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College students' perceptions and knowledge of hookah use

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Abstract

Purpose—Hookah is an increasingly popular tobacco product among college students. The purpose of this study was to determine if college students are aware of tobacco and nicotine content in hookah, and examine associations between college students' knowledge and perceptions of hookah and their past 30-day hookah use.

Methods—Participants were 5,451 young adults attending one of 24 2- and 4-year colleges. Analyses examined if hookah knowledge was uniquely associated with current hookah use, over and above perceptions of harm and addictiveness, number of other tobacco products currently used, and socio-demographic factors. Analyses were first conducted for the entire sample and then only for current hookah users.

Results—26.9% of all students believed hookah did not contain tobacco and 38% believed that hookah did not contain nicotine. Students who believed that hookah contained tobacco were at increased odds of hookah use, and those with increased perceptions of harm were at decreased odds of hookah use. However, hookah knowledge was not associated with hookah users' intensity of use. Moreover, although increased perceptions of harm were associated with lower intensity of

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Conflict of interest

No conflict declared

Contributors

Creamer-wrote introduction, results, and discussion

Loukas-PI of project, conceptualized the paper and methods, and edited drafts

Li-conducted analyses, wrote statistical analysis section

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Perry-PI of Center Grant and edited drafts

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use among current users, increased perceptions of addictiveness were associated with higher intensity of use.

Conclusions—This study shows gaps in knowledge of hookah contents, and adds to the body of literature, which provides evidence for mandating warning labels as well as tobacco interventions for college students.

Keywords

Hookah; Young Adults; Knowledge; Perceptions

1 INTRODUCTION

Hookah, or waterpipe, is a device typically used to smoke flavored tobacco. The health consequences are not well known, yet hookah contains harmful chemicals (Al Rashidi et al., 2008; Cobb et al., 2010, 2011; Shihadeh and Saleh, 2005), and one 45-minute hookah session can expose the user to 48.6 times the amount of smoke as compared to smoking a conventional cigarette (Eissenberg and Shihadeh, 2009).

While gains have been made in reducing cigarette use among college students, the prevalence of hookah use is increasing (Smith et al., 2011; Sutfin et al., 2011). In a nationally representative sample of college students, 9.3% of students reported past 30-day hookah use while 22.9% reported ever use (Jarrett et al., 2012). Smaller studies of college students have found wide ranges in the prevalence of hookah, with one study finding that current use was as high as 22% (Heinz et al., 2013; Latimer et al., 2013; Sutfin et al., 2011).

Research on hookah has focused on the socio-demographic characteristics and other tobacco and substance use behaviors of hookah users. Correlates of hookah use include male gender, being younger, alcohol use, and past 30-day cigarette use (Jarrett et al., 2012; Sutfin et al., 2011). Further, college students perceive hookah as a safe alternative to conventional cigarettes (Berg et al., 2015b; Heinz et al., 2013; Primack et al., 2008). One study found that college students with negative attitudes, including beliefs about the harmfulness and addictiveness of hookah, were at decreased odds of hookah initiation (Sidani et al., 2014). Studies on the perceptions of harm and addictiveness have focused on comparing perceptions to cigarettes, and have not distinguished between users and non-users of hookah.

While some research has been conducted regarding perceptions of hookah, few studies have examined knowledge or beliefs about hookah contents. An exception is a 2013 study, which found that 64% of US college students incorrectly believed that a single cigarette has more nicotine than a single hookah session, with more hookah users incorrectly answering the question than non-users (Nuzzo et al., 2013). There are no studies on college students' knowledge of hookah's tobacco and nicotine content, and the role that such knowledge plays in hookah use.

The Theory of Reasoned Action (TRA) provides a framework to view hookah use among college students (Ajzen and Fishbein, 1980; Montano and Kasprzyk, 2008). According to TRA, knowledge and perceptions (e.g., perceived harm and addictiveness) shape attitudes

towards a behavior, thus influencing behavior. This study extends the literature by determining if college students are aware of tobacco and nicotine content in hookah, and examining associations between their knowledge and perceptions of hookah and current (past 30-day hookah) use. Further, we examined these associations among current users to determine if knowledge and perceptions were similarly associated with intensity of use. We hypothesized:

1. Current users would have more knowledge of nicotine and tobacco content and decreased perceptions of harm and addictiveness than non-users.
2. Knowledge of tobacco and nicotine in hookah would be associated with current hookah use and intensity of use (among current users), even after controlling for perceptions of harm and addictiveness, number of other tobacco products currently used, and socio-demographic factors.

2 METHODS

2.1 Participants

Participants were 5,451 young adult students involved in the baseline survey (November, 2014–February, 2015) of the Marketing and Promotions across Colleges in Texas project (Project M-PACT). Students were 18–29 years old (mean age=20.49; SD=2.36). More than half were female (63.4%) and 36.3% of students were non-Hispanic white, 31.1% were Hispanic/Latino, 8.1% were African-American/Black, 16.9% were Asian, and 7.5% reported other or reported two or more races/ethnicities. Demographics of our sample were similar to those reported for all enrolled students at the 24 participating colleges in fall 2014, except that Asian Americans were over-represented in our sample and African American students were under-represented. Data from thirty-one students were excluded from the present study due to large amounts of missing data.

2.2 Procedure

Students were recruited from 24 2- and 4-year colleges in five counties surrounding Austin, Dallas/Fort Worth, Houston, and San Antonio. To be eligible for participation, students were required to be degree- or certificate-seeking undergraduates who were 18 to 29 years old; additional recruitment details are reported elsewhere (Loukas et al., 2016). Eligible students were recruited via email to participate in an online survey about college students' tobacco use and exposure to tobacco marketing. Students at 15 schools received an invitation email from project staff, while students at the remaining schools received the email invitation from a school administrator. The introductory invitation provided a brief description of the study and a hyperlink to the survey. Students receiving an email invitation from project staff received a reminder email five days after the introductory invitation and then again six days later. Students who participated in the study provided informed consent, received a \$10 e-gift card upon completion of the survey, and were entered into a drawing to win one of twenty \$50 e-gift cards. More than 13,000 students ($n=13,714$) were eligible to participate in the study and of these, 5,482 students (40%) provided consent and completed the survey. This rate of participation is similar to, or exceeds, that of other online studies of college students (Berg et al., 2015a; Velazquez et al., 2011).

2.3 Measures

2.3.1 Current hookah and other tobacco/nicotine product use—Current (past 30-day) use of hookah and other tobacco/nicotine products was assessed with one item each, adapted from the Youth Tobacco Survey (Starr et al., 2005) and the Population Assessment of Tobacco and Health (PATH) Survey (National Institutes of Health, 2015). The current hookah use question asked “During the past 30 days, how many days did you smoke hookah as intended (i.e., with tobacco)?” Current hookah use was dichotomized into 0=Nonusers and 1=Current Users (use on at least one day during the last 30 days). Among current hookah users, intensity of hookah use was measured by number of days used in the past 30. For all other products (i.e., cigarettes, cigar products, e-cigarettes, and smokeless tobacco) the question asked “During the past 30 days, how many days did you use/smoke [product]”? Each variable was dichotomized into 0=Nonusers and 1=Current-users (use on at least one day during last 30 days). The total number of other tobacco/nicotine products was summed together to determine number of products, besides hookah, used in the last 30 days.

2.3.2 Knowledge of tobacco and nicotine content—Participants were asked if hookah typically contains tobacco and if it typically contains nicotine. Responses to each item were coded 0 if “No” and 1 if “Yes.”

2.3.3 Perceptions of harmfulness and addictiveness—One item each assessed participants’ perceptions of hookah’s harmfulness and perceptions of hookah’s addictiveness. Similar to Popova and Ling (2013), participants were asked how harmful hookah is to health. Responses ranged from 1 (“Not at all harmful”) to 4 (Extremely harmful). Similar to the PATH survey (National Institutes of Health, 2015), participants were asked “how addictive is hookah?” Response options range from 1 (“Not at all addictive”) to 3 (“Very addictive”).

2.4 Data Analysis

All analyses were conducted in R 3.2 and Mplus 7.3. Chi-square tests were used to assess bivariate associations between each study variable and hookah user group. F tests were used to assess differences between users and non-users on perceived harmfulness and addictiveness. A multilevel logistic regression model, adjusting for school-level clustering by including school as a random intercept, was used to examine if hookah knowledge was uniquely associated with current hookah use, over and above perceptions of hookah harm and addictiveness. Number of other tobacco products used and sociodemographic variables were also included as covariates in the model. A parallel model, only with current hookah users was conducted using multilevel negative binomial regression analysis to determine if hookah knowledge was uniquely associated with intensity of hookah use (i.e., number of days used in the past 30), over and above perceptions of harm and addictiveness. The number of other tobacco products use and sociodemographic variables were also included in this model.

3 RESULTS

Approximately half of the sample (55.1%) reported ever hookah use, and 16.8% reported past 30 day hookah use. Among current users, the average number of days used in the past-month was 3.9 (SD = 5.5; see Table 1). Current hookah users were more likely to be younger (aged 18–24 versus 25–29), male, Hispanic/Latino, and to attend a 4-year (versus 2-year) institution, compared to non-users. The mean number of other tobacco products used by current hookah users was higher than non-current users, and non-users were more likely to believe hookah was harmful and addictive than users of hookah. Among the entire sample, approximately one-quarter (26.9%) incorrectly reported that hookah does not contain tobacco, and one-third (38.1%) incorrectly reported that hookah does not contain nicotine. Non-current users of hookah were more likely to report hookah did not contain tobacco compared to users. There were no differences between users and non-users in beliefs about hookah's nicotine content (see Table 1).

The multilevel logistic regression model (see Table 2) indicated that even after controlling for all other variables, knowledge that hookah contained tobacco was associated with increased odds of current hookah use and harm perceptions regarding hookah were associated with decreased odds of current use. There was no association between knowledge of nicotine or perceptions of addictiveness and hookah use. However, the multilevel negative binomial regression indicated that knowledge of hookah contents was not associated with current hookah users' intensity of use. Moreover, although increased perceptions of harm were associated with lower intensity of use among current users, increased perceptions of addictiveness were associated with higher intensity of use.

4 DISCUSSION

The results indicate that a majority of college students have tried hookah and current users smoke hookah approximately once per week. Similar to other studies, correlates of hookah use included younger age and current tobacco use (Jarrett et al., 2012; Sutfin et al., 2011). More than one quarter of all students were not aware that hookah contained tobacco and more than one third of the students were not aware of nicotine in hookah. The findings are consistent with limited research indicating few users know of the chemicals in hookah (Jawad et al., 2013). Consistent with TRA, current hookah use was associated with increased knowledge of tobacco in hookah, and lower harm perceptions, but there was no association between current hookah use and knowledge of nicotine in hookah. However, among current users neither knowledge variable was associated with intensity of use, and although harm perceptions were associated with lower intensity of use, addictiveness perceptions were associated with higher intensity of use.

Current findings extend existing research by showing that students who believed tobacco was in hookah were at increased odds for hookah use. However, among users there were no associations between intensity of hookah use and knowledge of tobacco in hookah. Findings suggest that while users of hookah have more knowledge of tobacco in hookah this is not associated with their level or intensity of use. In contrast, knowledge of nicotine in hookah was not associated with current use or intensity of use. Given that almost 40% of students

did not know that hookah contains nicotine, warning labels and ingredient listings should be mandated on hookah packaging and in places where this product is sold.

The current study asked about nicotine and tobacco in hookah, as well as perceptions of harm and addictiveness, independent of other tobacco products. While most studies about hookah perceptions use comparisons to conventional cigarettes (Heinz et al., 2013; Nuzzo et al., 2013), absolute perceptions are important to measure, as most people will perceive other tobacco products as less harmful when compared to cigarettes (Popova and Ling, 2013). In the only study to examine perceptions of harm and addictiveness independent of other products, Berg et al. (2015b) found that college students had lower harm perceptions for hookah than other products; however, differences were not examined by use status. The current study found that harm perceptions were negatively associated with use for the entire sample and intensity for users only. There was no association between use and perceptions of addictiveness in the overall sample. However, addictiveness was positively associated with intensity for current users. A potential explanation could be that the people who use more often are addicted to nicotine and recognize its effects. More research is needed to elucidate the relationship between perceptions, use, and intensity.

This study is limited by its cross-sectional design; as such, causal inferences cannot be drawn regarding hookah use and knowledge or perceptions of harm and addictiveness. However, the sample includes more than 5,000 students in the four largest metropolitan areas in Texas. Further, students are sampled from both 4-year and 2-year colleges.

Given that both users and non-users of hookah hold incorrect knowledge about hookah use, college tobacco prevention programs and warning labels at hookah bars and on packages are needed that include messages to correct misinformation regarding hookah contents. This is particularly important as students, particularly non-users, are likely unaware that hookah can be addictive. While, some hookah bars offer non-tobacco or non-nicotine options, research indicates that users are still exposed to harmful chemicals that are found in tobacco shisha (Aslam et al., 2014; Hammal et al., 2015; Shihadeh et al., 2012). Thus, herbal shisha is not a healthy alternative. Future research is needed to explore knowledge and harm perceptions with respect to nicotine free herbal shisha to determine if college students have misconceptions about the safety of all forms of hookah products. Importantly, this study underscores the need for education for users and non-users of hookah.

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References

- Ajzen, I.; Fishbein, M. *Understanding Attitudes And Predicting Social Behavior*. Prentice-Hall; New York: 1980.
- Al Rashidi M, Shihadeh A, Saliba N. Volatile aldehydes in the mainstream smoke of the narghile waterpipe. *Food Chem Toxicol*. 2008; 46:3546–3549. [PubMed: 18834915]

- Aslam HM, Saleem S, German S, Qureshi WA. Harmful effects of shisha: literature review. *Int Arch Med*. 2014; 7:1–9. [PubMed: 24387244]
- Berg CJ, Haardoefer R, Escoffery C, Zheng P, Kegler M. Cigarette users' interest in using or switching to electronic nicotine delivery systems for smokeless tobacco for harm reduction, cessation, or novelty: a cross-sectional survey of US adults. *Nicotine Tob Res*. 2015a; 17:245–255. [PubMed: 24951496]
- Berg CJ, Stratton E, Schauer GL, Lewis M, Wang Y, Windle M, Kegler M. Perceived harm, addictiveness, and social acceptability of tobacco products and marijuana among young adults: marijuana, hookah, and electronic cigarettes win. *Subst Use Misuse*. 2015b; 50:79–89. [PubMed: 25268294]
- Cobb C, Ward KD, Maziak W, Shihadeh AL, Eissenberg T. Waterpipe tobacco smoking: an emerging health crisis in the United States. *Am J Health Behav*. 2010; 34:275–285. [PubMed: 20001185]
- Cobb CO, Shihadeh A, Weaver MF, Eissenberg T. Waterpipe tobacco smoking and cigarette smoking: a direct comparison of toxicant exposure and subjective effects. *Nicotine Tob Res*. 2011; 13:78–87. [PubMed: 21127030]
- Eissenberg T, Shihadeh A. Waterpipe tobacco and cigarette smoking: direct comparison of toxicant exposure. *Am J Prev Med*. 2009; 37:518–523. [PubMed: 19944918]
- Hammal F, Chappell A, Wild TC, Kindzierski W, Shihadeh A, Vanderhoek A, Huynh CK, Plateel G, Finegan BA. 'Herbal' but potentially hazardous: an analysis of the constituents and smoke emissions of tobacco-free waterpipe products and the air quality in the cafés where they are served. *Tob Control*. 2015; 24:290–297. [PubMed: 24128428]
- Heinz AJ, Giedgowd GE, Crane NA, Veilleux JC, Conrad M, Braun AR, Olejarska NA, Kassel JD. A comprehensive examination of hookah smoking in college students: use patterns and contexts, social norms and attitudes, harm perception, psychological correlates and co-occurring substance use. *Addict Behav*. 2013; 38:2751–2760. [PubMed: 23934006]
- Jarrett T, Blosnich J, Tworek C, Horn K. Hookah use among US college students: results from the National College Health Assessment II. *Nicotine Tob Res*. 2012; 14:1145–1153. [PubMed: 22318687]
- Jawad M, Jawad S, Mehdi A, Sardar A, Jawad A, Hamilton F. A qualitative analysis among regular waterpipe tobacco smokers in London universities. *Int J Tuberc Lung Dis*. 2013; 17:1364–1369. [PubMed: 24025391]
- Latimer LA, Batanova M, Loukas A. Prevalence and harm perceptions of various tobacco products among college students. *Nicotine Tob Res*. 2013; 16:519–526. [PubMed: 24212764]
- Loukas A, Chow S, Pasch KE, Li X, Hinds JT III, Marti C, Harrell M, Creamer M, Perry C. College students' polytobacco use, cigarette cessation, and dependence. *Am J Health Behav*. 2016; 40
- Montano, DE.; Kasprzyk, D. Theory of reasoned action, theory of planned behavior, and the integrated behavior model. In: Glanz, K.; Rimer, BK.; Viswanath, K., editors. *Health Behavior And Health Education: Theory, Research, And Practice*. Jossey-Bass; San Francisco, CA: 2008. p. 67-96.
- National Institutes of Health. Population Assessment of Tobacco and Health. 2015. <https://pathstudyinfo.nih.gov/UI/HomeMobile.aspx> accessed on August 31 2015>
- Nuzzo E, Shensa A, Kim KH, Fine MJ, Barnett TE, Cook R, Primack BA. Associations between hookah tobacco smoking knowledge and hookah smoking behavior among US college students. *Health Educ Res*. 2013; 28:92–100. [PubMed: 22987864]
- Popova L, Ling PM. Perceptions of relative risk of snus and cigarettes among US smokers. *Am J Public Health*. 2013; 103:e21–e23.
- Primack BA, Sidani J, Agarwal AA, Shadel WG, Donny EC, Eissenberg TE. Prevalence of and associations with waterpipe tobacco smoking among US university students. *Ann Behav Med*. 2008; 36:81–86. [PubMed: 18719977]
- Shihadeh A, Saleh R. Polycyclic aromatic hydrocarbons, carbon monoxide, "tar", and nicotine in the mainstream smoke aerosol of the narghile water pipe. *Food Chem Toxicol*. 2005; 43:655–661. [PubMed: 15778004]
- Shihadeh A, Salman R, Jaroudi E, Saliba N, Sepetdjian E, Blank MD, Cobb CO, Eissenberg T. Does switching to a tobacco-free waterpipe product reduce toxicant intake? A crossover study

comparing CO, NO, PAH, volatile aldehydes, “tar” and nicotine yields. *Food Chem Toxicol.* 2012; 50:1494–1498. [PubMed: 22406330]

Sidani JE, Shensa A, Barnett TE, Cook RL, Primack BA. Knowledge, attitudes, and normative beliefs as predictors of hookah smoking initiation: a longitudinal study of university students. *Nicotine Tob Res.* 2014; 16:647–654. [PubMed: 24323574]

Smith JR, Edland SD, Novotny TE, Hofstetter CR, White MM, Lindsay SP, Al-Delaimy WK. Increasing hookah use in California. *Am J Public Health.* 2011; 101:1876–1879. [PubMed: 21852640]

Starr, G.; Rogers, T.; Schooley, M.; Porter, S.; Wiesen, E.; Jamison, N. Key Outcome Indicators For Evaluating Comprehensive Tobacco Control Programs. CDC; Atlanta, GA: 2005.

Sutfin EL, McCoy TP, Reboussin BA, Wagoner KG, Spangler J, Wolfson M. Prevalence and correlates of waterpipe tobacco smoking by college students in North Carolina. *Drug Alcohol Depend.* 2011; 115:131–136. [PubMed: 21353750]

Velazquez CE, Pasch KE, Laska MN, Lust K, Story M, Ehlinger EP. Differential prevalence of alcohol use among 2-year and 4-year college students. *Addict Behav.* 2011; 36:1353–1356. [PubMed: 21868168]

Highlights

- College students who know hookah contains tobacco are at higher odds of hookah use
- Perceptions of harm and addictiveness are associated with lower odds of hookah use
- Harm perceptions, not knowledge, are associated with lower intensity of hookah use

Table 1

Socio-demographics, cigarette use, and perceptions of harm and addictiveness – differences between current hookah users and hookah non-users

	Overall (N=5451)	Hookah Users (n=914)	Non-Users (n=4,537)	Chi-Square
<i>Age (18–24)</i>	92.6%	94.2%	92.3%	3.99 *
Gender (Male)	36.3%	41.7%	35.2%	13.74 ***
Type of Institution (4-year)	92.6%	94.2%	92.2%	4.33 *
Race				
Non-Hispanic White	36.4%	33.3%	37.0%	4.67 *
Hispanic	31.2%	34.2%	30.5%	4.90 *
Asian	16.9%	16.4%	17.0%	.20
Black	8.1%	7.0%	8.3%	1.64
Other	7.5%	9.1%	7.2%	4.04 *
<i>Tobacco Knowledge (% no)</i>	26.9%	17.6%	28.7%	47.92 ***
<i>Nicotine Knowledge (% no)</i>	38.1%	37.2%	38.3%	0.37
	M (SD) IQR[‡]	M (SD) IQR[‡]	M (SD) IQR[‡]	F
Index of other tobacco product use ^λ	0.51 (.85) 0–1	1.31 (1.06) 0–2	0.35 (0.69) 0–1	1217 ***
Average number days used in past 30	–	3.88 (5.53) 1–4	–	–
Average age of first use	–	17.44 (2.21) 16–18	–	–
	M (SD)	M (SD)	M (SD)	F
<i>Perceived Harm⁺</i>	2.87 (.89)	2.74 (.90)	2.90 (.89)	24.25 ***
<i>Perceived Addictiveness⁺⁺</i>	1.95 (.71)	1.79 (.65)	1.98 (.72)	56.80 ***

*
p<.05

p<.001

⁺1=not at all harmful to 4=extremely harmful

⁺⁺1=not at all addictive to 3=very addictive

[‡]
IQR=interquartile range

^λ
=sum of number of other tobacco products used in past 30 days

Table 2

Associations of knowledge, perceptions, and hookah use among the entire sample (n=5451) and among current hookah users (n=914)

	Past 30-Day Hookah Use [†]	No. of Days Used in Past 30 ^{††}
	Overall Sample (n=5451)	Current Users Only (n=914)
	AOR* (95% CI)	IRR** (95% CI)
<i>Covariates</i>		
Two-year college	Referent group	Referent group
Four-year college	1.43 (1.01–2.03)	0.96 (0.71–1.30)
18–24 year old	Referent group	Referent group
25–29 year old	.53 (0.38–0.74)	0.98 (0.74–1.29)
Female	Referent group	Referent group
Males	.82 (0.69–.97)	1.00 (0.87–1.14)
White	Referent group	Referent group
Race		
Hispanic	1.41 (1.15–1.73)	0.85 (0.72–1.00)
African American	1.16 (0.83–1.62)	0.94 (0.72–1.24)
Asian American	1.67 (1.31–2.14)	1.22 (1.00–1.49)
Other	1.58 (1.16–2.15)	1.26 (0.99–1.60)
Index of other tobacco product use ^λ	3.17 (2.90–3.46)	1.28 (1.20–1.36)
<i>Perceptions/Knowledge</i>		
Perceived Hookah Harm	0.85 (0.77–0.94)	0.90 (0.83–0.97)
Perceived Hookah Addictiveness	0.89 (0.78–1.01)	1.18 (1.06–1.31)
Tobacco in Hookah	1.92 (1.55–2.36)	1.17 (0.97–1.40)
Nicotine in Hookah	.92 (0.77–1.10)	0.95 (0.83–1.10)

[†] Multilevel logistic regressions, outcome is current hookah use, among full M-PACT sample

^{††} Multilevel negative binomial regression, outcome is intensity of hookah use (i.e., number of days used in past 30), among current hookah users only

* AOR=Adjusted Odds Ratio; model adjusted for all covariates listed; bolded AOR indicates significant at the p<.05 level

** IRR=Incident Rate Ratio; model adjusted for all covariates listed; bolded IRR indicate significant at the p<0.05 level

^λ =sum of number of other tobacco products used in past 30 days