Vaping, Smartphones, and Social Media Use among Young Adults: Snapchat is the Platform of Choice for Young Adult Vapers

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Abstract

Background.—Tobacco use often begins or stabilizes in young adulthood. Approximately 90% of young adults use social media and over 80% own a smartphone. Retailers of electronic nicotine delivery systems (ENDS) have targeted smartphones and social media with adverting campaigns. Despite evidence of ENDS advertising on social media and smartphones, few studies have examined associations between exposure to vaping advertisements on smartphones, social media use, and ENDS use (i.e., vaping) among young adults.

Methods.—College students aged 18-24 from a large public university (*N*=1047) completed online surveys about vaping. The survey measured frequency of vaping advertisement exposure, smartphone use, social media use, and vaping behaviors. Hierarchical logistic regression assessed whether demographics, vaping advertisement exposure, smartphone use, and social media use predicted ever vaping compared to never vaping.

Results.—The four most commonly used platforms (used "daily") were Snapchat (80.0%), Instagram (73.4%), YouTube (59.7%), and Facebook (54.3%). Use of Snapchat, Instagram, and Facebook were all significantly associated with higher rates of vaping advertisement exposure via smartphones. Exposure to vaping advertisements on smartphones was associated with ever vaping

(AOR: 1.30, 95% CI = 1.05-1.60). Of the social media platforms examined, only Snapchat use frequency was associated with higher odds of ever vaping (AOR: 1.22, 95% CI = 1.10-1.36).

Conclusions.—Exposure to advertisements via smartphones and use of Snapchat were associated with higher rates of vaping for young adults. Social media and smartphone use should be further investigated for young adult impact.

Keywords

vape; advertising; social media; young adults

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1. Introduction

Tobacco use often begins or stabilizes in young adulthood (USDHHS, 2012). Increasingly, that use involves electronic nicotine delivery systems (ENDS) (Dai & Leventhal, 2019). ENDS use (i.e., vaping) among young adults has grown over the last five years, with a 46% increase from 2017 to 2018 alone (Dai & Leventhal, 2019; Hu et al., 2016). The upward trend in vaping appears to begin in adolescence and carry into young adulthood. Despite declines in adolescent cigarette smoking, overall tobacco product use by high school students increased in recent years (Gentzke et al., 2019; Wang et al., 2019), arguably reaching epidemic proporions (Kong & Krishnan-Sarin, 2017). This is largely due to dramatic increases in vaping. Since 2014, vaping has become the most popular way for young adults to consume tobacco (USDHHS, 2016). Monitoring the Future recently reported a dramatic increase in past-month nicotine vaping by college students from 6.7% in 2017 to 15.5% in 2018 (Schulenberg et al., 2019)..

The growth of vaping among young adults may be linked to aggressive marketing by ENDS retailers. Social media use is popular among young adults with 90% reporting use of at least one social media site (Perrin, 2015). *Social media* are web-based platforms that allow users to share content through social networks (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). ENDS retailers have targeted social media platforms with advertising campaigns, including Snapchat (Pepper et al., 2017), Instagram (Chu, Allem, Cruz, & Unger, 2017), YouTube (Huang, Kornfield, & Emery, 2016), Facebook (Emery, Vera, Huang, & Szczypka, 2014), and Twitter (Huang, Kornfield, Szczypka, & Emery, 2014). Increasingly, these platforms are viewed not via computer, but on smartphones, with at least 85% of young adults reporting smartphone ownership (Smith, 2015). Together, there is reason to believe that young adults may be exposed to a high number of vaping advertisements—on smartphones, on social media, or both. However, the research on this issue is limited.

Alarmingly, Randomized Controlled Trial (RCT) evidence suggests exposure to ENDS advertising can increase the likelihood of use for never vapers (Villanti et al., 2015). Despite evidence ENDS retailers are targeting social media with vaping advertisements and that ENDS advertising can be effective, we could only find one published study where advertisement exposure on social media was associated with vaping among young adults (Pokhrel et al., 2018). In this survey-based study, Pokhrel et al. (2018) found young adults' exposure to vaping content on social media was indirectly associated with vaping through outcome expectancies. Importantly, this study did not include Snapchat, which is more

widely used among young adults than both Facebook and Twitter (Villanti et al., 2017). Snapchat has also been identified as a site where adolescents and young adults share user-generated content (e.g., "vape tricks") (Kong et al., 2019; Kong et al., 2020; Pepper et al., 2017). However, it is not currently known if vaping advertising is prevalent on this platform. Despite evidence ENDS retailers are targeting smartphones with mobile advertising (Cantrell et al., 2017), we could only find one study assessing linkage between smartphone use and vaping (Thrasher et al., 2016). This study found links between technology, internet advertising exposure, and vaping among adolescents in Mexico. It is unknown if similar results may be present among young adults in the United States.

Considering smartphones and social media are inter-related (yet different) pathways to vaping content, more research is needed to understand how exposure to advertisements on smartphones and frequency of using social media are associated with vaping. This topic is particularly relevant to young adults who are heavy users of both smartphones and social media, and who are at risk of developing life-long tobacco addictions. To better understand these relationships, we pose the following research question: How does frequency of exposure to vaping advertisements and use of social media affect the vaping behaviors of young adults? To answer this question, we conducted a secondary analysis of a survey of young adults, measuring smartphone use, social media use, frequency of exposure to ENDS advertisements (i.e., vaping advertisements), and frequency of ENDS use (i.e., vaping).

2. Methods

2.1 Participants and Procedures

A 4-year university in the Mid-Atlantic region of the United States provided researchers with all e-mail addresses for current students age 18-24 between September 25th and October 20th, 2017. Invitations for online surveys about vaping were e-mailed to a random selection of these students (*N*=6499). Once accessed, participants provided consent and were able to complete the survey if interested. Excluding partial completions (*n*=316) resulted in a sample of 1047 completed surveys, yielding an acceptable response rate of 16.1% (AAPOR, 2015; Van Mol, 2017). Participants were paid $10 (via Amazon gift card) for completing the survey. The survey was designed as part of a mixed methods study to develop a measure of ENDS expectancies (Harrell et al., 2019). Research was approved by a university institutional review board prior to data collection.

2.2 Measures

2.2.1 Demographics.—Participants were asked to report gender identification , racial identification (*American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White,* and *Other*), and age. Employment was measured by asking if participants worked for pay and how many hours worked per week (1=*Less than One Hour*, 2=*1-5 Hours*, 3=*6-9 Hours*, 4=*10-19 Hours*, 5=*20-29 Hours*, 6=*30-39 Hours*, and 7=*40 or More Hours*).

2.2.2 Vaping status.—Participants were asked if they had ever used or tried a vaping device (e.g., e-cigarette, vape, or tank). Responses included, 1=*No*, 2=*Yes, But Not in the*

Last 6 Months, or 3= *Yes, in the Last 6 Months.* Next, participants were asked how many days they had used a vaping device of the last 30 days. Vaping status (*Never user, Experimenter,* and *Current* [past month] *Vaper*) was dichotomized as "never vaper" (No, never used or tried a vaping device) versus "ever vaper" (Used or tried a vaping device in lifetime: either in the last 6 months or previously) for ANOVA and regression analyses.

2.2.3 Smoking status.—Smoking status was measured similarly to vaping status, with participants responding if they have ever used or tried a cigarette ("even a puff"), if they had used in the last 6 months, and how many days they used in the past 30 days.

2.2.4 Smartphone usage.—Participants were asked to estimate how many hours and minutes they spent using a smartphone (including all applications except music) per day. Initial values ranged from 0-100 hours per day, including some participants (9.0%) who reported using their smartphone 16 hours or more in a day. As over 24 hours per day of usage is impossible and over 16 hours per day was considered implausible, smartphone usage response options for these participants were cut off at 16 hours per day. On average, participants reported using their smartphone a mean of 7 hours and 10.4 minutes per day (*SD*=4 hours, 35.0 minutes).

2.2.5 Social media platform usage.—Respondents were asked how often they used 11 social media platforms: Snapchat, Instagram, YouTube, Facebook, Twitter, Google+, Reddit, Tumblr, Pinterest, Vine, and LinkedIn. For ANOVA analyses, responses were coded as: 0 = *No Use*, 1 = *Less than Monthly*, 2 = *Every Few Weeks*, 3 = *1-2 Days Per Week*, 4 = *3-5 Days Per Week*, 5 = *About Once Per Day*, and 6 = *Several Times Per Day*. On average, participants reported weekly use of 4.7 social media platforms (*SD*=1.7), and daily use of 3.7 platforms (*SD*=1.6).

2.2.6 Vaping ad exposure.—Participants were asked how often they saw advertisements for vaping devices when *reading news or magazines, watching TV or movies,* or *using a smartphone*. Some students reported "I don't do this," indicating they did not engage in the behavior and were thus left out of analyses (*n*=305 for news/magazines; *n*=59 for TV/movies; *n*=32 for smartphone). Responses were coded as: 0 *Never*, 1=*Rarely*, 2=*Sometimes*, 3=*Most of the time*, or 4=*Always*.

2.3 Data Analysis Plan

Analyses were conducted in SPSS Version 25. To understand differences in overall patterns of smartphone usage and vaping ad exposure between ever-vapers and never-vapers, number of minutes of smartphone usage per day, number of social media platforms used weekly, number of platforms used daily, social media platform usage, and vaping ad exposure were compared using Analyses of Variance (ANOVAs). ANOVAs were further used to examine differences in smartphone vaping advertisement exposure between daily usage of different platforms. Finally, we wanted to examine the relationship between social media platform usage and ENDS use. The outcome variable was vaping status (ever vaped/never vaped). We conducted both unadjusted logistic regressions and hierarchical logistic regression. Unadjusted logistic regression examines the relationship between two variables without

adjustment for potential confounders. Hierarchical logistic regression (HLR), similar to other forms of covariate adjustment, allows for understanding the influence of variables of interest independent of potential confounding variables. HLR differs from other forms of covariate adjustment by grouping covariates into blocks to allow for sequential assessment of groups of variables. For the present study, we were interested in understanding the influence of vaping advertisement exposure independent of demographic influences, as well as the influence of social media use independent of vaping advertisement exposure. Thus, we conducted a HLR with 3 blocks. Block 1 included demographic predictors: age, gender (male/female), race (non-White or White), ethnicity (Hispanic or Non-Hispanic), cigarette smoking status (Never-user, Experimenter, Current User) and employment information (work for pay: no/yes). Individuals who identified as transgender ($n = 2$) or preferred not to answer ($n = 5$) were removed due to the binary use of male/female in analyses. Block 2 added vaping ad exposure via several outlets: news or magazines, television or movies, or using a smartphone. Block 3 included social media platform usage for Snapchat, Instagram, YouTube, and Facebook.

3. Results

3.1 Participant Characteristics

Participant characteristics are shown on Table 1. The sample (N=1081) was majority female (56.5%), White (51.7%), non-Hispanic (90.1%), and 18 to 20 years old (67.5%). Less than half of respondents were ever smokers (25.0% experimenters and 15.4% current users). Conversely, over half of respondents were ever vapers (34.0% experimenters, 22.4% current users).

3.2 Smartphone and Social Media Use

Although never vapers did not differ significantly from ever vapers in minutes of smartphone use per day M=436.0, SD=282.5 versus M=426.0, SD=269.6, $F(1,1046) = 0.34$, p=.56, they did differ in the number of apps they reported using on a daily, M=3.5, SD=1.6 versus M=3.9, SD=1.6, $F(1,1046)$= 12.70, p<.001, or weekly, M=4.5, SD=1.7 versus M=4.9, SD=1.7, $F(1,1046)$=22.06, p<.001, basis. Thus, ever users were more active in terms of the number of social media platforms they used compared to never vapers.

3.3 Social Media Platform Usage

Table 2 describes social media platform use frequency of the sample. A majority of the sample used Snapchat (80.0%), Instagram (73.4%), YouTube (59.5%), and Facebook (54.3%) on a daily basis, i.e., either "About Once Per Day" or "Several Times Per Day"; less than half reported daily use of Twitter (44.4%), Google+ (21.7%), Pinterest (11.8%), Tumblr (10.3%), Reddit (9.8%), Vine (3.7%), or LinkedIn (4.1%). Based on these results, our analyses focused on platforms that were used daily by a majority of respondents (viz., Snapchat, Instagram, YouTube, and Facebook). Ever-vapers did not differ significantly from never-vapers in their levels of use of YouTube (p=.543), Facebook (p=.065), or Instagram (p=.052), but ever-vapers did report using Snapchat significantly more often than their non-vaping peers, M=5.22, SD=1.76 versus M=4.57, SD=2.34, $F(1,1045)$=26.29, p<.001. See Figure 1.

3.4   Vaping Advertisement Exposure

Many reported never using an advertising outlet or never seeing vaping advertisements on that outlet, including almost half (46.9%) in regards to reading news or magazines, over a third (33.9%) for TV or movies, and over a fourth (29.8%) for smartphones. However, sizable minorities said they saw vaping advertisements "most of the time" or "always" when reading news or magazines (7.5%), watching TV or movies (11.5%), or using a smartphone (11.2%). As shown in Figure 2, ever-vapers reported significantly *lower* exposure to vaping advertisements when reading news or magazines, M=2.23, SD=1.08, compared to never-vapers, M=2.40, SD=0.97, F(1,742)=26.29, p=.03. Ever-vapers did not differ significantly from never-vapers in television/movie vaping advertisement exposure (p=.12), but reported exposure to significantly more smartphone vaping advertisements than never-vapers, M=2.40, SD=0.98, versus M=2.24, SD=1.08, F(1,1015)=4.81, p=.03. In regards to platform use, daily Snapchat users reported significantly more exposure to vaping advertisements than daily users, M=2.32, SD=1.09 versus M=2.10, SD=1.00, F(1,1013)=6.34, p=.01, as did daily Instagram users, M=2.32, SD=1.08 versus M=2.15, SD=1.09, F(1,1013), p=.03, but there were no significant differences for Facebook (p=.14) or YouTube (p=.93) users. See Figure 3.

3.5   Predictors of Vaping Behavior

As shown in Table 3, several variables were significant predictors of ever vaping in unadjusted models, including female gender, non-white race, working for pay, smoking status, vaping advertisement exposure in newspapers, vaping advertisement exposure on smartphones, and Snapchat use frequency. Results of the hierarchical logistic regression model are presented in Table 4. Block 1 (demographics) correctly classified 72.6% of participants (Nagelkerke R^2=0.34). Significant predictors were age (OR=0.88, p<.05), female gender (OR=0.68, p<.01) work for pay (OR=0.58, p<.01), and cigarette smoking (OR=6.65, p<.001). No other variables in Block 1 were significant predictors. Addition of vaping advertisement exposure variables in Block 2 explained an additional 0.2% of variance in the model, with demographic block variables remaining significant, and exposure to vaping advertisements via news/magazines (OR=0.78, p<.05) and smartphone (OR=1.62, p<.05) predicting vaping. Block 3 (social media platform use) explained an additional 0.2% of variance in the model. Age was no longer significant, but other variables in Blocks 1 and 2 remained significant in predicting vaping status, as well as Instagram (OR=0.87, p<.05) and Snapchat (OR=1.22, p<.001) use frequencies.

4.   Discussion

Despite factors indicating that exposure to vaping advertisements on smartphones (Cantrell et al., 2017; Thrasher et al., 2016) and social media (e.g., Pepper et al., 2017; Kong et al., 2020) might be contributing to vaping behaviors of young adults, to our knowledge, only one published study has explored these relationships empirically (Pokhrel et al., 2018) and did not include Snapchat, one of the platforms most widely used by young adults. Indeed, in the current study, Snapchat was the most widely used. To address this gap in the literature, we surveyed young adults' vaping advertisement exposure, smartphone use, social media use, and vaping behaviors. Results showed that self-reported frequent exposure to vaping

advertisements on smartphones predicted vaping behaviors of young adults, while other media such as television and newspapers, did not. The four most commonly used social media platforms were Snapchat (71.9%), Instagram (62.1%), YouTube (41.9%), and Facebook (39.4%). Use of Snapchat, Instagram, and Facebook were all significantly correlated with higher rates of exposure to vaping advertisements. However, only daily use of Snapchat predicted vaping behaviors. Although these results are preliminary, they have the potential to help inform future research and prevention efforts targeting young adults.

Snapchat users were more likely to have tried vaping. No other platform increased the likelihood of vaping. This finding is noteworthy in identifying Snapchat as a platform favored by ENDS users. Snapchat is a mobile app that emphasizes photo and video sharing. Snapchat is more widely used among young adults than both Facebook and Twitter (Villanti et al., 2017) and is the most used social media platform for teens 13-17 years old (Pew Research Center, 2018). Research has found that adolescents use Snapchat to share videos of "vape tricks" (Pepper et al., 2017), a relatively common practice among adolescents (Kong et al., 2020) and young adults (Kong et al., 2019). Our results comport with this research by linking Snapchat to vaping, as Snapchat users in our sample were more likely to have tried vaping. To our knowledge, this is the first study finding an association between daily use of Snapchat and vaping. Given the exploratory nature of this study, results should be interpreted with caution. However, they indicate further research is needed to investigate this relationship.

Those who reported more frequent exposure to vaping advertisements on smartphones were more likely to have vaped (OR=1.62, 95% CI=1.02-2.60). Advertisement exposure through other media was not associated with vaping. This finding is informative, as exposure to tobacco advertising on television, in movies, and in magazines and newspapers, has been associated with greater use (USSHHS, 2012). However, we found exposure to vaping advertisements on smartphones—and not television, movies, and print—predicted greater use. Perhaps ENDS advertising is more prevalent online and thus, more salient to users. Analysis of National Youth Tobacco Surveys (NYTS), for instance, found youth were exposed to ENDS advertisements on the internet more so than television, newspapers, or magazines (Marynak et al. 2018). This is not surprising as ENDS advertisers target social media (Huang et al., 2016) and exposure to these advertisements has been associated with greater susceptibility for vaping (Hébert et al., 2017; Liu et al., 2020). Our results comport with this previous research associating exposure through social media to increased likelihood of vaping, and points to areas of future research on possible differential effects for exposure to vaping advertisements on new media versus traditional means.

Particular aspects of the internet should be considered when comparing exposure across media types. Unlike other advertising outlets, marketing on the internet, including smartphones, involves a dynamic process whereby algorithms react to prior user behavior and attempt to predict which ads may be most appealing to the user. Thus, another interpretation of our results is that ENDS users are seeking ENDS content, and due to marketing algorithms, are subject to a greater number of ENDS advertisements. Further, ENDS retailers may be exploiting user data to target people with advertisements (Huang et al., 2019). Thus, this study cannot speak to directionality. However, it is notable that

exposure to vaping advertisements on smartphones predicted the likelihood of vaping, while exposure through other media (e.g., television) did not. More research is needed to understand the unique role smartphones might play as an emerging medium for ENDS advertising and how the interplay between user and system facilitates exposure to ENDS content.

Our results found that never vapers and ever vapers did not differ significantly in time spent using their smartphones. However, ever vapers did use more apps on a daily and weekly basis. Of these apps, only Snapchat predicted vaping status in our sample. This finding points to possible independent effects of Snapchat use and smartphone use. Examining Table 4 shows that smartphone use was a significant predictor before (Block 3) and after (Block 4) frequency of Snapchat use was entered into the model. While Snapchat use was a significant predictor of ever-vaping in the model, including Snapchat did not eliminate or substantially reduce the significant effects of marketing exposure via smartphone on vaping status. This finding indicates there may be two different pathways encouraging vaping in our sample. Exposure to advertisements on smartphones may be one pathway, and frequency of Snapchat use another. Regarding Snapchat, the site has been identified as a place where users can share peer-generated vaping content (Kong et al., 2019; Kong et al., 2020; Pepper et al., 2017). The present study did not measure exposure to peer-generated vaping content on any social media platforms. However, our results indicate that Snapchat use may be an independent factor in predicting vaping status beyond exposure to advertisements on smartphones. Future research might parse apart independent effects of advertisement exposures versus exposure to peer-generated content.

This study has limitations. First, we used a convenience sample. Replication is needed to confirm findings. Second, we used survey design. Future research should use longitudinal or experimental design to make casual claims. Third, our measure of media exposure asked participants to recall seeing vaping advertisements. This strategy has been identified as a potential limitation in media-effects literature (Romantan, Hornik, Price, Cappella, & Viswanath, 2008). Future research might include a variety of measures (e.g., gross ratings points or open-ended responses) to capture different facets of exposure. Fourth, research has detailed how ENDS retailers employ innovative advertising tactics for social media campaigns (e.g., the use of influencers and hashtags) (Huang et al., 2019). Participants may not recognize these tactics as advertisements, and thus, might not recall them. A more discriminate analysis could identify evolving advertising tactics used by ENDS retailers. Finally, examination of social media use of minority populations (i.e. racial/ethnic minorities, sexual minorities) may provide more information about the impact of ENDS advertisement across populations. We present our limitations alongside results to aid with such future research.

5. Conclusions

Our survey of young adults identified concerning relationships between vaping advertisement exposure, smartphone use, social media use, and vaping behaviors of young adults. In our sample, exposure to vaping advertisements via smartphone and use of Snapchat were associated with higher rates of ENDS use. These results point to the need for

more research examining aspects of smartphones that may expose people to vaping advertisements. Additionally, more research is needed to understand how social media platforms may be affecting vaping behaviors of young adults. In this regard, future research might consider how advertisement exposure and social media use independently influence vaping behaviors. In identifying associations between vaping advertisement exposure, social media use, and vaping, this paper informs future research seeking to understand vaping behaviors and motivations of young adults.

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Highlights

- Higher frequency of social media use was associated with higher rates of vaping.

- The most commonly used platforms were Snapchat, Instagram, YouTube, and Facebook.

- Ever-vapers used more social media platforms than never-vapers.

- Snapchat and Instagram use were associated with vaping ad exposure via smartphones.

- However, only Snapchat use was associated with higher rates of vaping.
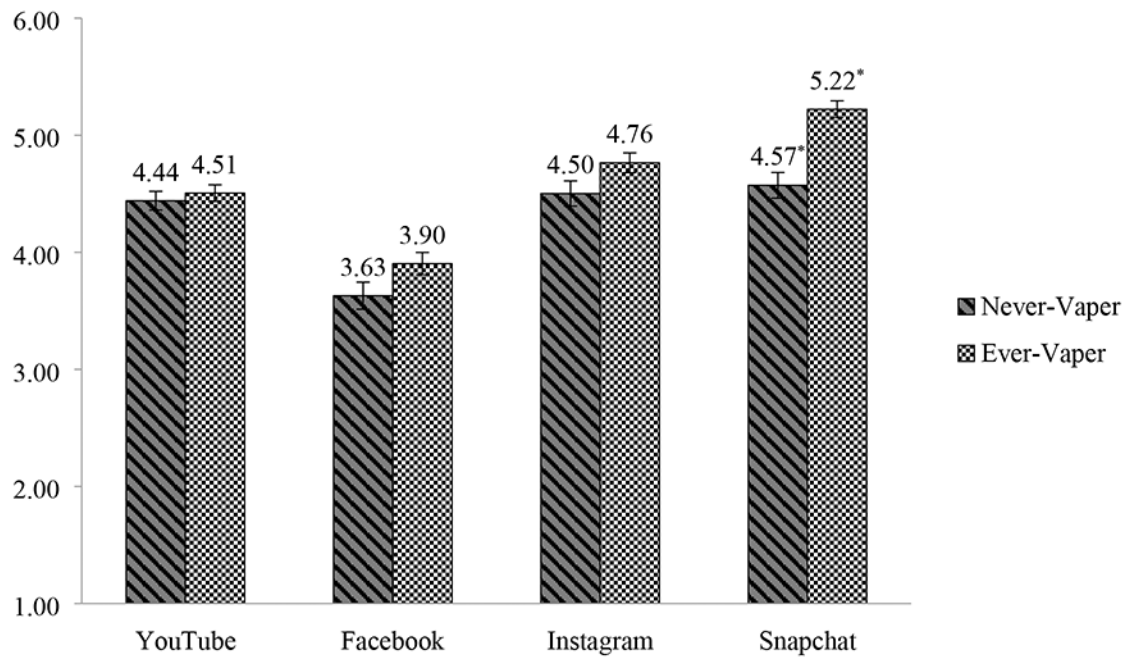
Figure 1.
Comparison Between Ever-Vapers versus Never-Vapers on Frequency of Social Media Use.
Note. * $p < .05$; ** $p < .01$
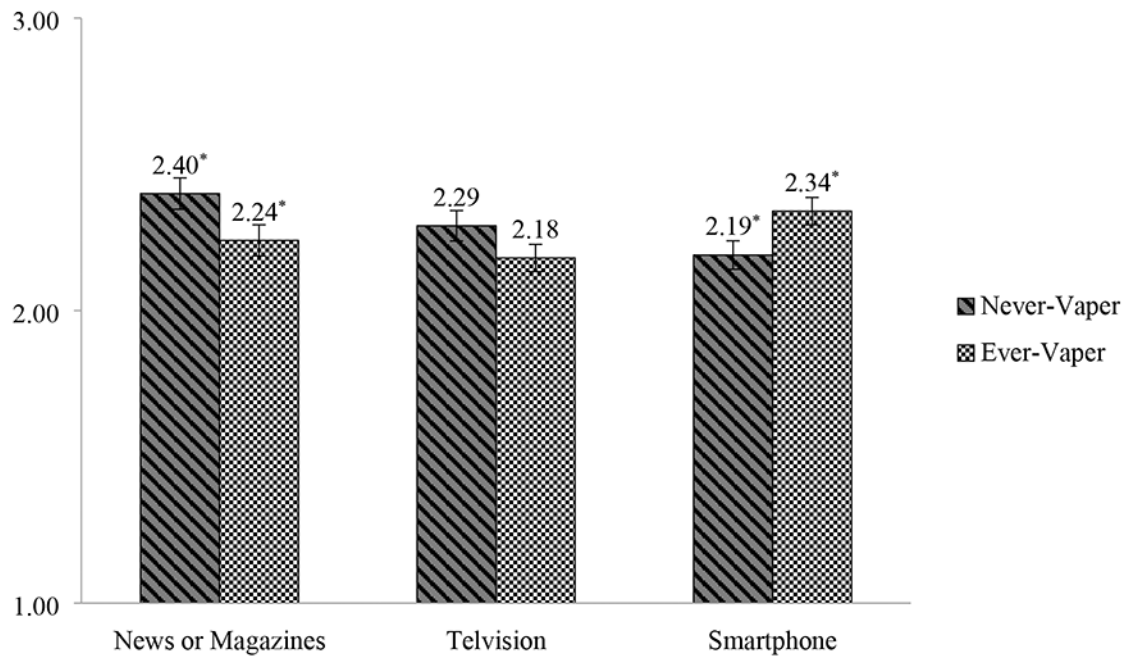
Figure 2.
Comparison Between Ever-Vapers versus Never-Vapers on Frequency of Vaping Ad
Exposure.
Note. * *p* < .05; ** *p* < .01
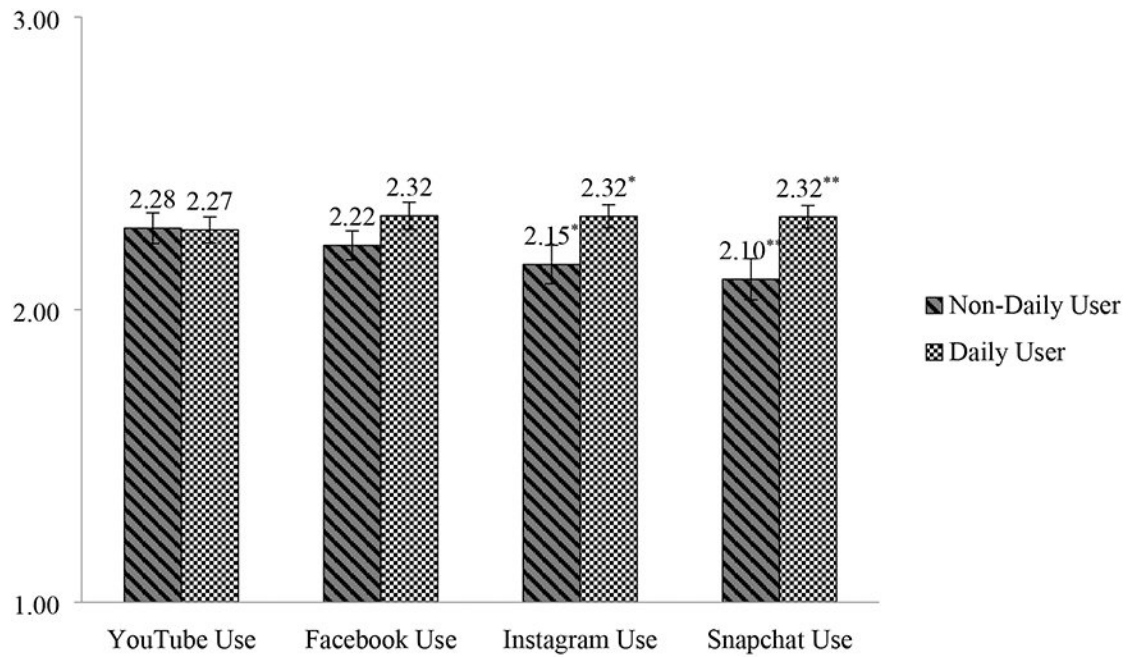
Figure 3.
Comparison Between Ever-Vapers versus Never-Vapers on Frequency of Ad Exposure by Daily Social Media Use.
Note. * $p < .05$; ** $p < .01$

Table 1.

Sample Characteristics (*N*=1047)

	n (%)
Gender	
Female	592 (56.5)
Age group, years	
18-20	707 (67.5)
21-24	340 (32.5)
Race	
Caucasian/White	541 (51.7)
African American/Black	321 (30.7)
Asian	58 (5.5)
Multiracial	104 (9.9)
Other	23 (2.2)
Ethnicity	
Hispanic	104 (9.9)
Employment	
Unemployed (Student Only)	489 (46.8)
Employed < 20 Hours per Week	297 (28.5)
Employed 20+ Hours per Week	257 (24.7)
Cigarette Smoking Status	
Never Smoker	624 (59.6)
Experimenter	262 (25.0)
Current (past month) smoker	161 (15.4)
E-Cigarette Vaping Status	
Never user	456 (43.6)
Experimenter	356 (34.0)
Current (past month) user	235 (22.4)

Table 2.

Social Media Platform Use Frequency

	Use (%)						
	Several Times Per Day	About Once Per Day	3-5 Days Per Week	1-2 Days Per Week	Every Few Weeks	Less Than Monthly	No Use
Snapchat	**71.9**	8.1	2.7	1.9	2.1	1.1	12.1
Instagram	**62.0**	11.4	4.6	3.2	3.1	2.1	13.7
YouTube	41.6	17.9	12.4	13.3	8.2	2.7	3.9
Facebook	39.5	14.7	7.7	6.6	5.3	6.4	19.8
Twitter	35.1	9.4	3.2	4.6	3.4	3.5	40.8
Google+	13.6	8.1	4.2	3.1	3.2	5.3	**62.6**
Reddit	7.7	2.1	2.4	3.2	3.0	4.6	**77.1**
Tumblr	6.8	3.5	2.9	3.0	4.1	5.8	**73.9**
Pinterest	6.0	5.8	6.2	6.9	9.4	10.2	**55.5**
Vine	2.8	1.0	0.9	0.8	1.3	2.6	**90.7**
LinkedIn	1.9	2.2	1.5	2.4	4.5	7.4	**80.1**

Note. Percentages greater than 50% shown in **bold**.

Table 3

Unadjusted logistic regressions predicting ever vaping.

	B	SE	Wald	OR [95% CI]
Age	−0.01	0.04	1.01	0.98 [0.92, 1.06]
Female	−0.42	0.13	10.78 ***	0.66 [0.51, 0.85]
Non-White	−0.34	0.13	7.26 **	0.71 [0.56, 0.91]
Hispanic	0.32	0.21	2.30	1.38 [0.91, 2.10]
Work for Pay	−0.25	0.13	4.12 *	0.78 [0.61, 0.99]
Smoking Status	1.72	0.13	171.19 ***	5.57 [4.31, 7.20]
Vaping Advertisement Exposure in Newspapers	−0.15	0.07	4.63 *	0.86 [0.75, 0.99]
Vaping Advertisement Exposure in TV/Movies	−0.09	0.06	2.32	0.91 [0.81, 1.03]
Vaping Advertisement Exposure on Smartphones	0.13	0.06	4.77 *	1.14 [1.01, 1.28]
Facebook Use Frequency	0.05	0.03	3.39	1.05 [1.00, 1.10]
Instagram Use Frequency	0.06	0.03	3.76	1.06 [1.00, 1.12]
YouTube Use Frequency	0.02	0.04	0.37	1.02 [0.95, 1.10]
Snapchat Use Frequency	0.15	0.03	23.79 ***	1.17 [1.10, 1.24]

*
$p = .05$

**
$p < .01$

***
$p < .001$.

Table 4

Hierarchical logistic regression predicting ever vaping among young adults.

Predictors	Model 1: Demographics				Model 2: Adds Vaping Ad Exposure				Model 3: Adds Social Media Platform Use			
	B	SE	Wald	OR [95% CI]	B	SE	Wald	OR [95% CI]	B	SE	Wald	OR [95% CI]
Block 1: Demographics												
Age	−0.13	0.05	6.13*	0.88 [10.79, 0.97]	−0.13	0.05	5.60*	0.88 [0.79, 0.98]	−0.12	0.06	3.65	0.89 [0.79, 1.03]
Female	−0.39	0.18	4.72**	0.68 [0.48, 0.96]	−0.38	0.18	4.38*	0.68 [0.47, 0.98]	−0.52	0.20	6.83**	0.60 [0.40, 0.88]
Non-White	0.14	0.18	0.64	1.15 [0.81, 1.64]	0.20	0.18	1.24	1.22 [0.86, 1.75]	0.25	0.19	1.70	1.28 [0.88, 1.85]
Hispanic	0.23	0.28	0.66	1.26 [0.73, 2.18]	0.20	0.28	0.49	1.22 [0.70, 2.12]	0.18	0.29	0.38	1.19 [0.68, 2.09]
Work for Pay	−0.54	0.19	8.25**	0.58 [0.40, 0.84]	−0.58	0.19	8.57**	0.57 [0.40, 0.83]	−0.58	0.20	8.83**	0.56 [0.38, 0.82]
Smoking Status	1.90	0.17	118.30***	6.65 [4.73, 9.36]	1.90	0.18	115***	6.71 [4.74, 9.50]	1.92	0.18	112.43***	6.85 [4.78, 9.76]
Block 2: Vaping Advertisement Exposure Outlets												
Newspapers					−0.25	0.18	5.83*	0.78 [0.64, 0.95]	−0.25	0.10	5.58*	0.78 [0.63, 0.96]
TV/Movies					−0.08	0.10	0.65	0.92 [0.74, 1.13]	−0.11	0.11	1.03	0.89 [0.72, 1.11]
Smartphones					0.25	0.11	5.76*	1.20 [1.05, 1.58]	0.26	0.11	5.91*	1.30 [1.05, 1.60]
Block 3: Social Media Platform Use												
Facebook									0.04	0.04	0.96	1.04 [0.96, 1.13]
Instagram									−0.14	0.05	8.27**	0.87 [0.79, 0.96]
YouTube									−0.06	0.05	1.14	0.94 [0.85, 1.05]
Snapchat									0.19	0.06	1.14	1.22 [1.10, 1.36]
−2 Log Likelihood				784.11				773.40				755.17
Nagelkerke R²				0.34				0.36				0.38

Note. B = unstandardized coefficient, SE = standard error, Wald = Wald x^2, OR = odds ratio.

*
$p < .05$

**
$p < .01$

***
$p < .001$.