



## An exploration of online behaviors and social media use among hookah and electronic-cigarette users



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### ABSTRACT

**Introduction:** The purpose of this study was to explore the relationship between social norms and attitudes towards ENDS and hookah and use of these products.

**Methods:** We conducted surveys with hookah and ENDS users who regularly used the Internet and social media and analyzed the primary social media account (e.g. Facebook) of each participant, coding all references to nicotine or tobacco products. The survey included domains on perceived favorability, perceived vulnerability and subjective norms.

**Results:** We surveyed 21 ENDS users and 20 hookah users. Both groups used the Internet to look up information about their respective tobacco product (95% for hookah vs. 90% for ENDS). Seventy percent of hookah users had references to hookah on their social media profiles while 43% of ENDS users had references to ENDS on their page. The majority of both groups were exposed to content posted by friends in their social media network about their respective products online. Those who posted on social media about hookah and those who read about ENDS online had lower perceived vulnerability to the health risks associated with tobacco products.

**Conclusions:** Hookah and ENDS users actively use the Internet and social media to obtain and share information about nicotine/tobacco products. Study participants who use hookah were more likely to share photos and discuss hookah related activities via social media than those who use ENDS. Social networks also represent valuable and untapped potential resources for communicating with this group about risks and harm reduction related to emerging nicotine/tobacco products.

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### 1. Introduction

Emerging tobacco products such as hookah and electronic nicotine delivery systems (ENDS) are increasingly popular in the United States. Estimates of hookah use range from 15–41% for lifetime use, 12–30% for past-year use, and 7–21% for past-month use in the U.S. and Europe (Grekin & Ayna, 2012). From 2010 to 2013, awareness of ENDS among US adults increased from 40% to 86% with self-reported use rising from 3.4% to 15% (Emery, Vera, Huang, & Szczyepka, 2014; Pearson, Richardson, Niaura, Vallone, & Abrams, 2012).

Internet searches on hookah and ENDS are on the rise (Ayers, Ribisl, & Brownstein, 2011; Salloum, Osman, Maziak, & Thrasher, 2014; Yamin, Bitton, & Bates, 2010). Yet, little is known about how users seek and apply information on alternative tobacco products, or the degree of

influence that online interactions have on use of these products. Emery et al. found that time spent online and use of social media were associated with awareness of ENDS and searching for ENDS information (Emery et al., 2014).

Social media represent an important forum for the exchange of information as it provides users the capacity to virtually interact with others by sharing and discussing text, photo, video or other multimedia-based content. Social media websites are extremely popular; 75% of those aged 18–29, 50% of those aged 30–45 and 30% of those aged 46–64 report creating a social media profile (Pew Research, 2010). In 2013, users in the US spent 16 min of every hour online on social networking websites (Experian Marketing Services, 2013).

Social media websites provide a daily bulletin of attitudes and behaviors of people in one's social network. Since having at least one friend perceived to be a current smoker is a predictor of initiation (Kandel, Kiros, Schaffran, & Hu, 2004), peer use in online networks may be a powerful influence on experimentation (Freeman & Chapman, 2010). The purpose of this study was to explore the relationship between social norms and attitudes towards ENDS and hookah and use of these products.

Abbreviation: ENDS, Electronic nicotine delivery system.

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## 2. Methods

We conducted surveys with hookah and ENDS users who regularly used the Internet and social media and analyzed the primary social media account of each participant, coding all references to nicotine or tobacco products.

### 2.1. Recruitment and participants

We distributed print flyers on The City University of New York and New York University campuses, at/near hookah bars in Manhattan and an ENDS store in Queens, and posted flyers on [Craigslis.org](http://Craigslis.org) and [e-cigaretteforum.com](http://e-cigaretteforum.com). The eligible participants: 1) were  $\geq 18$  years of age; 2) currently used hookah or ENDS ( $\geq 2 \times$  in the past 30 days); 3) actively used social media websites (Facebook, Instagram, Twitter or Google+) in the past 2 days; 4) used the Internet  $>1$  h/day; and 5) spoke English. The eligible participants were invited for a 60–90 minute interview for which they were compensated \$50. At the beginning of the interview, all participants provided written informed consent. This study was approved by the Institutional Review Board at the NYU School of Medicine.

### 2.2. Data collection and measures

Participants also completed a brief survey guided by the Prototype/Willingness Model (PWM). The PWM is a dual-processing model that recognizes two paths to risk behavior: an analytically-driven reasoned action pathway, and a social reaction pathway that relies more on heuristic processing (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; Hukkelberg & Dykstra, 2009; Litt & Stock, 2011; Ravis, Abraham, & Snook, 2011; Stock, Litt, Arlt, Peterson, & Sommerville, 2013). To assess the constructs of the PWM, we included several items used by Gerrard et al. (2006) including: 1) *perceived favorability* of the typical person their age and gender who uses the given tobacco product; 2) *attitudes/perceived vulnerability* to the negative consequences of using each type of product (e.g. 'if you were to smoke hookah, what are the chances that you would get lung cancer'); and 3) *subjective normative perceptions* of use of each product (e.g. 'I feel under pressure from friends to smoke hookah'). Each of these were measured on a Likert-scale with the 'neutral' option receiving a score of 0: 1) perceived favorability (7 items with a 5-point scale, max score = +14, indicating the highest favorability); 2) perceived vulnerability (3 items with a 5-point scale, max score = +6, indicating answers of 'very likely' to get lung cancer/other cancer/heart disease); 3) social norms (4 items with a 7-point scale, max score = +12, indicating the highest perceived social pressure to use the respective products). For categorical analyses, we dichotomized the measures for perceived vulnerability and social norms into high ( $>0$ ) vs. low ( $\leq 0$ ). We adapted questions from the California Tobacco Survey (University of San Diego, 1999) on tobacco use history, peer/parental use, advertising exposure, and plans to quit.

### 2.3. Social media profile coding

We had participants log in to their most frequently used social media accounts and a trained research assistant used a standardized worksheet to review each participants' homepage and profile, specifically looking for content related to nicotine/tobacco products. Moreno et al. used this strategy to characterize exposure to alcohol content and peer influence online (Moreno, Grant, Kacvinsky, Egan, & Fleming, 2012). We reviewed text, photographs, and groups/pages that the participant followed. We created a codebook informed by the PWM that was used to define key terms and images related to or referencing tobacco use (e.g., photos showing consumption or display of tobacco). For each item containing N/T content, we documented a description of the content, the number of likes (perceived favorability), and the number of comments (social norms).

### 2.4. Analysis

We calculated descriptive statistics, including means and standard deviations where applicable. We used t-tests to evaluate continuous variables and Fisher's Exact Test to evaluate categorical data. For the purpose of this analysis, the results of the social media coding were simplified into dichotomous outcomes (yes/no), based on whether the coder found references to *any* nicotine/tobacco and references to hookah and ENDS, specifically.

## 3. Results

The mean age among hookah smokers ( $N = 20$ ) was 26 and 65% were male, while among the ENDS users ( $N = 21$ ) the mean age was 36 and 62% were male (Table 1). Among all participants, 41% used both hookah or ENDS and cigarettes, 34% used both hookah and ENDS and 15% used all three. However, among the participants who had used the other alternative tobacco product, all reported infrequent use (less than monthly for hookah and less than weekly for ENDS). Thus, for the analyses we based the two groups on the alternative product that participants used more frequently and on a regular basis. Both groups used the Internet to look up information about their respective tobacco product (95% for hookah vs. 90% for ENDS). Seventy percent of hookah users had references to hookah on their social media profiles while 43% of ENDS users had references to ENDS on their social media page. While the majority of both groups were exposed to content posted by friends in their social media network about their respective products online – hookah users were more likely to see this content

**Table 1**  
Demographics and characteristics.

	ENDS users (n = 21)	Hookah users (n = 20)
Age (years, mean $\pm$ SD)	36 $\pm$ 12	26 $\pm$ 6
18–22	5%	40%
23–29	38%	30%
30–39	19%	30%
40+	38%	0%
Race		
White	48%	35%
Black	43%	40%
Other	10%	25%
Hispanic ethnicity	10%	45%
Male	62%	65%
Education		
High school	24%	5%
At least some college	52%	65%
Graduate degree	24%	15%
Current student		
No	76%	55%
Undergrad	5%	35%
Graduate	19%	10%
Married or living w. partner	33%	30%
Foreign-born	14%	20%
Cigarette use		
Never cigarette smoker	5%	30%
Former cigarette smoker	52%	30%
Current cigarette smoker	43%	40%
Plans to quit cigarettes?		
Yes, within the next 30 days	22%	13%
Yes, within the next 6 months	56%	38%
No, not thinking of quitting	22%	50%
Plans to quit alt. tobacco product		
Yes, within the next 30 days	5%	0%
Yes, within the next 6 months	52%	11%
No, not thinking of quitting	43%	89%
Dual and poly-use		
Uses the other alternative tobacco product (e.g. hookah or ENDS)	38%	30%
Currently uses cigarettes, hookah & ENDS	10%	25%
Former cigarette smoker who uses hookah & ENDS	20%	0%
Never cigarette smoker who uses hookah & ENDS	5%	5%

**Table 2**

Internet and social media behaviors relating to N/T products.

	ENDS users (n = 21)	Hookah users (n = 20)	p-Value
Used the Internet to look up info about N/T products	90%	95%	1.0
Seen references to ENDS or hookah on social media site/app	52%	90%	<b>0.02</b>
References to any N/T on social media profile	52%	75%	0.20
References to ENDS or hookah on social media profile	43%	70%	0.12
Conversed about N/T products online	57%	45%	0.75
Tried a N/T product because of something read on the Internet	43%	40%	1.0
Read about another's N/T quit attempt on social media	62%	70%	0.74
Supported another's N/T quit attempt through social media	43%	45%	1.0
Interested in a social media based quit intervention	76%	75%	1.0

Bold values indicate significance at \* $p < 0.05$ .

compared with ENDS users (90% vs. 52%,  $p = 0.02$ ) (Table 2). Both groups communicated with others about N/T products online (45% of hookah users, 57% for ENDS users). Sixty-five percent of ENDS users purchased ENDS products over the Internet. Participants who reported having seen N/T related content on a social media site were significantly more likely to have tried a N/T product because of something that they read or saw on the Internet (54% vs. 17%,  $p = 0.03$ ). Hookah users had more friends who used hookah (50% vs. 4%) while ENDS users had more friends who use ENDS products (19% vs. 3%) (Appendix A – Table A.1).

### 3.1. Perceived favorability

Participants generally perceived users of their own product more favorably. While ENDS users had a neutral favorability score towards hookah users ( $-0.4 \pm 5.5$ ) and a very positive favorability towards other ENDS users ( $4.6 \pm 4.6$ ), hookah users had positive perceived favorability towards both groups ( $3.9 \pm 4.3$  for hookah;  $1.5 \pm 4.2$  for ENDS). ENDS users had slightly positive favorability ( $1.33 \pm 5.2$ ) while hookah users had neutral favorability ( $-0.1 \pm 3.5$ ) towards cigarette users (Appendix A – Table A.1).

### 3.2. Perceived vulnerability

Both groups perceived high vulnerability to tobacco-related diseases if they were to smoke cigarettes (overall mean =  $+2.6$ ). Mean scores for perceived vulnerability to the risks of hookah were concentrated around 0 (unsure) for both hookah and ENDS users. ENDS users perceived themselves to be at low risk for tobacco-related diseases based on their use of ENDS ( $-3.5 \pm 2.7$ ), while hookah users were unsure about their perceived vulnerability were they to use an ENDS (Appendix A – Table A.1).

Those who self-reported posting hookah-related content on social media were significantly more likely to perceive low vulnerability to tobacco related diseases associated with hookah use than those who have not posted photos ( $p = 0.04$ ). This finding was consistent with the social media profile coding; 67% of those who had references to hookah on their profile perceived low vulnerability to health risks. Ninety percent of ENDS users with references to ENDS on their profile had low perceived vulnerability for diseases caused by ENDS use. All participants who tried ENDS because of something that they read on the Internet ( $n = 9$ ) perceived low vulnerability.

### 3.3. Social norms

Overall, the mean subjective norm scores were negative for both groups across all three forms of N/T, indicating that participants generally did not feel pressure from others to use N/T products. On average, hookah users reported higher social pressure to use hookah than did ENDS users ( $-4.3 \pm 4.1$  vs.  $-8.1 \pm 5.8$ ,  $p = 0.04$ ). The same pattern was observed for pressure to use ENDS with ENDS users reporting higher social pressure than hookah users ( $-2.6 \pm 5.2$  vs  $-7.5 \pm 5.0$ ,

$p = 0.02$ ). When dichotomized into high vs. low subjective norm scores, all hookah participants who reported high social pressure to smoke hookah had posted photos of themselves smoking hookah on social media.

### 3.4. Social media & quitting tobacco

Two-thirds of participants had read about and 44% had supported another's tobacco quit attempt (e.g. liking the post or writing a comment) on a social media site (Table 2). Three-quarters of participants stated that they were interested in a social-media based quit intervention (Table 2); however only 57% of ENDS users and 11% of hookah users were planning to quit their respective products within the next 6 months (Table 1).

## 4. Discussion

Hookah and ENDS users actively use the Internet and social media to obtain and share information about hookah and ENDS. Based on the social media analysis and the interviews, the study participants who use hookah were more likely to share photos and discuss hookah related activities via social media than those who use ENDS.

Hookah-related social media behavior was associated with low perceived vulnerability to tobacco related diseases, as well as high influence of social pressures. ENDS users strongly believed themselves to be at low risk for tobacco related diseases, a belief even stronger among those who tried an ENDS-product because of something that they had read on the Internet. Since those who posted hookah photos on social media believed themselves to have significantly lower vulnerability to disease than those who didn't, this suggests that hookah users may be influenced by the social norms enforced by photos on social media. Our data support the assertion that both hookah and ENDS users may be easily persuaded by information found on the Internet.

Users of hookah and ENDS perceived other users of these products favorably and reported social pressure to use these products. Indeed a majority of participants' 10 closest friends used tobacco products. Given the social context of hookah use, in particular, this may promote continued use. Furthermore, both groups, and especially hookah users, are continually exposed to risk images depicting product use via social media. Relating our findings back to the Model, there appears to be a cyclic pattern through which peer or prototype behavior exemplified by pro-tobacco content on the Internet contributes to willingness to try and continue using alternative tobacco products.

Our results build on the findings of Emery et al. that 76% of ENDS users had searched for ENDS information online, 23% had searched specifically on Facebook, and 49% had shared ENDS information on Facebook (Emery et al., 2014). In a longitudinal cohort study, positive attitudes and normative beliefs around the acceptability of hookah smoking were associated with increased odds of initiation (Sidani, Shensa, Barnett, Cook, & Primack, 2014). This suggests that exposure to photographs of friends or acquaintances smoking hookah may

contribute to initiation as well. Thus, it appears that social media can play an important role in exposure to alternative tobacco products.

This study had several limitations. First, given that this was a pilot study, we had a small sample size. Second, we recruited a convenience sample through free online advertisements and flyers in New York City, and the findings may not be representative of all hookah and ENDS users. Third, the data were cross-sectional and results were based on self-report, aside from the social media profile coding, which may limit the conclusions.

Since the Family Smoking Prevention and Tobacco Control Act reduces the tobacco industry's ability to use traditional marketing to reach potential smokers (U.S. Department of Health and Human Services, 2012), it is important to understand how people share, perceive and discuss tobacco-related content online in order to identify effective anti-tobacco messages and channels. Importantly, the study participants noted high interest in a social media-based quit intervention – this is an avenue that should be pursued further. The Internet may be a double-edged sword for hookah and ENDS users. Our data suggests that those who actively engage in nicotine/tobacco-related social media behavior are less likely to believe that their N/T product of choice makes them vulnerable to disease. However, social networks also represent valuable and untapped potential resources for communicating with this group about risks and harm reduction related to emerging N/T products.

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#### Contributors

AL, DS and SS designed the study and wrote the protocol. AL oversaw the data collection and conducted the data analysis. PC conducted literature searches, provided summaries of previous research studies, and assisted with data analysis. All authors contributed to writing and editing the manuscript, and all have approved the final manuscript.

#### Conflict of interest

The authors have no conflicts of interests to declare.

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