



Original investigation

Does Interest in Smoking Affect Youth Selection of Pro-smoking Videos? A Selective Exposure Experiment

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Abstract

Background: Many pro-smoking videos on YouTube reach view counts in the hundreds of thousands and more. Yet, there is limited information on who is viewing these potentially misleading videos. This study attempts to understand the viewership of online pro-smoking videos to examine if youth at high risk for smoking are more likely to watch these videos.

Methods: We conducted a selective exposure experiment with a national sample of youths (ages 15–21 years; $n = 614$) to identify characteristics that make individuals more likely to select pro-smoking videos. During a 10-min browsing session, participants were given a set of 16 videos (eight smoking and eight nonsmoking) and were asked to view video(s) of their choice. Exposure to videos was unobtrusively logged. View count was manipulated such that smoking videos had either high or low views.

Results: Behavioral data revealed that youth with higher interest in smoking were more likely to select and spend more time watching pro-smoking videos than youth with lower interest in smoking. The view count manipulation did not affect selection patterns. However, exposure to high view count smoking videos was associated with more positive attitudes toward smoking.

Conclusions: The findings of this study call into question the existence and prominence of pro-smoking videos on YouTube and bring to attention the need for regulatory or monitoring efforts of such content.

Implications: Given the presence and prevalence of misleading pro-smoking videos online, this is the first study to ask the practical and important question of who is viewing these videos. Using behavioral data, we are able to demonstrate that youth who are high at risk for smoking are more susceptible to select and spend more time viewing pro-smoking videos than youth who are low at risk for smoking. Findings also show that when pro-smoking videos appear to be “popular,” they affect attitudes toward smoking. Our findings provide policy implications regarding regulation of smoking promotion videos online.

Introduction

YouTube is an interactive video-sharing platform in which more than a billion users can upload, watch, and share content.¹ It is the second most viewed website on the Internet.² With few restraints

to the diffusion of inaccurate and misleading information, the new media have created a myriad of opportunities to generate smoking-related contents, increasing availability not just of information but also of *misinformation*.

Studies show that smoking imagery on YouTube is “prolific and easily accessed”³ and that such readily accessible videos contain potentially misleading information related to smoking.^{4,5} According to Forsyth and Malone,³ YouTube videos containing positive smoking imagery outnumber videos containing negative smoking imagery. Because of the prevalence of pro-smoking messages online and their potential to create positive associations with smoking, some have called for regulatory practices.^{4,5}

Pro-smoking content on YouTube may be a special problem for adolescents and young adults because they are the primary users of the platform. According to Pew Research Center,⁶ YouTube reaches 82% of 18- to 29-year-olds, more than any cable network in the United States.² Adolescence is also a time when smokers actively experiment with and establish smoking as a habit. The Surgeon General reports⁷ almost 9 out of 10 smokers initiate smoking by age 18.

Aside from antismoking videos, the most often viewed videos are images of people smoking, smoking fetish videos, comedy clips, or cigarette tricks videos,⁴ which have the potential to attract and mislead younger audiences. Past research^{8,9} has shown that exposure to smoking on entertainment media and positive media portrayals of smoking can be associated with smoking initiation among adolescents. Likewise, YouTube viewers may vicariously form positive outcome expectations about the short-term social benefits of smoking while ignoring the long-term health consequences,⁵ which is often characteristic of youth who initiate smoking.¹⁰

Because youth are the primary users of YouTube and this group tends to be overly optimistic about the health costs and ease of quitting smoking, a deeper understanding of pro-smoking video viewership is warranted. If those exposed to misleading videos are among those more susceptible to start, increase, or sustain smoking, then the potential impact of these online materials would be particularly problematic. Although prior studies have examined the presence and prevalence of pro-smoking messages online^{11,12} and probed into the content of these messages,⁵ there is insufficient knowledge about the characteristics of individuals who seek out such content. This problem is a practical but an important one: Are youth at high risk for smoking more likely to watch videos that depict smoking in a positive light?

Selective Exposure

Selective exposure is conceptualized as “any systematic bias in audience composition for a given medium or message, as well as any systematic bias in selected messages that diverges from the composition of accessible messages.”¹³ Individual predispositions affect selection of messages such that selection is nonrandom. Past studies of selective exposure^{14,15} with smokers found that, in general, smokers preferred attitude-consonant messages such as “smoking does not lead to lung cancer” as opposed to messages titled “smoking leads to lung cancer.” These studies essentially compared a misinformation claim about smoking against an accurate one and found that smokers were more inclined to view the misinformation claim that is less dissonance provoking (ie, less challenging to their smoking behavior). More recently, a meta-analysis¹⁶ synthesizing 67 studies of selective exposure found that there was a moderate ($d = 0.36$) preference toward information that confirmed individuals’ existing beliefs, attitudes, or behaviors as opposed to information that challenged them. Therefore, we believe that selection patterns of pro-smoking videos would be based on congeniality toward the topic and thus be different as a function of individual levels of interest in smoking.

H1–3: Pro-smoking videos will be viewed (1) more often, (2) earlier, and (3) longer by youth with high interest in smoking than youth with low interest in smoking.

Social Influence and Youth

Research has shown that adolescents are especially susceptible to social influence, which in turn affects risk assessments and behaviors.^{17–19} Existing studies on social influence in the new media environment have yet to focus exclusively on younger populations and their selective exposure patterns to potentially risky material. We believe this study will help to fill this gap.

Several empirical findings^{20–23} illustrate that in the case of news selection, social endorsements are important, sometimes to the point that they trump partisan source cues.²⁴ This bandwagon effect²² was similarly found in other domains such as in the selection of online video clips²⁵ or songs.²⁶ This could also be the case for pro-smoking videos. Another possibility is that view count will have differential effects on selection of pro-smoking videos, based on interest in smoking. While people with little interest in smoking may use social endorsements as a heuristic cue in selecting pro-smoking videos, people with high interest in smoking may be motivated to select pro-smoking videos—regardless of view count. Because little is known about the influence of social endorsements on selective exposure to risky content and how this interacts with personal identity, the following questions are put forth:

- RQ1: Does view count affect selective exposure to pro-smoking videos?
- RQ2: Does view count have different effects on selection of pro-smoking videos based on interest in smoking such that youth with low interest in smoking will be more influenced by view counts than youth with high interest in smoking?
- RQ3–4: Does view count affect (3) perceived social norms and (4) attitudes about smoking?

Method

Participants

A national convenience sample of 614 US youth and young adults between the ages 15 and 21 was recruited by Toluna (www.toluna-group.com), a survey company that maintains an online youth panel with parental permission. Smoking interest²⁷ (described further in the Measures section) was used as a quota to sample a 1:1 ratio of participants with complete disinterest in smoking and participants with some level of interest in smoking (ie, “the absence of a firm decision not to smoke”²⁷).

Recruited participants were randomly assigned to one of three conditions. Overall, 59.9% of the sample were female, 66.4% were White, 13.5% were Asian, 8.5% were African American, 7.8% were more than one race, and 3.7% were of another race. There were no significant differences in demographic features, personality traits, or interest in smoking across the three experimental conditions.

Stimulus Material

A total of 64 videos were used as experimental stimuli: 32 smoking videos and 32 nonsmoking videos. For each participant, eight smoking videos and eight nonsmoking videos were randomly sampled.

None of the videos were age-restricted or restricted to certain viewers at the time they were collected so that all videos were available to anyone who visited YouTube.

Smoking Videos

Stimulus smoking materials were a subset of videos collected by the Annenberg Public Policy Center (APPC) of the University of Pennsylvania (blinded for peer review). The search API was used to gather videos on YouTube using 136 tobacco-related search keywords (eg, “smoking + stress,” “celebrity + smoker,” “inhale + tobacco,” “smoke + tricks”). From this, undergraduate research assistants narrowed down the pool to cigarette smoking-related videos that were pro-smoking (ie, videos that contained positive portrayals of cigarette smoking). The final set of stimulus smoking materials was selected based on researcher consensus on how misleading or factually incorrect the videos were (see Supplementary Material for more details about the pro-smoking videos selected for this study). Based on the content and format of the videos, three categories were created so that participants could be faced with video choice options that are representative of the different formats of smoking videos available on YouTube. *Social acceptance smoking videos* consisted of videos that emphasize the social rewards of smoking and promote norms that smoking is common and/or socially approved of. *Tutorial smoking videos* included videos of people giving instructions related to how to smoke cigarettes that implicitly encourage smoking, for instance, as a form of rebellion, or to receive some type of benefit. *Testimonial smoking videos* contained pro-smoking videos in which people speak directly to the camera on the topic of smoking. These videos contain the most explicit misinformation about smoking. Lastly, user-generated *antismoking videos* were also included as a category to see if some participants (eg, youth who are genuinely just interested in smoking and have yet to make up their mind about it) are selecting videos that are about smoking—regardless of valence. It was apparent that the videos had smoking content from the thumbnail images and/or the video titles.

Nonsmoking Videos

All nonsmoking videos were selected to appeal to a younger audience (given sample characteristics) and to both genders. This was determined by the age of the person(s) in the video and the topic of the video. Nonsmoking control videos were topically matched to the format of pro-smoking videos (ie, *social acceptance*, *tutorial*, and *testimonial*). These videos did not contain any risky or unhealthy behavior.

A separate category of *risky behavior videos* depicting risky behaviors that are not illegal (eg, bungee jumping, skydiving) as well as risky behaviors that are illegal and similar to smoking (eg, teenage alcohol consumption) was created to control for the possibility that participants are selecting videos that are of risky behavior in general and not necessarily because the videos contain smoking.

Results of a pilot study indicated that our pool of nonsmoking videos would be selected by members of the target population, offering partial evidence that these videos appeal to youth.

Design

To address our main hypotheses concerning smoking interest and whether it affects selection of pro-smoking videos, we measured smoking interest at the beginning of the study, prior to the browsing phase. To address our secondary research questions regarding

social influence as a factor of selective exposure to pro-smoking videos, we experimentally manipulated view count, and participants were randomly assigned to one of three conditions. In Condition 1, the *no-view-count-comparison condition*, there was no view count information. In Condition 2 or the *smoking-high-views condition*, all of the eight smoking videos that participants were randomly assigned had high view counts and all of the eight randomly assigned nonsmoking videos had low view counts. Lastly, in Condition 3 or the *smoking-low-views condition*, smoking videos received low view counts and nonsmoking videos received high view counts. For each participant, each video was given a randomly assigned value of view count so that view count and video were not confounded. Precisely, videos that were in the “high view count” category received a view count number that was taken from the top 20% of actual YouTube videos selected for this study (range: 575 877–47 274 402), and videos that were in the “low view count” category received a view count number from the bottom 20% (range: 8650–34 747).

Participants were recruited by Toluna through a link sent to their e-mail. After providing informed consent and answering a series of screening and demographic questions, eligible participants were randomly assigned to one of the three conditions. Procedures for all conditions were identical except for the presence and absence of view count information.

Participants first completed a pre-test questionnaire that assessed personality traits. To keep participants from guessing the purpose of the study, foil questions (eg, social media use) were asked as well. Next, participants entered a browsing phase.

Browsing Phase

During this time-restricted phase, each participant was shown a YouTube-like browsing page with 16 randomly selected videos (eight smoking and eight nonsmoking). The order in which the videos were displayed on the browsing screen was randomized for each participant to minimize positional effects. Participants could play, stop, and re-watch any video(s) of their choice. Although the literature²⁸ recommends that the time span be limited so that a third to half of the messages can be consumed, given that stimuli were videos that took relatively longer to view, browsing was restricted to 10 min. The average length of the videos was 3.81 min (and the maximum length was edited to be 5 min), so participants would have been able to view at least two videos fully if they wished to do so. A timer appeared in the top right-hand corner at all times so that participants could know how much time they had left.

This study attempted to increase ecological validity by mimicking the browsing page of YouTube as closely as possible (eg, matching font style, the size of the images) and by presenting a larger number of selection options compared with past selective exposure studies. For each video, the original (1) thumbnail image that was uploaded on YouTube, (2) title of the video, and (3) username of the video originator were presented. An example of a browsing screen can be found in Figure 1.

A computer program was embedded into the online survey so that exposure behavior was unobtrusively recorded. After the 10-min browsing period, participants finished a post-test questionnaire.

Measures

Smoking Interest

Smoking interest²⁷ was measured by three items: (1) “Do you think you will try a cigarette soon?” (2) “If one of your friends were to offer

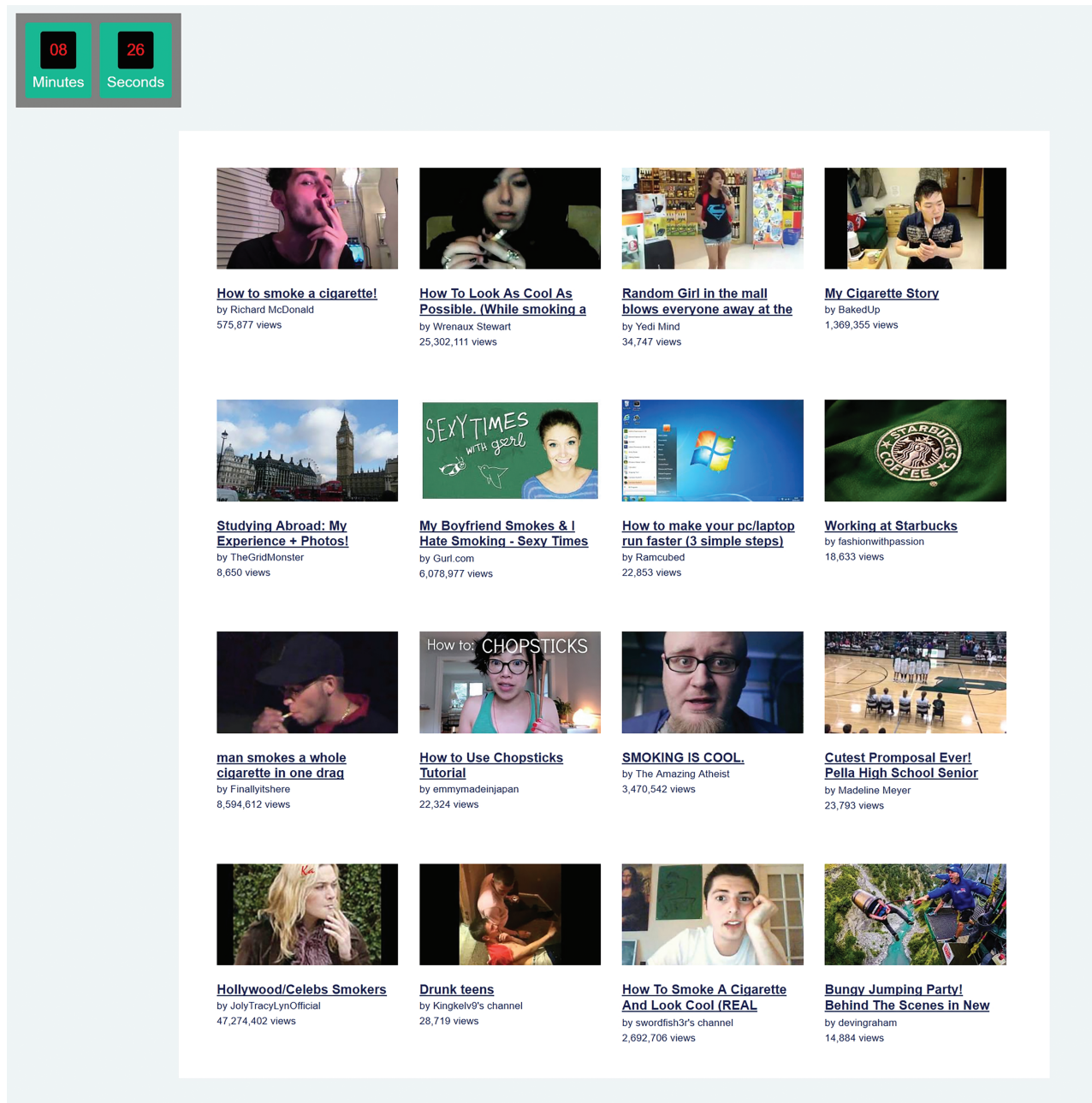


Figure 1. Screenshot of a browsing screen from the smoking-high-views condition. Note that the smoking videos have high view counts and the nonsmoking videos have low view counts.

you a cigarette, would you smoke it?” and (3) “Do you think you will be smoking cigarettes 1 year from now?” Those who answered “No,” “Definitely not,” and “Definitely not” respectively were given a 0 score because this corresponded to complete disinterest; otherwise their responses were scored 1. The scores were summed yielding an interest scale varying from 0 to 3 (0 score: $n = 310$; 1 score: $n = 106$; 2 scores: $n = 91$; 3 scores: $n = 107$). Higher scores indicate higher interest in smoking.

Personality Traits

The following personality traits were included as covariates when testing hypotheses concerning what types of youth are more likely

to select pro-smoking videos: (1) sensation seeking²⁹ ($M = 3.29$, $SD = 0.79$, $\alpha = .81$); (2) regulatory focus³⁰ (promotion focus, $M = 3.98$, $SD = 0.70$, $\alpha = .73$; prevention focus, $M = 3.77$, $SD = 0.66$, $\alpha = .57$); (3) belonging to a social group³¹ ($M = 4.01$, $SD = 0.78$, $\alpha = .70$); (4) social comparison orientation³² ($M = 3.54$, $SD = 0.59$, $\alpha = .80$); (5) need for cognition³³ ($M = 3.45$, $SD = 0.79$, $\alpha = .76$); and (6) need for affect³⁴ ($M = 3.18$, $SD = 0.83$, $\alpha = .62$). For more details on the measures used, see Supplementary Material.

Selective Exposure Outcome Variables

The key outcome of interest for this study—video exposure—was unobtrusively logged so we had behavioral data at the individual

level. Several measures of selective exposure served as dependent variables: (1) *number of selected videos*, a frequency measure of how many pro-smoking videos were selected ($M = 0.71$, $SD = 1.33$); (2) *first selection likelihood*, a dichotomous measure of whether the first selection was a pro-smoking video ($M = .17$, $SD = 0.38$); and (3) *exposure time*, a measure of the aggregated length of pro-smoking videos watched in seconds ($M = 67.92$, $SD = 125.09$).

Smoking-Related Outcome Variables

Perceived social norms were measured using an adapted version of Park and Smith's³⁵ previously validated scales. Responses were measured using three items on a 5-point Likert-type scale with answer options ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A single item from each type of personal norm was used: subjective norm ("It is expected of me that I smoke"), personal descriptive norm ("Most people whose opinion I value smoke"), and personal injunctive norm ("Most people whose opinion I value would approve of my smoking"). Higher scores indicate more favorable normative perceptions about smoking ($M = 1.93$, $SD = 0.98$, $\alpha = .82$).

Attitudes toward smoking were measured using five items on a 7-point semantic differential scale that stated "Smoking is..." followed by a set of bipolar adjective pairs: "bad/good," "unenjoyable/enjoyable," "unpleasant/pleasant," "foolish/wise," and "harmful/beneficial." Negative scores indicate negative attitudes and positive scores indicate positive attitudes toward smoking ($M = -2.08$, $SD = 1.34$, $\alpha = .91$).

Analysis

Multiple logistic and ordinary least squares regression analyses were conducted to examine if smoking interest (H1–3) was associated with behavioral outcomes related to selection of pro-smoking videos. Smoking interest was treated as a categorical variable, ranging from 0 (*no interest*) to 3 (*high interest*). Condition, gender, age, race, and several personality traits were included as control variables. Participants from all three conditions were used in the analyses because there were no main or interaction effects from the experimental condition on the association between individual predictors and selection outcomes.

To address research questions related to view count, multiple logistic and ordinary regression analyses were conducted to examine if there was an effect of condition on behavioral outcomes related to selection of pro-smoking videos. Then, smoking interest and its interaction with condition were entered into each model to see if there were any significant interactions. Lastly, multiple ordinary least squares analyses were conducted to examine if condition was associated with social norms or attitudes about smoking.

Results

Across the entire sample, individuals selected 3.93 videos ($SD = 2.55$) overall, of which 0.71 videos ($SD = 1.33$) were pro-smoking. On average, pro-smoking videos were viewed for 1.13 min ($SD = 2.08$) out of the mandatory 10-min browsing period.

H1–3 were concerned with comparing people with varying interest in smoking and their selection behaviors of pro-smoking videos. Overall, the effect of smoking interest was significant on number of videos selected, $F(3, 594) = 3.47$, $p = .016$, and exposure time, $F(3, 594) = 6.23$, $p < .001$. The omnibus effect for first selection likelihood, however, was not significant, $\chi^2(3) = 3.68$, $p = .298$. Compared

with participants with no interest in smoking (score = 0), participants who are extremely interested in smoking (score = 3) were significantly more likely to select pro-smoking videos more often and watch a greater amount of them. Thus, consistent with H1 and H3, pro-smoking videos were viewed more often and for longer periods of time by individuals with high interest in smoking than individuals with low interest in smoking. Data were not consistent with H2. Table 1 and Figure 2 depict the effect of smoking interest on selective exposure to pro-smoking videos.

The first research question asked whether there was a main effect of condition (ie, view count manipulation; independent variable [IV]) on selection of pro-smoking videos (dependent variable [DV]). Regression analyses showed that condition did not predict any of the selective exposure outcomes (see Table 2). For the second research question, interaction terms between condition and smoking interest were added into each of the models presented in Table 2. However, none of the interactions were statistically significant, suggesting no differential effect of view count on selection behaviors based on smoking interest.

The final two research questions concerned whether view count was associated with subsequent social norms or attitudes about smoking. There was no significant effect of manipulated view count on social norms about smoking, $F(2, 611) = 1.53$, $p = .217$, although there was a trend in the expected direction with participants in the smoking-high-views condition having the most favorable social norms toward smoking ($M = 2.02$, $SD = 1.04$), followed by the smoking-low-views condition ($M = 1.89$, $SD = .97$), and the no-view-count-comparison condition ($M = 1.86$, $SD = .90$). The effect of manipulated view count was significant on attitudes toward smoking, $F(2, 611) = 3.35$, $p = .036$. Participants who were in the no-view-count-comparison condition ($B = -0.32$, $SE = 0.14$, $p = .018$) and the smoking-low-views condition ($B = -0.26$, $SE = 0.13$, $p = .043$) had less favorable attitudes toward smoking compared with those who were in the smoking-high-views condition.

Discussion

It is well established that pro-smoking videos on YouTube often include misleading claims and some have accumulated views in the millions. Little is known, however, about who is watching these videos. Without this key piece of information, it is not possible to explore the potential harms caused by these videos.

The results of this study indicate that youth with high levels of interest in smoking were more likely to select a greater number of pro-smoking videos and to spend more time watching them than those with lower levels of interest. The fact that smoking interest affected selection of pro-smoking videos is an important finding given its relationship with smoking uptake and smoking behavior.

Results showed that selection behavior of pro-smoking videos did not significantly differ based on view count. These patterns did not differ based on interest in smoking. Note that the contrast between view counts was intentionally strong (low view counts: 8650–34747; high view counts: 575877–47274402). Moreover, view count was randomly assigned to each video such that no video was tied to a specific view count.

These results were somewhat unexpected, given the growing literature on social influence that suggest there should be a stronger effect of social endorsements on selection.^{20–26} One possible explanation is that since our study used artificial manipulations of view count, the numbers presented could have been unconvincing to participants.

Table 1. Smoking Interest Predicting Pro-smoking Selective Exposure Outcomes

| | Selective exposure outcomes: pro-smoking video selection | | |
|------------------------|--|----------------------|-------------------------|
| | First selection likelihood | Number of selection | Exposure time |
| | OR [95% CI] | B (SE) | B (SE) |
| Smoking interest | | | |
| 1 (Low interest) | 0.93 [0.47, 1.82] | 0.15 (0.15) | 8.41 (13.85) |
| 2 (Medium interest) | 1.03 [0.51, 2.05] | 0.29* (0.16) | 12.35 (14.98) |
| 3 (High interest) | 1.68* [0.92, 3.08] | 0.50** (0.16) | 62.33*** (14.66) |
| Personality traits | | | |
| Sensation seeking | 1.47* [1.05, 2.06] | 0.14* (0.08) | 7.16 (7.06) |
| Promotion focus | 0.92 [0.58, 1.45] | −0.09 (0.11) | 1.18 (10.01) |
| Prevention focus | 1.10 [0.70, 1.72] | 0.02 (0.11) | −5.36 (10.03) |
| Belonging to group | 1.19 [0.87, 1.62] | 0.04 (0.08) | −4.03 (6.88) |
| Comparison orientation | 0.72 [0.47, 1.10] | 0.09 (0.10) | −2.02 (9.22) |
| Need for cognition | 1.08 [0.78, 1.49] | −0.01 (0.08) | 0.59 (6.91) |
| Need for affect | 0.83 [0.62, 1.11] | 0.01 (0.07) | −13.74* (6.10) |
| Condition | | | |
| 2 (Smoking-high-views) | 1.47 [0.84, 2.58] | 0.20 (0.13) | 16.05 (12.20) |
| 3 (Smoking-low-views) | 1.05 [0.59, 1.89] | −0.07 (0.13) | −5.10 (12.25) |
| Demographics | | | |
| Female | 0.39*** [0.25, 0.62] | −0.33** (0.11) | −43.20*** (10.16) |
| Age | 1.16* [1.02, 1.30] | 0.00 (0.03) | 4.17 (2.65) |
| Non-White | 1.54* [0.98, 2.43] | 0.04 (0.11) | 16.05 (9.90) |
| R ² | .09 | .06 | .11 |

Odds ratios (OR) and unstandardized coefficients are shown; 95% confidence intervals (CI) and standard errors (SE) are in parentheses. McFadden's R^2 and R^2 reported. Exposure time is in seconds. Reference categories – smoking interest: 0 (*no interest*); condition: 1 (*no-view-count-comparison condition*); gender: male; race: White. No interactions between smoking interest and condition were significant. $n = 614$. Bolded values indicate significant p-values.

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p < .001$.

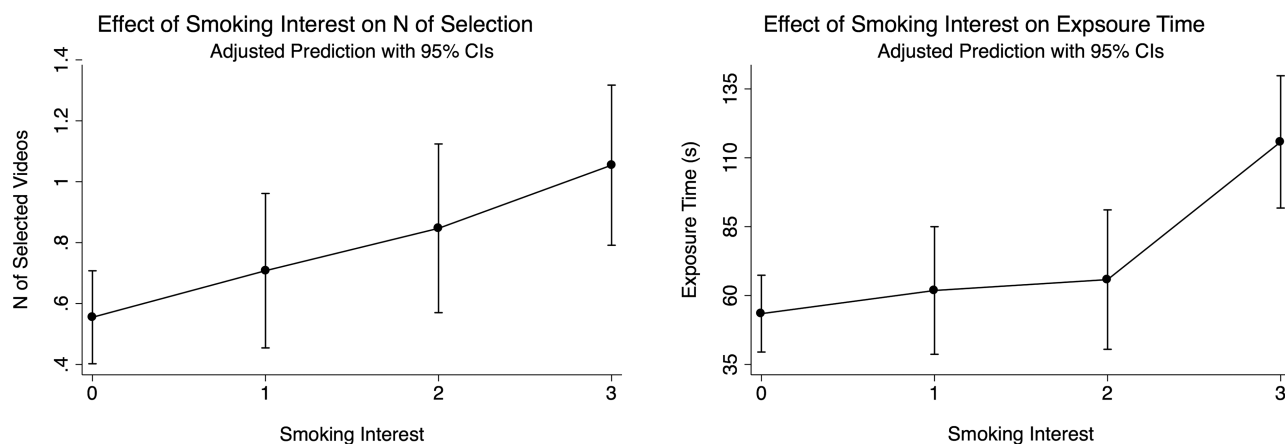


Figure 2. Graphical depiction of smoking interest predicting pro-smoking selective exposure outcomes: (A) number of pro-smoking videos selected and (B) aggregated length of pro-smoking videos watched in seconds. Error bars represent 95% confidence intervals. Predicted values are adjusted with all control variables held at their mean score. Control variables include other personality traits (sensation seeking, promotion focus, prevention focus, belonging to a social group, social comparison orientation, need for cognition, need for affect), condition, gender, age, and race (see Table 1 for further information).

Some studies^{25,26} used numbers that reflected the “real” intrinsic popularity of the content. Another possibility is that our manipulation was not strong enough. For instance, Salganik and colleagues²⁶ found that the effects of social endorsements were stronger when the manipulation was made more noticeable (ie, in descending order or popularity). Nevertheless, while our social endorsement manipulation may not have been prominent, it was ecologically valid—view count information was presented in a similar manner to YouTube. Furthermore,

while other studies examined content that were generally more spread out in terms of topic with older populations, our study examined selection of risky material by youth. User-generated videos also tend to be noisier than news articles or songs in terms of information presented alongside view count (eg, thumbnail images, video titles, usernames). In fact, a study on user-generated videos²⁵ found that the bandwagon effect of view count diminished in the presence of a thumbnail image and likewise in the presence of more textual information when there

Table 2. Condition Predicting Pro-smoking Selective Exposure Outcomes

| Condition | Selective exposure outcomes: pro-smoking video selection | | |
|------------------------|--|---------------------|---------------|
| | First selection likelihood | Number of selection | Exposure time |
| | OR [95% CI] | B (SE) | B (SE) |
| 2 (smoking-high-views) | 1.35 [0.79, 2.30] | 0.20 (0.13) | 16.09 (12.66) |
| 3 (smoking-low-views) | 1.04 [0.60, 1.82] | −0.06 (0.13) | −3.68 (12.73) |
| R ² | .00 | .01 | .01 |

Odds ratios and unstandardized coefficients are shown; 95% confidence intervals (CI) and standard errors (SE) are in parentheses. McFadden's R² and R² reported. Reference category – condition: 1 (*no-view-count-comparison condition*). No interactions between smoking interest and condition were significant. *n* = 614.

was no thumbnail image. Future research should examine whether the effect of social influence on selection depends on what type of content is in question as well as on the prominence with which social endorsements are presented.

Although view count information did not affect youth's selective exposure to pro-smoking videos nor their social norms about smoking, it did affect attitudes toward smoking. Participants who were randomly assigned to the smoking-high-views condition had significantly more positive attitudes toward smoking than participants in the smoking-low-views or no-view-count-comparison conditions. Therefore, it appears that social endorsements do not go unnoticed—even though selection behaviors were unaffected by view count, view count influenced subsequent attitudes. It is troubling that youth hold more favorable attitudes toward smoking when given the impression that pro-smoking videos are popular, as previous research³⁶ shows that attitudes are indicative of future behavior to some degree.

There are some limitations to this study to note when interpreting the findings. Each person was exposed to a predetermined 1:1 ratio of eight smoking and eight nonsmoking videos. In a more realistic setting, one is unlikely to be faced with such a high proportion of smoking video options, so the findings of this study may be stronger than and not necessarily generalizable to selection patterns in the real world. Nonetheless, the algorithm of YouTube is designed to offer people more of what they previously selected, so such an environment is not that improbable for people who initially select smoking videos. Another limitation concerns the selection of stimulus materials. Specifically, the pro-smoking videos were selected based on researcher consensus on how misleading the videos were rather than taking a more systematic approach. Although this could be seen as arbitrary, note that we relied on expert judgment in an attempt to use pro-smoking videos that were more potentially problematic and thus have a greater need for regulation. Future research could benefit from taking a more rigorous approach and conduct a study only using pro-smoking videos that contain explicit smoking-related misinformation. Lastly, because smoking interest cannot be experimentally manipulated, there may have been some other unmeasured variable that went overlooked and that could have explained the results that we found. The magnitude of the effect that youth with higher interest in smoking are more likely to select and view pro-smoking videos is not overwhelmingly large. However, it is noteworthy that this effect is still present in spite of factors like impression management motives that might limit the size of the effect than would be the case in the real world.

Notwithstanding these limitations, there are several methodological strengths of this study. Instead of relying on self-reports or forced exposure, we developed a more ecologically valid browsing setting

(using real-world messages) and tracked selective exposure through unobtrusive means that could record selection behavior as it unfolds. This selective exposure paradigm allows us to better tap into the motivations driving selective exposure by making use of behavioral data and can overcome the shortcomings of self-report such as recall bias, social desirability bias, and the lack of introspective ability.³⁷

The present study addressed a practical and important question of whether youth who are high at risk for smoking are more susceptible to watch pro-smoking videos on YouTube. The availability of pro-smoking videos in the information sphere itself is problematic, but now that we have shown—with behavioral data—that youth who are particularly interested in smoking are more likely to watch these videos, the problem is twofold. This study provided a first step into assessing audience characteristics that drive selection of videos containing potentially misleading smoking information. Future studies should examine if these videos have any direct effects on smoking-related intentions, attitudes, or behavior.

Additionally, the findings of this study provide some policy implications regarding regulation of smoking promotion videos online. While Google already has regulations against advertising tobacco products,³⁸ smoking content in user-generated videos remain largely unregulated. Although it is true that most pro-smoking user-generated videos can serve as endorsements of cigarette smoking and of certain cigarette brands, these videos cannot be prosecuted under the Cigarette Labeling and Advertising Act because they do not fall under “commercial speech” and are thus protected under the First Amendment.³⁹

At the very minimum, pro-smoking videos should be age-restricted so that they are not visible to at-risk youth, who we find are most attracted to these videos. Despite YouTube policy that “portrayal of harmful or dangerous activities” falls under age-restricted content,⁴⁰ an earlier study⁵ found that 85% of smoking fetish videos were not age-restricted on YouTube. Tobacco-control advocates could call for stricter self-regulation by YouTube and also contribute to reporting problematic videos. Another suggestion is to incorporate more antismoking messaging on this platform—for instance, in the form of YouTube advertisements or in the form of comments—such that individuals who click on pro-smoking content would be able to make a more informed decision. All in all, because of (1) pro-smoking videos' prevalence on YouTube,³⁻⁵ (2) the young and at-risk nature of the individuals who view them, and (3) their ability to affect smoking-related attitudes when they appear popular, more regulatory effort is indeed called for.

Supplementary Material

Supplementary data are available at *Nicotine & Tobacco Research* online.

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Declaration of Interests

None declared.

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References

1. The top 500 sites on the web. Alexa. <http://www.alexa.com/topsites>. Accessed July 24, 2017.
2. YouTube for press. YouTube. <https://www.youtube.com/yt/about/press/>. Accessed July 24, 2017.
3. Forsyth SR, Malone RE. "I'll be your cigarette-light me up and get on with it": examining smoking imagery on YouTube. *Nicotine Tob Res*. 2010;12(8):810–816.
4. Freeman B, Chapman S. Is "YouTube" telling or selling you something? Tobacco content on the YouTube video-sharing website. *Tob Control*. 2007;16(3):207–210.
5. Kim K, Paek HJ, Lynn J. A content analysis of smoking fetish videos on YouTube: regulatory implications for tobacco control. *Health Commun*. 2010;25(2):97–106.
6. Anderson M. *5 Facts About Online Video, for YouTube's 10th Birthday*. Pew Research Center; 2015. <http://www.pewresearch.org/fact-tank/2015/02/12/5-facts-about-online-video-for-youtubes-10th-birthday/>. Accessed July 24, 2017.
7. US Department of Health and Human Services. *The Health Consequences of Smoking: 50 Years of Progress: A Report of the Surgeon General*. 2014. <http://www.surgeongeneral.gov/library/reports/50-years-of-progress/exec-summary.pdf>. Accessed July 24, 2017.
8. Charlesworth A, Glantz SA. Smoking in the movies increases adolescent smoking: a review. *Pediatrics*. 2005;116(6):1516–1528.
9. Sargent JD, Gibson J, Heatherton TF. Comparing the effects of entertainment media and tobacco marketing on youth smoking. *Tob Control*. 2009;18(1):47–53.
10. Halpern-Felsher BL, Biehle M, Kropp RY, Rubinstein ML. Perceived risks and benefits of smoking: differences among adolescents with different smoking experiences and intentions. *Prev Med*. 2004;39(3):559–567.
11. Hong T, Cody MJ. Presence of pro-tobacco messages on the web. *J Health Commun*. 2002;7(4):273–307.
12. Ribisl KM. The potential of the internet as a medium to encourage and discourage youth tobacco use. *Tob Control*. 2003;12(suppl 1):i48–i59.
13. Knobloch-Westerwick S. *Choice and Preference in Media Use: Advances in Selective Exposure Theory and Research*. New York, NY: Routledge; 2015.
14. Brock TC. Commitment to exposure as a determinant of information receptivity. *J Pers Soc Psychol*. 1965;2(1):10–19.
15. Brock TC, Balloun JL. Behavioral receptivity to dissonant information. *J Pers Soc Psychol*. 1967;6(4):413–428.
16. Hart W, Albarracín D, Eagly AH, Brechan I, Lindberg MJ, Merrill L. Feeling validated versus being correct: a meta-analysis of selective exposure to information. *Psychol Bull*. 2009;135(4):555–588.
17. Knoll LJ, Magis-Weinberg L, Speekenbrink M, Blakemore SJ. Social influence on risk perception during adolescence. *Psychol Sci*. 2015;26(5):583–592.
18. Maxwell KA. Friends: the role of peer influence across adolescent risk behaviors. *J Youth Adolesc*. 2002;31(4):267–277.
19. Prinstein MJ, Boergers J, Spirito A. Adolescents' and their friends' health-risk behavior: factors that alter or add to peer influence. *J Pediatr Psychol*. 2001;26(5):287–298.
20. Kim HS. Attracting views and going viral: how message features and news-sharing channels affect health news diffusion. *J Commun*. 2015;65(3):512–534.
21. Knobloch-Westerwick S, Sharma N, Hansen DL, Alter S. Impact of popularity indications on readers' selective exposure to online news. *J Broadcast Electron Media*. 2005;49(3):296–313.
22. Sundar SS, Nass C. Conceptualizing sources in online news. *J Commun*. 2001;51(1):52–72.
23. Winter S, Metzger MJ, Flanagin AJ. Selective use of news cues: a multiple-motive perspective on information selection in social media environments. *J Commun*. 2016;66(4):669–693.
24. Messing S, Westwood SJ. Selective exposure in the age of social media. *Commun Res*. 2012;41(8):1042–1063.
25. Fu WW. Selecting online videos from graphics, text, and view counts: the moderation of popularity bandwagons. *J Comput Mediat Commun*. 2012;18(1):46–61.
26. Salganik MJ, Dodds PS, Watts DJ. Experimental study of inequality and unpredictability in an artificial cultural market. *Science*. 2006;311(5762):854–856.
27. Pierce JP, Choi WS, Gilpin EA, Farkas AJ, Merritt RK. Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. *Health Psychol*. 1996;15(5):355–361.
28. Hastall MR, Knobloch-Westerwick S. Caught in the act: measuring selective exposure to experimental online stimuli. *Commun Methods Meas*. 2013;7(2):94–105.
29. Hoyle RH, Stephenson MT, Palmgreen P, Lorch EP, Donohew RL. Reliability and validity of a brief measure of sensation seeking. *Pers Individ Dif*. 2002;32(3):401–414.
30. Haws KL, Dholakia UM, Bearden WO. An assessment of chronic regulatory focus measures. *J Mark Res*. 2010;47(5):967–982.
31. David C, Cappella JN, Fishbein M. The social diffusion of influence among adolescents: group interaction in a chat room environment about antidrug advertisements. *Commun Theory*. 2006;16(1):118–140.
32. Gibbons FX, Buunk BP. Individual differences in social comparison: development of a scale of social comparison orientation. *J Pers Soc Psychol*. 1999;76(1):129–142.
33. Cacioppo JT, Petty RE. The need for cognition. *J Pers Soc Psychol*. 1982;42(1):116–131.
34. Maio GR, Esses VM. The need for affect: individual differences in the motivation to approach or avoid emotions. *J Pers*. 2001;69(4):583–615.
35. Park HS, Smith SW. Distinctiveness and influence of subjective norms, personal descriptive and injunctive norms, and societal descriptive and injunctive norms on behavioral intent: a case of two behaviors critical to organ donation. *Hum Commun Res*. 2007;33(2):194–218.
36. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process*. 1991;50(2):179–211.
37. Knobloch-Westerwick S. The selective exposure self- and affect-management (SESAM) model applications in the realms of race, politics, and health. *Commun Res*. 2015;42(7):959–985.
38. Dangerous products or services. Google. <https://support.google.com/adwordspolicy/answer/6014299?hl=en>. Accessed November 10, 2017.
39. Ciolli A. Joe camel meets YouTube: cigarette advertising regulations and user-generated marketing. *Univ Toledo Law Rev*. 2007;39(1):121–128.
40. Age-restricted content. YouTube. <https://support.google.com/youtube/answer/2802167?hl=en>. Accessed November 10, 2017.