.16[−0.13, 0.45]	−0.06[−0.22, 0.10]	−0.11 [−0.48, 0.27]	0.13[−0.23, 0.50]
Parental Use						
Combustible tobacco	0.15[−0.13, 0.44]	0.24[−0.09, 0.58]	−0.01[−0.36, 0.33]	0.02[−0.16, 0.21]	0.53[0.09, 0.97]*	0.14[−0.82, 1.09]
Smokeless tobacco	−0.04[−0.89, 0.27]	−0.18[−0.87, 0.51]	−0.16[−0.87, 0.55]	−0.18[−0.57, 0.21]	−0.21[−1.11, 0.69]	−1.10[−2.00, 0.21]*
Electronic cigarette	−0.04[−0.84, 0.76]	−0.54[−1.48, 0.42]	0.26[−0.71, 1.23]	0.11[−0.43, 0.64]	0.36[−0.88, 1.60]	−0.40[−1.63, 0.83]
Marijuana	0.37[−0.13, 0.87]	0.53[−0.06, 1.12]	0.09[−0.51, 0.69]	0.13[−0.20, 0.46]	−0.13[−0.91, 0.65]	0.35[−0.41, 1.11]
No. of Friends Who Use						
Cigarettes	0.48[0.37, 0.59]***	0.21[0.08, 0.34]**	0.24[0.11, 0.38]***	−0.07[−0.15, 0.00]*	0.33[0.16, 0.51]***	−0.15[−0.32, 0.02]
Cigar products	−0.13[−0.24, −0.02]*	0.17[0.04, 0.31]*	−0.01[−0.15, 0.12]	0.04[−0.03, 0.12]	−0.09[−0.27, 0.08]	−0.08[−0.25, 0.10]
Smokeless tobacco	−0.02[−0.21, 0.17]	−0.05[−0.28, 0.17]	0.44[0.21, 0.66]***	0.05[−0.08, 0.17]	0.02[−0.27, 0.31]	0.04[−0.25, 0.10]
Hookah	−0.01[−0.09, 0.07]	0.10[0.01, 0.19]*	0.06[−0.04, 0.15]	0.17[0.12, 0.22]***	0.22[0.10, 0.34]*	0.17[0.05, 0.29]**
Electronic cigarettes	0.35[0.08, 0.63]**	0.20[−0.12, 0.52]	0.14[−0.19, 0.46]	−0.01[−0.19, 0.17]	0.43[0.01, 0.85]*	−0.32[−0.73, 0.09]
Marijuana	−0.01[−0.09, 0.08]	0.01[−0.09, 0.11]	−0.10[−0.20, .01]	0.02[−0.04, 0.07]	0.05[−0.08, 0.18]	1.04[0.91, 1.17]***
Substance Use						
Cigarettes	1.03[0.64, 1.43]***	0.67[0.20, 1.13]**	0.33[−0.15, 0.80]	0.34[0.09, 0.60]**	1.14[0.53, 1.75]***	1.70[1.10, 2.29]***

Variable	Cigarettes OR (CI)	Cigar Products OR (CI)	Smokeless Tobacco OR (CI)	Hookah OR (CI)	Electronic cigarettes OR (CI)	Marijuana OR (CI)
Cigar products	0.29[−0.11, 0.69]	0.95[0.48, 1.42]***	0.82[0.34, 1.30]***	0.27[0.01, 0.54]*	0.38[−0.24, 1.00]	0.84[0.12, 1.44]**
Smokeless tobacco	0.64[−0.19, 1.46]	0.43[−0.53, 1.38]	0.52[−0.47, 1.51]	0.18[−0.36, 0.72]	−0.18[−1.45, 1.08]	−0.74[−1.97, 0.50]
Hookah	−0.45[−0.31, 0.44]	0.29[−0.15, 0.75]	−0.21[−0.66, 0.23]	0.16[−0.09, 0.40]	0.14[−0.45, 0.72]	−0.20[−0.76, 0.37]
Electronic cigarettes	0.11[−0.26, 0.49]	−0.53[−1.27, 0.22]	−0.17[−0.94, 0.59]	0.02[−0.40, 0.44]	0.84[−0.14, 1.82]	0.14[−0.83, 1.09]
Marijuana	0.11[−0.26, 0.49]	0.26[−0.18, 0.70]	−0.02[−0.47, 0.43]	0.20[−0.05, 0.45]	0.55[−0.04, 1.13]	2.29[1.72, 2.85]***
Adjusted R^2	0.116	0.103	0.045	0.067	0.097	0.343

Note:

* $p < .05$;

** $p < .01$;

*** $p < .001$.