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# Content analysis of antismoking videos on YouTube: message sensation value, message appeals, and their relationships with viewer responses

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## Abstract

Focusing on several message features that are prominent in antismoking campaign literature, this content-analytic study examines 934 anti-smoking video clips on YouTube for the following characteristics: message sensation value (MSV) and three types of message appeal (threat, social and humor). These four characteristics are then linked to YouTube's interactive audience response mechanisms (number of viewers, viewer ratings and number of comments) to capture message reach, viewer preference and viewer engagement. The findings suggest the following: (i) antismoking messages are prevalent on YouTube, (ii) MSV levels of online antismoking videos are relatively low compared with MSV levels of televised antismoking messages, (iii) threat appeals are the videos' predominant message strategy and (iv) message characteristics are related to viewer reach and viewer preference.

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## Introduction

For health communication practitioners and researchers, the exponential proliferation of Web 2.0 technologies provides both opportunities and challenges. In particular, YouTube, a free video-sharing service, is currently one of the fastest growing Web sites in the United States [1] and the fourth most-accessed site on the Internet [2]. Among the

Web site's visitors, youths aged 12–17 comprise a greater portion than any other demographic [3]. Due to this popularity among youth and the potential to influence their behavior, YouTube has already been noticed by the business world as an ideal platform for advertising and marketing [4]. Just as commercial marketers have taken advantage of the Web site as a promotional tool, health campaign researchers and practitioners could learn to use it as a tool for promoting beneficial and prosocial behaviors. However, only a few have begun to do so.

Smoking takes center stage in the following content analysis because of its topical salience and its significance as a public health concern. A small handful of studies have examined prosmoking messages available on YouTube, highlighting the potential impact on risky adolescent health behaviors and examining the Web site's potential uses for health promotion and education [5, 6]. Taking those explorations one step further, the current study examines the availability and characteristics of antismoking messages available on YouTube. Tobacco control advocates have long recognized the need to counter the prevalence of prosmoking messages in traditional media. But as they extend this effort to the new medium of video-sharing Web sites, they need to determine how available antismoking messages are online and what their main characteristics are.

This study addresses this need through content analysis and by focusing on several theoretical concepts, message characteristics and message strategies

that have been developed in the areas of health communication and persuasion. These include message sensation value (MSV) and three types of message appeal—threat appeal, social appeal and humor appeal [7, 8]. Additionally, this study advances efforts to explore the utility of YouTube by linking anti-smoking video message characteristics with the data the Web site provides on viewer responses. Unlike traditional media channels such as television and print, video-sharing Web sites often have interactive mechanisms that can collect data on content popularity and audience response. In the case of YouTube, it provides data on number of viewers, number of comments and viewer ratings [9]. However, few researchers have taken advantage of these interactive mechanisms. To demonstrate one way of doing so, we examine how the message characteristics identified in our content analysis—MSV and message appeals—are related to the viewer response data that these mechanisms provide. Ultimately, we recommend using YouTube as a health promotion medium for its ability to reach youths, to make various health messages available and to examine audience responses to those messages.

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## Literature review

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### YouTube as a potential health promotion channel

Researchers have increasingly recognized the Internet's importance as a promotional medium. One Web site that has proven to be particularly effective in disseminating promotional messages is YouTube, which has experienced a rapid growth in user volume and attained popularity among both Internet users and businesses. This popularity stems largely from its social media features, such as user communities and comment threads [10]. Founded in February 2005, YouTube is a free service that provides its subscribers with a convenient and user-friendly interface for uploading and sharing original videos. The Web site draws approximately 10% of Web traffic, as determined by number of visitors and the number of pages they visit [3]. As a result of

this popularity, YouTube has been receiving more and more attention from the business world as an ideal platform for advertising and marketing. It has been widely used by various business and advocacy groups, from entertainment companies to charitable organizations [4]. Having noted these trends, both researchers and practitioners in public health are beginning to investigate how YouTube could also be used for health communication [6].

The present study contributes to this investigation by exploring the availability and characteristics of antismoking videos on YouTube. The dangers of smoking have been publicized and combated in the United States since the 1960s. As a result, over the past five decades, the smoking rate among the US population aged 18 or older has decreased from 42.4 to 20.8% [11]. There has also been major progress since the late 1990s in lowering adolescent smoking rates. For example, the smoking rate among youth declined from 34.8% in 1999 to 19.5% in 2009 [12]. However, the decrease in the smoking rate among adolescents (especially high school students) has been stalled, and the 2010 health goal set by the US government to reduce high school smoking to 16% has failed to be met [13]. Furthermore, as the Internet continues to grow as a new platform for delivering prosmoking messages, many challenges still remain.

Health communication researchers have become more and more concerned about the many anti-health messages that target young people online, especially as their Internet use continues to expand. Several studies have determined the prevalence of Internet messages that celebrate smoking [5, 14–16]. For example, Kim *et al.* [5] found a high proportion of prosmoking messages that were glamorized by sexuality on YouTube. Based on their results, the authors urged more rigorous self-regulation within the medium. Now that such studies have documented the prevalence of prosmoking messages on YouTube, researchers also need to know the extent to which antismoking videos are available. In addition, we need to know what kinds of message characteristics they employ to appeal to young target audiences.

### Message characteristics

The success of a health campaign often depends on the persuasiveness and impact of its messages [17]. In particular, researchers have tried to identify which appeals and types of messages audiences prefer, remember and find effective. Guided by several persuasion and psychology theories, researchers have identified several message characteristics that are effective in antismoking and other health campaigns. These include MSV and three types of message appeals—threat appeal, social appeal and humor appeal.

### Message sensation value

MSV is a concept that was developed to classify the message characteristics of broadcast antidrug campaigns. Palmgreen *et al.* [7] define MSV as ‘the degree to which formal and content audio-visual features of a televised message elicit sensory, affective, and arousal responses’. Among the features researchers identify as likely to trigger these responses are impressive sound and visual effects, for example ‘suspenseful or intense music, multiple cuts and edits, unusual lighting and camera angles, zooms, or close-ups’ [8]. MSV encompasses two dimensions. First, it involves an ‘attribute’ of a message related to its structural and content features. Second, it also includes the sensory, affective and arousal ‘responses’ to message features. This second dimension, however, is often separated out as ‘perceived MSV’ [18]. Our study focuses only on the first dimension of message attributes because our aim is to identify structural and content features of antismoking videos on YouTube.

High MSV messages may lead to persuasion. For example, according to the Limited Capacity Model, people’s attention to broadcast messages is often ruled by involuntary processes that can be stimulated by specific aspects of a given message [19, 20]. Viewers are more likely to attend to broadcast videos when they contain evocative content and features such as intense imagery, movement and speed. In other words, such message features can provide more stimulation for cognitive processing and response. A few studies have empirically

demonstrated MSV’s effects on cognitive responses [21]. For example, examining antidrug campaigns, Stephenson [8] argued that MSV leads to persuasion by inducing respondents’ affect toward the message and thereby making them attend to it. In addition, Niederdeppe linked a content analysis of the ‘truth’ antismoking ads with survey data collected from youths who were exposed to them. He found that ads with high MSV levels increased message processing, particularly among older adolescents [20, 22].

Generally, these theoretical arguments and empirical studies suggest that high MSV levels may be more effective, especially when a message is delivered in broadcast and video formats and targeted toward youths. A question then arises about antismoking efforts in new media: To what degree is MSV used in antismoking videos available on video-sharing Web sites that are predominantly viewed by youths? A second related question concerns how antismoking videos may target different audiences: Does MSV level vary across types of antismoking videos? For example, smoking prevention messages mostly target youths, while smoking cessation messages usually target adults or older audiences who are already established smokers. By contrast, secondhand smoke warnings may target non-smokers, who can influence smokers to quit smoking. We combine these two questions as follows:

**RQ1:** To what degree do antismoking videos on YouTube employ MSV, and how does the degree differ across types of antismoking videos (i.e., smoking prevention, smoking cessation, and secondhand smoke)?

### Message appeals

Another message characteristic that may influence persuasion is the type of message appeal. Health communication researchers have long debated which message appeals are most effective. Various types have been used in antismoking campaigns and studied in health campaign literature. In antismoking research, the three most prominent types are threat appeals, social appeals and humor appeals

[22]. Threat appeals, sometimes called fear appeals, refer to ‘persuasive messages that emphasize the harmful physical or social consequences of failing to comply with message recommendations’ [23]. Although the fear and threat appeal labels are often interchangeable, we use ‘threat appeal’ consistently because it refers more precisely to a message characteristic. Fear is a person’s subjective reaction or a negative valence, but a threat is an external stimulus or a message cue that might arouse fear [24]. Threat appeals have the most extensive literature confirming their usage and effectiveness, particularly in health messages and public service announcements. To cite one such study, a content analysis of televised public service announcements (PSAs) reported that about 26% of them (the highest frequency) employ threat appeals [21].

Several theoretical models explain how threat appeals lead to attitude change [25]. For example, threat appeals may enhance people’s message response by arousing a level of fear that is sufficiently intense to motivate their drive state. Another explanation could be that threat appeals work by making people think about the threatening message and develop strategies to control the perceived threat, such as attitude or behavior changes. However, several researchers have cautioned that messages with threat levels that are either too low or too high may not lead to persuasion. If the threat level is too low, people will evaluate the message more carefully and decide not to respond. If it is too high, people’s defense mechanisms will engage and lead them to turn away from the message [23, 25].

Despite the threat appeal’s long history and widespread use, researchers continue to debate its effectiveness, particularly with respect to the question of how much of a threat is enough. Generally, older audiences seem to respond more to threat appeals because they feel more susceptible to the threat and are more willing to react to it. By contrast, threat appeals are less likely to influence youths because they see themselves as relatively invulnerable, tending to regard death and disease as happening to elders or perhaps to other young people but not to themselves [23]. For these reasons, different uses of threat appeals according to

age have also been reported in smoking contexts. While antismoking ads targeting adults tend to appeal to fear and rely on long-term health consequences, most ads targeting youths emphasize social appeals and short-term health consequences [22].

### **Social and humor appeals**

Compared with threat appeals, social and humor appeals focus more on the benefits of positive emotional valence. Positive appeals may elicit affective responses to a message ‘by creating emotional states that exemplify the emotional, psychological, or experiential benefits of complying with a campaign’ [26, p. 83]. Studies have found that social factors are one of the most important determinants of youth substance use, specifically alcohol and tobacco, because youths are relatively more susceptible to social influence and peer norms [27]. Direct or indirect effects of peer smoking norms on adolescent smoking have also been documented [28], which indicates the importance of employing social appeals in antismoking ads. For example, adolescents may see smoking as having important social benefits that outweigh its health risks [29]. In such cases, antismoking messages may be more effective if they use social appeals that associate coolness with either abstaining from smoking or resisting peer pressure to smoke.

In addition to social appeals that associate smoking abstinence with positive, sociable, and cool images, humor appeals may also effectively elicit positive affect toward the antismoking cause [22, 30]. Past studies have documented humor’s effectiveness in advertising and PSAs. For example, Nelson and While [31] found that more than a half of their college student study participants linked perceptions of a favorite ad to its humor value. Studies have also shown that emotionally arousing ads tend to be more successfully recalled [32]. When ads combine humor with executional cues such as music, charming vignettes and attractive models, they evoke positive affect such as excitement, happiness and warmth [33]. It was also found that humorous antismoking ads that show positive affect produced higher recall than

normative ads that show both positive and negative emotions [34]. However, another line of research may find the opposite, such that messages containing strong negative appeals (e.g. threat appeal) work better in inducing cognitive message processing compared with those featuring humor appeals [35].

Several content-analytic studies of antismoking messages have documented the prevalence of humor appeals in television antismoking campaigns. One notable example is the spot that features a pair of cowboys who start a brawl in a smoke-filled room but cannot finish it because they become immobilized by coughing fits [36]. Based on a review of the results of 186 focus groups with 118 antismoking ads, Goldman and Glantz [37] reported that some of the ads often use grotesque humor to highlight the negative physical consequences of smoking, for example yellow teeth and fingers, headaches and foul-smelling clothes and hair. Such humor appeals may elicit positive emotions and favorable responses to the ad. But, they may also bring about unintended consequences, including disbelief in the ads' messages due to the use of exaggeration or limited impact due to some potentially unrealistic portrayals [37]. Furthermore, excessive humor might subvert the seriousness of the antismoking cause. Given these theoretical arguments on the effectiveness of the three message appeals and the empirical findings associated with them, we address the following research question.

**RQ2:** What kinds of message appeals do the antismoking videos on YouTube employ and how does the employment of the appeals differ across video types (i.e., smoking prevention, smoking cessation, and secondhand smoke)?

### **Relationships between message characteristics and viewer responses**

Most content-analytic studies aim only to examine the frequencies, patterns and characteristics of a content of interest. Taking this aim further, the

current study links antismoking videos' message characteristics to three types of viewer responses: number of viewers, number of comments and viewer rating. This interactive capacity to capture such immediate responses is one of the unique features of YouTube and similar video-sharing Web sites, and we suggest that it can provide mechanisms for measuring the popularity and success of an Internet health campaign [9]. Number of viewers may indicate an antismoking video's popularity. Number of comments may indicate the extent to which the video content generates qualitative viewer feedback. Finally, viewer rating enables users to express their relative preference for a video [38]. For viewers to rate a YouTube video, they must log in and choose the rating option by clicking from one to five stars under the video. One star gives the video a rating of 'Poor'; two stars, 'Nothing special'; three stars, 'Worth watching'; four stars, 'Pretty cool'; and five stars, 'Awesome!' Such ratings provide useful insights about website users' opinions and behavior [39]. For example, as demonstrated in a study of consumer behavior in online bookstores, Web site user ratings of a book were associated with consumers' purchase of it [40].

So far, though, only a few studies in business and marketing have analyzed viewer responses to online videos. What these studies measured was the sincerity of viewer participation in the YouTube community and the popularity and access patterns of YouTube videos [3, 41, 42]. But if the research goal is to focus on antismoking videos to understand the association between message characteristics and viewer responses, one way to achieve it is to link a content analysis to the data provided by the interactive features of number of viewers, number of comments and viewer rating. Thus, we address the following research question:

**RQ3:** To what extent will a video's message characteristics (MSV and message appeals) be associated with viewer responses (i.e., number of viewers, number of comments, and viewer rating)?

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## Methods

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### Sample

Our sample includes 934 antismoking video clips retrieved from a search using four key phrases that were entered into YouTube's search engine in a general-to-specific order: (i) 'no smoking', (ii) 'antismoking', (iii) 'smoking prevention' and (iv) 'smoking cessation'.

YouTube displayed 4870 outcomes when the phrase 'no smoking' was entered, but we were able to click and watch only 400 of the 4870 video clips. One reason for this disparity between search results and available videos is that many search engines, including YouTube, provide a synthetic estimate of results, only a fraction of which are retrievable [39]. Thus, after retrieving 1600 initial outcomes by using the four key phrases ( $400 \times 4$ ), and after excluding duplicates, we obtained 1053 antismoking video clips. We then downloaded them, but in the meantime 28 videos had been deleted by their creators. Finally, 91 irrelevant videos were screened out from the remaining 1025, for example videos that featured prosmoking rather than antismoking themes. After downloading all the sample video clips, we recorded video length and three types of viewer response (number of viewers, number of comments and viewer rating). Viewer rating was assigned by using a scale of 1–5 stars (1 being low and 5 being high).

Regarding the types of antismoking messages, approximately 66% of the sample video clips featured the issue of smoking cessation, whereas 21% presented smoking prevention and 8% the danger of secondhand smoke. A typical smoking cessation video would sympathetically dramatize, often humorously, an adult struggling in his or her effort to quit smoking. A typical smoking prevention video would either warn or encourage youths to 'say no' to various temptations to smoke. A typical secondhand smoke video would dramatize victims of secondhand smoke standing up to smokers, frequently with humorous or shockingly exaggerated responses. These categories, however, were not mutually exclusive. For example, a video might feature both the issues of secondhand smoking and

smoking cessation simultaneously. As a result, the percentages did not necessarily add up to 100%. Regarding video creators, most of the sample videos were user generated (74%), while the rest were uploaded by government agencies, non-profit organizations, private companies or media companies.

### Coding scheme

This study mainly captured the characteristics of antismoking videos on YouTube with regard to the following: (i) types of antismoking message (prevention, cessation and secondhand smoke), (ii) message creators or sponsors, (iii) message appeals (threat, social and humor) and (iv) MSV. We adopted a coding scheme from the existing MSV literature [19], but we modified it slightly by adding the 'loud/fast music' item to the audio category [18]. As a result, the MSV category encompasses 3 categories and 12 items. The visual category includes number of cuts, visual effects, slow motion, bold or unusual colors and intense imagery. The audio category includes sound saturation, background music, loud/fast music and sound effects. The content category includes acted out, unexpected format and surprise ending. Each item, except number of video editing cuts, was coded as either 1 (present) or 0 (absent). Number of cuts was coded as either 0 (0–6 cuts), 1 (7–14 cuts) or 2 (more than 15 cuts). Coded values for the 12 elements were summed to create an MSV Index from 0 to 13 (0 being low and 13 being high). Each of the three message appeals was coded as either 1 (present), 0 (absent) or 99 (hard to tell) [23, 34, 36].

### Coding procedure

Two coders, both blind to the research questions, coded a sample totaling 934 videos [43]. They were trained for four consecutive days before the main coding. Training sessions involved several group discussions about the meanings and nuances of coding categories [44, 45]. For their work, the coders received a cash reward.

**Table I.** Operational definitions of variables

Variables <sup>a</sup>	P/L index <sup>b</sup>
Types of antismoking message <sup>c</sup>	
Smoking prevention: messages focusing on making young people not smoke	0.83
Smoking cessation: messages focusing on making people stop/quit smoking	0.87
Secondhand smoke: messages focusing on dangers of secondhand smoke	0.91
Source/sponsor/video creator	
(1) Government, (2) non-profit organization, (3) individuals, (4) media and other company, (5) foreign, (6) other (specify) and (7) hard to tell	1.00
MSV <sup>d</sup>	
Video/images	
Number of cuts: the number of times the camera cuts from one visual scene to the next. Converted to low (0–6), moderate (7–14) and high (more than 15) levels and coded as 0, 1 or 2.	0.87
Visual effects: anything beyond the range of human ability involving special visual effects.	0.79
Slow motion: the slowing of real-life action through technical intervention.	0.97
Bold or unusual colors: unusual colors outside the range of colors normally perceived in real life.	0.94
Intense images: intense or horrifying images including needles going into arms, guns pointed at heads or death.	0.91
Audio/music	
Sound saturation: background sound throughout the video clip, including street noise or other sounds, rather than simply a person talking throughout the video clip.	0.78
Background music: music to accompany the dialogue or action of the video clip.	0.90
Loud/fast music: the use of loud (relative to other sounds in the video clip) and fast (more than 120 beats per minute) music throughout the video clip.	0.80
Sound effects: unusual sounds (those that could not have occurred in real life) heard in the video clip, including gongs and other noises.	0.86
Content	
Acted out: instead of being told about the dangers of smoking, viewers see actions corresponding to the point of the antismoking video clip.	0.80
Unexpected format: if images and message are interchangeable with those in other antismoking videos, the format is expected.	1.00
Surprise/twist ending: the presence of a climactic, shocking end to the antismoking video clip.	0.96
Advertising appeals <sup>e</sup>	
Threat appeal: the overall impression is that you will suffer in some way if you smoke by showing cancer patients, gross teeth or lungs, scary images of people who suffer from smoking-related diseases.	0.89
Social appeal: visuals and major headline convey that you will have more friends, dates, and popularity if you do not smoke.	0.88
Humor appeal: play on words, puns, use of incongruous visuals or nonsensical statements.	0.88

<sup>a</sup>Operational definitions for the MSV measure were borrowed from past literature (e.g. Morgan *et al.* [21]; Palmgreen *et al.* [18]).

<sup>b</sup>P/L index indicates inter-coder reliability.

<sup>c</sup>Items were coded as 1 (present), 0 (absent) or 99 (hard to tell).

<sup>d</sup>Items were coded as 1 (present), 0 (absent) or 99 (hard to tell), except number of cuts.

<sup>e</sup>Items were coded as 1 (present), 0 (absent) or 99 (hard to tell).

Each coder coded half of the sample video clips. To achieve inter-coder reliability, the two coders coded 25% overlaps, which exceeds the 10% rule-of-thumb sample size for inter-coder reliability calculation [43]. To compute reliability, we adopted Perreault and Leigh's Index (P/L Index) [46]. The P/L Index is a proper inter-coder reliability formula

when there are two coders and coding categories with a nominal scale. The index is also known to be relatively rigorous because it takes chance agreements into account [5, 41]. The average for inter-coder reliability was 0.90. Table I presents the reliability coefficients for all the coding categories. Table II reports descriptive statistics of the variables for analysis.

**Table II.** Descriptive statistics: general characteristics of 934 sample video clips

Variables			
MSV	$M = 2.92$	$SD = 1.93$	Range: 0–9
Viewer responses			
Number of viewers	$M = 7877$	$SD = 38589.35$	
Number of comments	$M = 14.78$	$SD = 74.32$	
Viewer rating	$M = 2.73$	$SD = 2.08$	
Appeals	Percent (%) of presence		
Threat appeal	56.8		
Social appeal	8.0		
Humor appeal	15.3		
Content types of antismoking videos	Percent (%) of presence		
Prevention	20.6		
Cessation	65.7		
Secondhand smoke	8.2		
Video source/sponsor/creator	Percent (%) of presence		
Government/non-profit organizations/companies	26.0		
Individuals (users)	74.0		
Video length	Percent (%)		
Less than 30"	12.1		
30–59"	29.2		
1'–1' 59"	22.2		
2'–2' 59"	10.8		
3'–4' 59"	13.5		
More than 5'	12.2		

## Results

### RQ1: degree of MSV by type of antismoking videos

Research question 1 asked the extent to which the antismoking videos employ MSV and how that employment differs across types of video content. As shown in Table II, the average MSV score was 2.92 ( $SD = 1.93$ ) with a range of 0–9. Examined more closely, the videos had the following distribution of characteristics: about 35% contained a high level of editing cuts (i.e. more than 15), about 38% had visual effects and sound saturation, about 49% had background music and about 38% acted out their antismoking message, as opposed to verbalizing it through voiceovers or captions.

A one-way analysis of variance (ANOVA) test indicates that there was a significant difference in terms of MSV degree across the three types of antismoking videos—prevention ( $M = 3.47$ ,  $SD = 1.78$ ), cessation ( $M = 3.05$ ,  $SD = 1.89$ ) and secondhand smoke ( $M = 3.62$ ,  $SD = 1.97$ ) with  $F(2, 588) =$

3.39,  $P < 0.05$ . But *post hoc* tests revealed that the mean difference did not reach the statistical significance at  $P$ -value 0.05.

### RQ2: prevalence of message appeals by type of antismoking video

Research question 2 asked the extent to which the antismoking videos employ threat, humor or social appeals. RQ2 also asked how the use of these appeals differs across types of antismoking video. Threat appeals seemed most frequently used (56.8%), followed by humor appeals (15.3%) and social appeals (9%). Chi-square tests reveal a significant difference only regarding the use of humor appeals. In other words, smoking cessation videos seem to employ fewer humor appeals (present in 12%), while secondhand smoke videos seem to employ more (present in 31.3%) (chi-square (2) = 17.11,  $P < 0.001$ ). On the other hand, there was no significant difference in the use of either threat appeals or social appeals across the types of antismoking videos.



### RQ3: relationships between message characteristics and viewer responses

Alongside these content-based questions about the prevalence of MSV and message appeals and their different uses across antismoking video types, our RQ3 asked how these message characteristics are associated with message reach (i.e. number of viewers), viewer engagement (i.e. number of comments) and viewer preference (i.e. viewer rating). A multivariate analysis of covariance (MANCOVA) would enable us to simultaneously examine the effects of type of appeal and type of message as factors and MSV as a covariate on the viewer responses as the three outcome variables. However, as one of the statistical procedures to test assumptions for this analytic technique, Box's  $M$  test for homogeneity of variance (also known as homoscedasticity test) revealed statistical significance (Box's  $M = 2029.58$ ,  $F = 22.95$ ,  $P < 0.001$ ). This significance indicates that homogeneity of variance was found not to exist, failing to meet assumptions needed to perform multivariate ANOVA/ANCOVA. Therefore, a series of univariate analysis of covariance (ANCOVA) was performed. Diagnostic statistics (skewness and kurtosis) indicated that two of the outcome variables, number of viewers and number of comments, were highly skewed, thereby violating the normality assumption for the ANOVA/ANCOVA tests. Thus, these variables were natural logarithm transformed. Meanwhile, the message appeal variable was created to include all the categories that were separately coded (threat, humor, social appeal and multiple/other). The message type variable was also created through the same procedure (four categories: prevention, cessation, secondhand smoke and multiple/other).

First, the three ANCOVA models were fitted to examine the main effects of the factors (two fixed factors—message type and message appeal: covariate MSV) on the three dependent variables without any effects cancelled or weakened by interaction terms. Then, the interaction term between MSV and message appeal was included in the ANCOVA models to examine its effect along with the main effects. Lastly, our full ANCOVA models include all the main and interaction effects among

message type, message appeal and MSV. Tables III–V present each of the models with marginal means and standard errors of the two fixed factors and  $F$ -test results.

The results show that, in the main effects only model, message appeal and MSV had significant main effects on all three dependent variables (see the  $F$ -test results in Table III). Parameter estimates indicate that videos containing humor appeal, threat appeal and social appeal were all positively associated with the number of viewers [ $B = 0.724$  (SE = 0.284), 0.713 (SE = 0.181), 1.392 (SE = 0.279) respectively, all  $P < 0.01$ ], viewer rating [ $B = 0.658$  (SE = 0.294), 0.594 (SE = 0.189), 0.681 (SE = 0.289), respectively, all  $P < 0.05$ ] and the number of comments [ $B = 0.923$  (SE = 0.273) 0.727 (SE = 0.199), 1.527 (SE = 0.285), respectively, all  $P < 0.001$ ]. On the other hand, when an antismoking video has a high MSV value, it receives a higher number of viewers [ $B = 0.268$  (SE = 0.035),  $P < 0.001$ ], higher viewer rating [ $B = 0.136$  (SE = 0.036),  $P < 0.001$ ] and a higher number of comments [ $B = 0.072$  (SE = 0.035),  $P < 0.05$ ]. Meanwhile, message type also had a significant main effect only on the number of viewers, in that smoking cessation videos tended to have a lower number of viewers [ $B = -0.517$  (SE = 0.177),  $P < 0.01$ ].

Next, the interaction term between MSV and message appeal was introduced in the three ANCOVA models. As shown in Table IV, MSV and message appeal had a significant interaction effect on the number of viewers and viewer rating. Parameter estimates indicate that MSV, when coupled with humor appeal, is negatively associated with the number of viewer comments [ $B = -0.536$  (SE = 0.168),  $P < 0.01$ ] and viewer rating [ $B = -0.492$  (SE = 0.175),  $P < 0.01$ ]. However, when the interaction term was introduced, the main effects of MSV on viewer rating and the number of comments became non-significant. Meanwhile, message appeal remained as a significant main factor of all the three outcome variables. Parameter estimates indicate that YouTube videos employing humor appeal and threat appeal were positively related to the number of viewers [ $B = 2.10$  (SE = 0.517) and 0.978 (SE = 0.275), both at  $P < 0.001$ ],

**Table III.** Summary of ANCOVAs for the three dependent variables (main effects-only model)

Factor	<i>M</i>	SE	<i>F</i>	df	<i>P</i>
Dependent variable 1: number of viewers ( $R^2 = 0.117$ )					
MSV			58.917	1, 923	0.000
Message appeal			9.913	3, 923	0.000
Threat	6.673	0.127			
Humor	6.684	0.274			
Social	7.352	0.242			
Other	5.960	0.151			
Message type			3.431	3, 923	0.017
Prevention	6.609	0.289			
Cessation	6.369	0.118			
Secondhand smoke	6.804	0.255			
Other	6.886	0.150			
Dependent variable 2: viewer rating ( $R^2 = 0.035$ )					
MSV			14.071	1, 923	0.000
Message appeal			4.234	3, 923	0.006
Threat	2,891	0.132			
Humor	2,956	0.284			
Social	2,979	0.252			
Other	2,298	0.156			
Message type			2.470	3, 923	0.061
Prevention	2,560	0.300			
Cessation	2,711	0.122			
Secondhand smoke	2,674	0.265			
Other	3,179	0.156			
Dependent variable 3: number of comments ( $R^2 = 0.092$ )					
MSV			4.395	1, 493	0.037
Message appeal			11.312	3, 493	0.000
Threat	1.895	0.120			
Humor	2.092	0.263			
Social	2.696	0.225			
Other	1.169	0.167			
Message type			1.285	3, 493	0.279
Prevention	1.783	0.264			
Cessation	1.826	0.124			
Secondhand smoke	2.081	0.241			
Other	2.161	0.151			

M, marginal mean; SE, standard error.

viewer rating [ $B = 1.932$  (SE = 0.538) and 0.599 (SE = 0.286), both at  $P < 0.05$ ] and the number of comments [ $B = 0.987$  (SE = 0.476) and 0.923 (SE = 0.304), both at  $P < 0.05$ ]. By contrast, the relationship between social appeal and only the number of comments remained statistically significant [ $B = 2.382$  (SE = 0.614),  $P < 0.001$ ]. That is, videos that employ social appeal tend to have a higher number of comments than those that do not.

Lastly, when all the possible interactions among MSV, message appeal and message type were introduced in the ANCOVA models, effects of the variables became weaker, probably because they cancel out one another's effects. Only MSV remained as a significant factor of the number of viewers. Parameter estimates indicate that videos with a higher level of MSV seemed to have a higher number of viewers [ $B = 0.118$  (SE = 0.052),  $P < 0.001$ ].

**Table IV.** Summary of ANCOVAs for the three dependent variables (model with main and interaction effects of MSV  $\times$  message appeal)

Factor	<i>M</i>	<i>SE</i>	<i>F</i>	<i>df</i>	<i>P</i>
Dependent variable 1: number of viewers ( $R^2 = 0.129$ )					
MSV			12.951	1, 920	0.000
Message appeal			8.703	3, 920	0.000
Threat	6.672	0.127			
Humor	6.584	0.275			
Social	7.212	0.264			
Other	6.047	0.154			
Message type			2.422	3, 920	0.065
Prevention	6.588	0.290			
Cessation	6.361	0.120			
Secondhand smoke	6.797	0.259			
Other	6.769	0.155			
MSV $\times$ message appeal			4.103	3, 920	0.007
Dependent variable 2: viewer rating ( $R^2 = 0.044$ )					
MSV			1.046	1, 920	0.307
Message appeal			5.142	3, 920	0.002
Threat	2.872	0.133			
Humor	2.852	0.286			
Social	2.860	0.274			
Other	2.354	0.160			
Message type			1.627	3, 920	0.182
Prevention	2.517	0.302			
Cessation	2.691	0.125			
Secondhand smoke	2.667	0.269			
Other	3.064	0.161			
MSV $\times$ message appeal			2.942	3, 920	0.032
Dependent variable 3: number of comments ( $R^2 = 0.079$ )					
MSV			0.560	1, 490	0.454
Message appeal			6.994	3, 490	0.000
Threat	1.911	0.121			
Humor	2.136	0.307			
Social	2.852	0.249			
Other	1.207	0.170			
Message type			1.290	3, 490	0.277
Prevention	1.864	0.270			
Cessation	1.874	0.131			
Secondhand smoke	2.162	0.247			
Other	2.205	0.165			
MSV $\times$ message appeal			0.961	3, 490	0.411

*M*, marginal mean; *SE*, standard error.

## Discussion

In response to YouTube's popularity and promotional potential, a few studies have determined the prevalence of prosmoking messages on the Web site [5]. However, what remains to be explored is whether video-sharing Web sites can prove useful

in delivering antismoking messages and countervailing the abundance of online prosmoking messages. To begin answering this question, this content-analytic study examined the availability and characteristics of antismoking videos on YouTube. In addition, it explored how antismoking message characteristics relate to the Web site's

**Table V.** Summary of ANCOVAs for the three dependent variables (full model with main and interaction effects)

Factor	<i>M</i>	SE	<i>F</i>	df	<i>P</i>
Dependent variable 1: number of viewers ( $R^2 = 0.127$ )					
MSV			8.384	1, 908	0.004
Message appeal			0.748	3, 908	0.524
Threat	6.655	0.154			
Humor	6.042	0.426			
Social	7.361	0.410			
Other	6.210	0.327			
Message type			0.277	3, 908	0.842
Prevention	6.561	0.469			
Cessation	6.250	0.142			
Secondhand smoke	6.791	0.401			
Other	6.665	0.265			
MSV × message appeal			1.058	3, 908	0.366
Message appeal × message type			1.578	9, 908	0.117
MSV × message type			1.615	3, 908	0.184
Dependent variable 2: viewer rating ( $R^2 = 0.056$ )					
MSV			3.148	1, 908	0.076
Message appeal			0.635	3, 908	0.592
Threat	2.810	0.161			
Humor	2.401	0.445			
Social	2.715	0.429			
Other	2.359	0.341			
Message type			1.028	3, 908	0.379
Prevention	2.314	0.490			
Cessation	2.652	0.148			
Secondhand smoke	2.401	0.419			
Other	2.918	0.277			
MSV × message appeal			1.547	3, 908	0.201
Message appeal × message type			0.563	9, 908	0.828
MSV × message type			2.069	3, 908	0.103
Dependent variable 3: number of comments ( $R^2 = 0.117$ )					
MSV			0.052	1, 478	0.820
Message appeal			1.715	3, 478	0.163
Threat	1.945	0.142			
Humor	1.916	0.405			
Social	2.981	0.376			
Other	1.713	0.350			
Message type			1.448	3, 478	0.228
Prevention	1.719	0.388			
Cessation	1.845	0.156			
Secondhand smoke	2.634	0.436			
Other	2.358	0.298			
MSV × message appeal			0.392	3, 478	0.759
Message appeal × message type			0.754	9, 478	0.660
MSV × message type			0.973	3, 478	0.405

M, marginal mean; SE, standard error.

interactive response mechanisms: number of viewers, number of comments and viewer rating.

First, our findings suggest that YouTube makes a large number of antismoking videos available. Nevertheless, this number falls far short of the much greater number of available prosmoking videos. For example, when we searched antismoking videos on YouTube with the key word antismoking, 2330 videos were retrieved. Even when we used multiple keywords to find antismoking videos, the number of outcomes was less than 7000. However, when we searched with the keyword 'cigarette', approximately 55 000 videos were available. Although there might be an overlap between antismoking and prosmoking videos when these search terms are used, the results still imply that prosmoking videos vastly outnumber antismoking videos. In terms of message characteristics, our findings also showed a relatively low level of MSV across the antismoking videos (i.e. 2.92 of 13 possible MSV scores).

In particular, we compared the mean level, in addition to some individual items comprising MSV, with that of the successful truth antismoking TV campaigns that Niederdeppe [20] analyzed. This comparison is useful in assessing the meaning of the average MSV level found in the antismoking videos available on YouTube. This is not to say that all the coding conditions, for example the coders and coding scheme, between the current study and that by Niederdeppe were exactly the same. Nevertheless, the operational definitions of MSV used in both studies are almost identical, and they are adopted from several previous studies [18, 21]. Niederdeppe's [20] study found that about 74% of the ads acted out the main point of the antismoking campaigns, 33% used intense imagery and about 66% used sound saturation. By contrast, our findings indicate that approximately 38% acted out their main point, 4% used intense imagery and 38% used sound saturation. This comparison reveals that the antismoking videos available on YouTube have a relatively low level of MSV.

Our ANCOVA models show that a high level of MSV is associated with how many viewers watched each video, how highly viewers rated it and how many viewers expressed their opinion about it by

posting comments. For example, the average number of viewers is about 4804 when an antismoking video has a low level of MSV, as opposed to about 14 696 when it has a high level of MSV. This finding seems consistent with past findings that health messages with either high MSV or provocative appeals seem to draw more viewers and generate viewers' liking. Specifically, regarding antismoking messages with provocative appeals, Hafstad *et al.* argued that such messages would generate affective responses, thereby leading to interpersonal communication [47]. These findings are also well explained theoretically, for example by the Limited Capacity Model [19].

Regarding the prevalence of message appeal types in antismoking videos, our findings reveal that threat appeals outnumber social and humor appeals. Threat appeals typically consisted of showing audiences the dangers of smoking in terms of fatal health consequences, such as mouth cancer, rotten lungs and dying patients. Our finding on the threat appeal's prevalence also reaffirms why the health campaign literature has concentrated on this message type for so long [25].

Our ANCOVA models clearly show the significant main effects of message appeals on viewer responses. In particular, the significant main effects of threat appeals on viewer responses seem to suggest that the threat appeal captures viewers' attention and stimulates their thoughts more so than the social appeal.

On the other hand, we found that, when coupled with a high level of MSV, humor appeals seem negatively related to the number of viewers and viewer rating. This finding suggests that humor appeals should be used with discretion. As discussed earlier, humor appeals with a high level of MSV may lead people to perceive them as excessive, resulting in unintended consequences such as viewers disbelieving the ads' messages or construing the messages as subverting the seriousness of the antismoking cause [35, 37].

While several smoking studies have demonstrated the impact of social appeals [48–52], in the current content analysis their presence was rare. The weaker main effect of social appeals on viewer

responses may result either from this rarity or from the way they are presented. Or it may be that social appeals do not draw viewer attention as much as threat appeals or high MSV levels.

Despite several important findings and theoretical contributions to content analysis literature, several limitations should be acknowledged. First, we tried to capture the entire population of antismoking videos available on YouTube. We might not have captured all, and it is well known that various technical problems pose challenges for researchers who examine Web site content [53]. Internet researchers should therefore continue to develop more rigorous and standardized research methods that accommodate the Internet's mobile, fluid and interactive features.

Second, although a content-analytic study represents an important first step in exploring the types of content available to target audiences, and although we made connections between message characteristics and viewer responses, the findings and the insights generated from them are somewhat limited [15]. A controlled experiment study may be needed to further investigate the variety of attitudinal and behavioral consequences that antismoking videos on YouTube generate among young audiences. In addition, if we could link the characteristics of antismoking videos with a more systematic analysis of viewer comments, we could better understand the range of audience responses to messages available on this and other video-sharing Web sites.

Lastly, this study focused on antismoking videos because of the salience and importance of smoking as a public health concern. It also focused on a limited number of message characteristics that are prominent in antismoking campaigns. But to progress beyond the scope of this study, health promotion researchers and practitioners should explore the utility of video-sharing Web sites in other areas of public health, particularly if these other areas might be better served by the use of different message characteristics.

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### Conflict of interest statement

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None declared.

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