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Counteracting Misleading Protobacco YouTube Videos: The Effects of Text-Based and Narrative Correction Interventions and the Role of Identification

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YouTube's propagation of misleading protobacco content to youth has the potential to increase their protobacco beliefs, attitudes, and smoking behavior. We assessed the effects of potential interventions aimed at ameliorating the effect of misleading protobacco videos. An online experiment randomly exposed past and current young tobacco users (*N* = 716) between the ages of 15 and 19 years to real protobacco, pipe-focused YouTube content that was either shown in its original uncorrected form or edited to include either a propositional voiced and text-based rebuttal that warned about the health effects of smoking or a counternarrative that showed that a person who promoted protobacco messages was diagnosed with and eventually died from esophageal cancer. On average, the two interventions were equally effective at reducing the effects of protobacco messages on beliefs and attitudes. However, the narrative correction was more effective for participants who strongly identified with the character. Practical and theoretical implications are discussed.

Keywords: misinformation, YouTube, smoking videos, narrative persuasion, identification

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With more than 1 billion users (Adhikari, Sharma, Arjyal, & Uprety, 2016), YouTube serves as a major source of easily accessible information about tobacco products. Most YouTube tobacco-related videos portray smoking in a positive way, underrepresenting the dangers and health implications of tobacco use (Bromberg, Augustson, & Backinger, 2012; Forsyth & Malone, 2010). Prosmoking content on YouTube poses a unique health concern for one primary group of YouTube's users: youth (Anderson & Jiang, 2018; Bae, Maloney, Albarracín, & Cappella, 2018). Roughly one third of teens say they use YouTube more often than other social media (Anderson & Jiang, 2018). Americans often approach the media, including YouTube, when seeking health information, preferring them to official health information sources (Ramírez et al., 2013). Experiments found that youth with higher interest in smoking are also more likely to select prosmoking content (Bae et al., 2018). This group is also more susceptible to smoking initiation (Veeranki, Mamudu, Anderson, & Zheng, 2014).

Analyses of protobacco YouTube videos identified several common categories, including images of people smoking, fetishization of smoking, comedy, and cigarette magic tricks (Freeman & Chapman, 2007; K. Kim, Paek, & Lynn, 2010). Protobacco videos often include foci popular with the young (Padon, Maloney, & Cappella, 2017), such as celebrities, sports, and music (Elkin, Thomson, & Wilson, 2010). Another taxonomy suggests five categories: rejection of science, benefit assertion (e.g., tobacco may be healthy), harm denial, acceptable risks (e.g., tobacco use is no riskier than other activities), and modeling (Romer, Jamieson, Hall Jamieson, Jones, & Sherr, 2017). All of these could potentially influence beliefs and behaviors.

Exposure to videos containing positive portrayal of smoking has been associated with both an increase in protobacco attitudes (Albarracin, Romer, Jones, Hall Jamieson, & Jamieson, 2018) and smoking initiation among youth (Charlesworth & Glantz, 2005; Sargent, Gibson, & Heatherton, 2009). Videos modeling young people smoking can increase smoking behavior as well (Sargent et al., 2005; Villanti, Boulay, & Juon, 2011). Youth exposed to protobacco videos are also prone to form positive expectations about short-term benefits and to underplay long-term health effects of smoking (Bae et al., 2018).

In this study, we tested the effects of two interventions aimed at ameliorating the effect of protobacco videos. The first was a voiced and printed warning about the health effects of smoking that we appended to the protobacco video. The second was a narrative correction that provided additional short video content that showed that the person who promoted a protobacco message was diagnosed with and eventually died from esophageal cancer. Theoretical and practical implications are discussed.

Combating Protobacco Information

According to the U.S. District Court for the District of Columbia, the tobacco industry falsely denied and minimized the adverse health effects of smoking on smokers and nonsmokers for decades, as well as the addictive properties of nicotine, and misled the public about the benefits of low-tar or light cigarettes (Cappella, Maloney, Ophir, & Brennan, 2015). Today, misinformation is also prevalent in YouTube videos about tobacco products (Albarracin et al., 2018), with some containing explicit misinformation (Freeman, 2012; Seidenberg, Rodgers, Rees, & Connolly, 2012), and others misleading audiences by failing to include the negative health effects from smoking (Hong & Cody, 2002; Seidenberg et al., 2012). The propipe video on which this experiment focused falls into the latter category. Such misinformation could affect perceptions regarding the adverse health effects of smoking (Cummings, Hyland, Bansal, & Giovino, 2004).

As a result, efforts have been made to educate the public about the consequences of smoking through public campaigns (Kranzler, Gibson, & Hornik, 2017), warning labels (Brennan, Maloney, Ophir, & Cappella, 2016, 2018; Ophir, Brennan, Maloney, & Cappella, 2017), and industry-funded messages (Howard, 2017; Kodjak, 2017). Although some efforts have proven successful (Albarracin et al., 2018), simply providing people with the correct information often fails to eliminate the effects of misinformation on beliefs, attitudes, and behaviors (known as "the continued influence effect"; Ecker, Swire, & Lewandowsky, 2014; Johnson & Seifert, 1994). Even when people are able to recall corrections, misinformation may still affect attitudes through "belief echoes" (Thorson, 2015). Studies have found that misinformation embedded within personal narratives (Hinyard & Kreuter, 2007) is especially hard to correct. This challenge results from audiences' identification with characters (Cohen, 2001) and the ability of narrative to produce causal explanations for events (Green & Donahue, 2011), which once established are resistant to change (Johnson & Seifert, 1994). As a result, scholars have argued that misinformation about tobacco should be debunked using enhanced corrections (Lee, Sanders-Jackson, & Tan, 2020) and specifically narratives that include emotional appeals and causal explanations (Cappella et al., 2015; Green & Donahue, 2011; Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). It is unsurprising, then, that narrative correctives have been found to be more effective as countermeasures against narrative misinformation (Sangalang, Ophir, & Cappella, 2019).

Identification (de Graaf, Hoeken, Sanders, & Beentjes, 2012), the temporal state in which one mentally adopts the goals, perspective, emotions, and identity of another person (Cohen, 2001), can be an influential element in protobacco YouTube videos. Characters allow audiences to vicariously experience new attitudes and behaviors (Bandura, 2001), increasing the likelihood that audiences will accept the story's messages (Cohen, 2001). Identification can increase perceived susceptibility to diseases (Frank, Murphy, Chatterjee, Moran, & Baezconde-Garbanati, 2015) and story-consistent attitudes and beliefs, including those about expected results of unhealthy behaviors (Moyer-Gusé, Chung, & Jain, 2011; Murphy, Frank, Chatterjee, & Baezconde-Garbanati, 2013). Identification with a smoker in a video may occur even if the character and viewer differ from each other demographically (Cohen, Weimann-Saks, & Mazor-Tregerman, 2017). Hence, young viewers may identify with an older character if the character and the viewer share similar attitudes (e.g., protobacco; Hoffner & Buchanan, 2005).

Here, we tested the claim that narrative-based corrections are more effective than simple propositional ones (Cappella et al., 2015) in blunting misleading narratives. We randomly assigned past and self-identified smokers (identified by first being asked which tobacco products they ever used, and then whether they currently define themselves as smokers) to watch real protobacco YouTube content (from a user named "Pipepops," published in his YouTube channel "OldPipepops") that was either shown in its original uncorrected form or edited to include either a traditional propositional voiced and text-based rebuttal or a narrative correction.[2] A control group watched a similar video that was not about tobacco or smoking (but still consisted of one person directly approaching the audience).

[2] Because the original video does not make an erroneous claim, but rather misleads through omission (i.e., discussing only the benefits of tobacco without introducing adverse health effects), rebuttals do not correct the character's argument that he enjoys pipe smoking, but instead provide audiences with a more complete and balanced depiction of the consequences of the behavior.

Because the stories used in different conditions conveyed different messages about smoking, we expected them to yield different beliefs and attitudes (Albarracin et al., 2018; Charlesworth & Glantz, 2005; Sargent et al., 2009). In the no-correction condition, participants were exposed only to protobacco arguments. In the propositional correction, participants also learned about the adverse health effects of smoking. In the narrative correction condition, participants were exposed to the "Pipepops" original video and also to an additional later clip in which he explains that he has been diagnosed with esophageal cancer, and a third clip bearing a later date in which another individual ("Pipelawyer") tells viewers that "Pipepops" has passed away. We hypothesized that

H1: *Participants exposed to a video portraying a smoker who discusses the benefits of smoking but not its adverse health effects (no correction) will express more protobacco attitudes and beliefs compared with those exposed to a nontobacco control video.*

H2: *Participants exposed to the text-based propositional rebuttal (simple correction) or the narrative correction will express less positive tobacco attitudes and beliefs than those exposed to the nontobacco control and the no-correction video.*

Due to previous failures to correct misleading information using simple corrections and empirical evidence suggesting an advantage for narrative corrections for narrative misinformation (Cappella et al., 2015; Sangalang et al., 2019), we also predicted that

H3: *Participants exposed to the narrative correction will express less positive tobacco attitudes and beliefs compared with those exposed to the simple correction.*

Given that the different conditions conveyed different messages, we also anticipated an interaction between condition and identification. In particular, those who identified more strongly with "Pipepops" were expected to express more protobacco attitudes and beliefs in the original video, but to also be more influenced by the news of his death in the narrative correction video. We hypothesized that

H4: *Exposure to the narrative correction will suppress the positive effect of identification on protobacco attitudes and beliefs.*

Method

Participants and Procedure

In total, 716[3] current (n = 241) and past (n = 475) smokers of any tobacco products (347 females, 594 Whites) between the ages of 15 and 19 years (M = 17.39 years, SD = 1.36; 174 had at least some college

[3] The original sample consisted of 761 participants; 38 participants were omitted from analysis as they claimed to have seen videos by the main character before (n = 27) or seen the specific video they were assigned to before (n = 11). Seven participants did not complete the study and were also removed, resulting in 716 participants in the analyzed data set.

experience) participated in an online study in exchange for monetary compensation. Participants were recruited from October to November 2015 through two Internet panel companies (Critical Mix and Federated Sample) that drew random samples from their respondent pool of English-speaking U.S. households with oversampling of respondent demographics that are underrepresented in online panels or have a higher likelihood of nonresponse. The panel firms verified the name and address of panel members and provided incentives with a value of approximately $3 for participation. Of those invited, 9.7% completed the study. Participants were randomly assigned to one of four conditions described below, three treatment and one control (a non-tobacco YouTube video).[4] To increase attention and comprehension, videos were played twice, back to back. Participants then completed a questionnaire and were compensated for their time. Consent was secured from parents and guardians of participants younger than 18 years old. All procedures were approved by the University of Pennsylvania's Institutional Review Board. After completion of the experiment, those in the no-correction condition were debriefed about the dangers of smoking by being exposed to the textual propositional content.

Materials

All videos used in this study were original YouTube videos. Participants were randomly assigned to watch one video from the following conditions:

1. Original no correction (*n* = 160): A video from the "OldPipepops" channel in which a bearded grey-haired man who self-identifies as "Pipepops" smokes a pipe as he recounts his pleasant experiences as a pipe smoker. He describes his collection of 15 pipes, and argues that he enjoys smoking a pipe as part of his current retired lifestyle. No discussion of adverse health effect is present in this video.

2. Text-based propositional correction (*n* = 179): In this condition, text sourced to the U.S. Department of Health and Human Services (and also read aloud by a speaker) is added to the end of the original video. It says, "Cigar and pipe smoke, like cigarette smoke, contains toxic & cancer causing chemicals that are harmful to both smokers & non-smokers."

3. Narrative correction (*n* = 193): In this condition, two short videos are added to the end of the original one. Each indicates the date when it was posted. The first is the one of "Pipepops" used in the no-correction condition (February 28, 2011). In the second (October 20, 2011), "Pipepops" reports that he has been diagnosed with a malignant tumor ("turns out my tumor in my esophagus is malignant"). To that video clip, we appended a third one dated February 27, 2012, showing a second YouTube user, "Pipelawyer," announcing with obvious emotion that "Pipepops" has lost his "battle with esophageal cancer" and passed away.

4. Control (*n* = 184): A video showing a man (not "Pipepops") cooking salmon, with no mentions of tobacco or smoking.

[4] No significant differences were found between conditions on key demographic variables.

Measures

Identification was measured using the average of three items (α = .84), ranging from 1 (*not at all*) to 4 (*very much*), adapted from the following identification scale (Cohen, 2001): "Think about what the person you saw in the video said. How much could you relate to the person in the video? Did you feel that you can really get inside the person's head? Did you feel the emotions the person portrayed?"

Misinformed beliefs about pipes were measured using the average of three items (α = .80) ranging from 1 (*not accurate at all*) to 5 (*very accurate*): "Based on what you know, how accurate is the claim. . . ?" with the items "As long as you don't smoke all the time, the likelihood of getting cancer from smoking a pipe is low," "The risk of developing a disease due to pipe smoking is very low as long as you engage in other behaviors which promote health," and "If you're a cigarette smoker, switching to pipe smoking can save your life."

Perceived risk of pipe smoking was measured using the sum of 12 items, asking participants to indicate whether a health effect can result from smoking tobacco in a pipe (yes/no/don't know). The items were death, fatal lung disease, emphysema, heart disease, stroke, nicotine addiction, lung disease in nonsmokers exposed to second-hand smoke, mouth cancer, blindness, hepatitis C,[5] psoriasis, and cancer. Those who answered "don't know" were coded as "no."

Perceived susceptibility was measured using an average of 12 items (α = .94), ranging from 1 (*not at all likely*) to 5 (*extremely likely*). Participants were asked to "rate the likelihood that each of the following illnesses will happen as a result of having smoked tobacco in a pipe, if you have smoked tobacco in a pipe over an extended period of time," with items corresponding to the 12 health effects described in the perceived risk measure.

Attitudes were measured using the average of six items ranging from 1 to 7: "Please tell us how you feel about smoking cigarettes using the following scales," with the items labeled "bad/good," "enjoyable/unenjoyable" (reversed), "unpleasant/pleasant," "wise/foolish" (reversed), "harmful/beneficial," and "healthy/not healthy" (reversed). The same items were asked for attitudes regarding smoking tobacco in a pipe (α = .89) and in regular cigarettes (α = .83).

Tobacco use was measured in two steps. First, participants were asked whether they ever used any of the following products: cigarettes, cigars/cigarillos/little cigars, chewing tobacco/dipping tobacco/snuff, tobacco pipe, e-cigarettes, or hookah/water pipe. Those who answered "yes" for any of the products were then asked whether or not they currently considered themselves to be "smokers." Those who answered "yes" were labeled "self-identified smokers." Those who answered "no" were labeled "ever tobacco users."

[5] Hepatitis C is not caused by smoking, although it could aggravate its effects and the two may therefore be associated in the mind of smokers. Notice that we measured perceived and not actual risk. We examined our models with and without hepatitis C as part of the scale and results remained virtually the same.

Results

Descriptive Statistics

Overall, across all tobacco-related conditions, identification (ranging from 1 to 4) with "Pipepops" was moderate (M = 2.12, SD = 0.86). Misinformed beliefs about pipes (1–5) were moderately low (M = 2.10, SD = 0.92). Attitudes (1–7) on average were negative, both toward pipes (M = 2.30, SD = 1.25) and regular cigarettes (M = 2.66, SD = 1.31). Perceived susceptibility (1–5) was moderately high (M = 3.42, SD = 1.00). On average, participants believed that 7.84 of the 12 diseases listed were caused by tobacco smoking (SD = 3.28). On average, identification was positively correlated with misinformed pipe beliefs, perceived risk, and attitudes toward cigarettes and pipe smoking ($p < .001$). Beliefs and attitudes were positively correlated with each other and negatively correlated with perceived susceptibility and risk perceptions ($p < .001$). Table 1 presents the bivariate correlations among key variables.

Table 1. Pearson Correlations Among Variables of Interest.

Variable	*M* (*SD*)	*n*	1	2	3	4	5
1. Identification	2.13 (0.78)	532					
2. Misinformed beliefs	2.40 (0.81)	681	.20**				
3. Perceived risk	7.84 (3.28)	683	.13*	−.22**			
4. Cigarettes attitudes	2.66 (1.30)	696	.18**	.31**	−.16**		
5. Pipe attitudes	2.30 (1.25)	690	.12*	.47**	−.29**	.56**	
6. Susceptibility	3.42 (1.00)	650	.06	−.27**	.45**	−.30**	−.40**

Note. Identification is correlated with other variables in this table only for participants who watched tobacco-related videos with the "Pipepops" character.
*$p < .01$. **$p < .001$.

Hypothesis Testing

To test our hypotheses we conducted analyses of covariance (ANCOVAs), controlling for age, race, education, and gender (for each analysis, only significant covariates were kept in the model). We also controlled for whether the participants considered themselves smokers. That variable was significant for all tests. Those considering themselves smokers were more likely to express propipe and procigarette attitudes and hold misinformed beliefs ($p < .001$). There were no significant differences between those considering themselves smokers and those who did not on perceived susceptibility or health effects ($p > .05$).

Hypothesis 1 predicted that people exposed to the original video (protobacco only) would express more positive attitudes toward and beliefs about smoking than those in the control condition. An ANCOVA found significant differences between the original and control conditions on attitudes toward pipe smoking ($p = .022$). Attitudes toward pipe smoking were more positive after exposure to the original protobacco video (M = 2.47, SE = 0.33) than the control (M = 2.10, SE = 0.32). There was a marginally significant difference in perceived risk ($p = .058$), with higher perceived risk in the control video (M = 7.70, SE = 0.27) than in the protobacco

video (M = 6.78, SE = 0.27). There were no differences on misinformed beliefs about pipes (p = .805), attitudes toward regular cigarettes (p = .853), or perceived susceptibility (p = .775). To sum, exposure to the protobacco video increased propipe attitudes and reduced perceived risk compared with the control. However, the difference in perceived risk, misinformed beliefs about pipes, attitudes toward regular cigarettes, and perceived susceptibility were not significant. Hypothesis 1 was partially supported.

Hypothesis 2 predicted that participants exposed to the text-based propositional rebuttal or to the narrative correction would express fewer positive attitudes and beliefs about tobacco smoking than those exposed to the nontobacco control and the protobacco video. The same ANCOVA conducted for Hypothesis 1 found significant differences between some of the conditions. For attitudes toward pipe smoking, there was a significant difference between the no-correction (M = 2.47, SE = 0.33) and simple correction (M = 2.08, SE = 0.33, p = .014) conditions. The difference between the narrative correction (M = 2.18, SE = 0.33) and the other conditions was not statistically significant (p > .05) on this measure. Neither corrective differed from the control (M = 2.10, SE = 0.33). In addition, both simple correction (M = 8.05, SE = 0.27, p = .002) and narrative correction (M = 7.79, SE = 0.26, p = .027) videos increased perceived risk compared with the protobacco video (M = 6.78, SE = 0.27). However, neither differed from the control video (M = 7.70, SE = 0.27, p > .05).

There were no significant differences between any of the conditions on misinformed beliefs about pipes (protobacco M = 2.77, SE = 0.27; narrative correction M = 2.71, SE = 0.27; simple correction M = 2.74, SE = 0.27; control M = 2.69, SE = 0.26). There were no significant differences between any of the conditions on attitudes toward regular cigarettes (protobacco M = 3.19, SE = 0.34; narrative correction M = 3.22, SE = 0.33; simple correction M = 3.24, SE = 0.34; control M = 3.30, SE = 0.33). Moreover, there were no significant differences between any of the conditions on perceived susceptibility (protobacco M = 3.31, SE = 0.30; narrative correction M = 3.51, SE = 0.30; simple correction M = 3.57, SE = 0.30; control M = 3.42, SE = 0.29). Hypothesis 2 was partially supported. Both the simple correction and the narrative correction videos increased perceived risk compared with the protobacco video, and the simple correction also reduced propipe attitudes. Other comparisons were not significant, including all comparisons between the corrective videos and the control. To sum, exposure to the original "Pipepops" video resulted in more propipe attitudes and perceived risk than exposure to the corrections (for attitudes, the difference was significant only for the simple correction). The corrections did not differ from the control on any variable. There were no significant differences between the no-correction and correction conditions on misinformed beliefs, attitudes toward regular cigarettes, and perceived susceptibility. Hypothesis 2 was partially supported.

Hypothesis 3 predicted that the simple correction would suppress protobacco attitudes to a lesser extent than would the narrative correction. The ANCOVA results indicated no significant differences between the correctives on attitudes toward pipe smoking (p = .821) or regular cigarettes (p = .999), misinformed beliefs about pipe smoking (p = .989), perceived risk (p = .869), or perceived susceptibility (p = .938). To sum, as there were no differences on any variable between the two types of corrections, Hypothesis 3 was not supported.

Hypothesis 4 predicted that the positive effect of identification on misinformed tobacco beliefs (r = .24, p < .001) and negative attitudes toward pipe smoking (r = .11, p = .007) would increase in the counternarrative video. On average, identification was highest among those exposed to the narrative correction (M = 2.35, SD = 0.87), followed by the simple correction (M = 2.08, SD = 0.86) and the protobacco video (M = 1.87, SD =

0.78). The difference between the narrative correction and the protobacco video ($p < .001$) and the simple correction ($p = .007$) was significant. The difference between the simple correction and the protobacco video was marginally significant ($p = .054$). As for moderation, there was an interaction between exposure to the narrative correction and identification on misinformed beliefs about pipe smoking ($p = .005$), attitudes toward pipe smoking ($p = .002$), and attitudes toward regular cigarettes ($p = .010$). As expected, the positive effect of identification on misinformed pipe beliefs and attitudes was suppressed in the narrative correction condition, but not in the text rebuttal condition. The interaction between the narrative correction and identification was marginally significant for perceived susceptibility ($p = .086$), where the negative effect of identification on perceived susceptibility in the protobacco video was reversed for the narrative correction (see Figure 1). Interactions between condition and identification were not significant for perceived risk ($p > .05$).

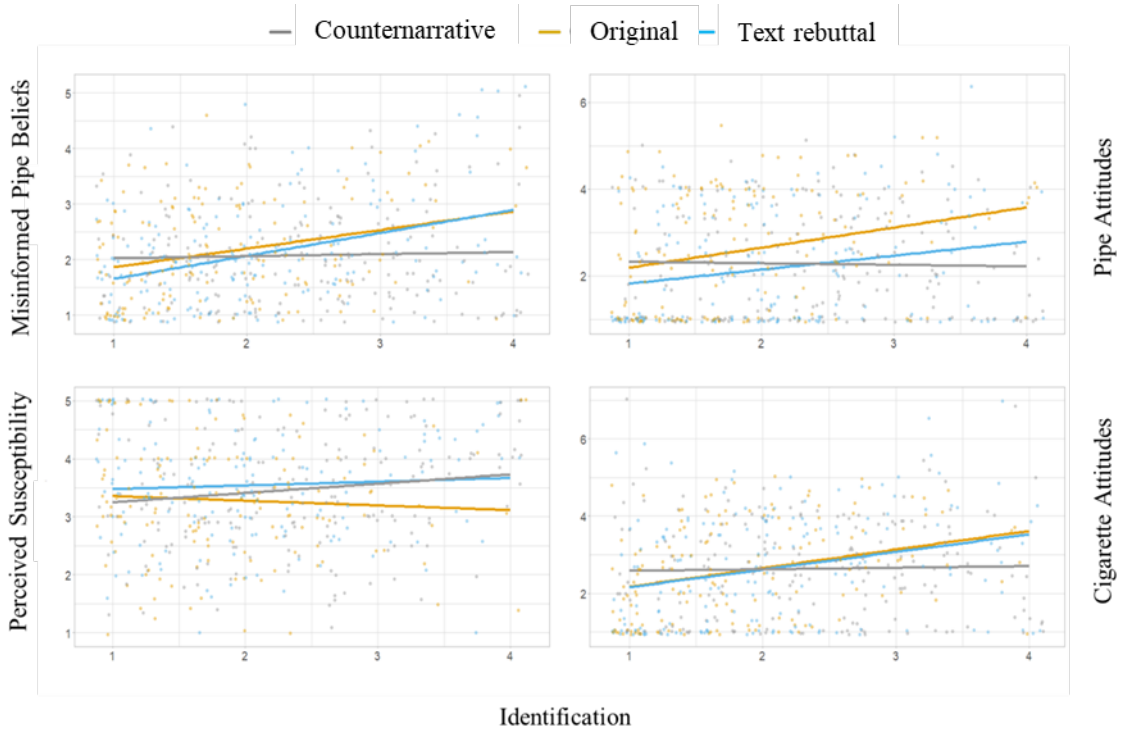

Figure 1. The interaction between conditions with identification on four key outcomes.

Discussion

YouTube has emerged as a noteworthy information source for youth, who often seek health information outside official sources (Ramírez et al., 2013). In the tobacco realm, most user-generated content on YouTube is supportive of tobacco use, and is often misleading by way of omitting crucial information about the deleterious health effects of smoking, focusing exclusively on the advantages of smoking (Freeman & Chapman, 2007; K. Kim et al., 2010). Protobacco videos, especially those directed to youth who are at higher risk (Bae et al., 2018), could increase prosmoking attitudes and misinformed beliefs,

and encourage smoking behavior (Albarracin et al., 2018; Charlesworth & Glantz, 2005). Unfortunately, misleading narratives are hard to counter (Green & Donahue, 2011).

In this study, young current and past smokers watched real protobacco videos that were either presented in their original uncorrected form or countered by the presentation of additional textual or narrative information about the consequences of smoking. The counteractive content was presented either in the form of propositional textual rebuttal or a narrative correction. Participants who were exposed to the protobacco video expressed more propipe attitudes and reduced perceived risk from smoking pipes compared with the control condition. Both the simple correction and narrative correction increased risk perceptions and reduced propipe attitudes compared with the protobacco video clip (but not compared with the control).

Prior studies have found that personal narratives, particularly ones employing emotional cues, are more effective at correcting misinformation that was by itself presented via a narrative (Sangalang et al., 2019). Contrary to our expectation that the narrative correction would be more effective than the textual rebuttal (Cappella et al., 2015), we found no significant differences in their effectiveness. This lack of difference may result from the specific interventions used in this study, particularly the fact that only the narrative correction implied "Pipepops" died because of smoking. The use of strong fear appeals, especially invoking death, could lead to reactance (Brehm & Brehm, 1981), followed by a rejection of the narrative correction message among smokers and past smokers (Cho et al., 2016). However, we did not measure reactance directly and cannot support this postulation empirically. Second, the text condition discussed second-hand smoke effects, but the narrative correction did not. Third, the simple correction explained the mechanism of harm (cancerous toxins), a causal explanation absent from the narrative correction. Future studies using different stimuli should explore these intuitions.

The narrative nature of tobacco videos portraying individuals talking about and using tobacco products prompted our interest in the role identification may play in moderating the effects of exposure. Generally, identification with "Pipepops" was associated with an increase in misinformed pipe beliefs and positive attitudes toward pipe and cigarette smoking. However, the positive association of identification with beliefs and attitudes was suppressed in the narrative correction. This finding demonstrates the potential of narratives as correctives in the realm of tobacco control (Cappella et al., 2015; Sangalang et al., 2019) and the potential influence of psychological connection facilitated through testimonial first-person videos (Ophir & Weimann, 2012). This counteractive effect was observed after a one-time exposure to a short video clip featuring a person who is much older than the participants and who uses a tobacco product that is not popular among youth. Presumably, the overall effect of narrative corrections would yield even stronger effects after more frequent exposure in more relevant contexts.

The prevalence of protobacco videos on YouTube poses a public health threat because it could increase smoking behavior, especially among youth interested in smoking (Bae et al., 2018). This worry is exacerbated by the misleading nature of many online videos (Albarracin et al., 2018). Although the U.S. courts have intervened to stop the paid spread of misinformation from the tobacco companies on publicly owned airwaves, in a country that prizes First Amendment freedoms, a governmental regulation of the personal expression of individuals on privately owned social media platforms remains unlikely (Polin, 1988).

This study has several limitations. First, the effects identified may be limited to the unique video used ("Pipepops"). Relatedly, as we prioritized ecological validity, we used real-world videos that somewhat differed in length. Notably, the control was longer than other conditions. Future studies may replicate our findings using other videos. Second, our study focused on pipes, a product less popular among youth. However, effects are expected to be stronger for more popular products. Third, the character in the videos was substantially older than participants. However, studies have shown that the effect of demographic similarity on identification with narrative characters is limited, and often identification is driven by other forces or aspects of similarity (M. Kim, 2019). Fourth, due to the wording of the identification items, it is possible that some participants reported identification with the second person that appeared in the video ("Pipelawyer") who expressed sadness over the death of "Pipepops," and not identification with "Pipepops." However, the fact that "Pipepops" appeared in the video for 35 seconds and "Pipelawyer" for only nine seconds increases the possibility that participants interpreted the questions as referring to "Pipepops." Importantly, this caveat does not change the argument that engagement with the individuals in a narrative influenced the evaluation of the video clips.

This experiment demonstrated the effectiveness of interventions to counter protobacco YouTube videos' effects on youth, showing positive effects for a propositional text rebuttal and a narrative correction, with an interaction of narrative corrections with identification that could guide the creation of future interventions designed to reduce the harmful impact of protobacco videos on youth.

This study suggests that the use of correctives could ameliorate risks posed by smoking videos. However, because vulnerable youth are more likely to choose protobacco rather than antitobacco videos (Bae et al., 2018), other means would be necessary to increase the effectiveness of interventions. These might include an increase in the availability of accurate antitobacco videos in popular platforms such as YouTube; technological solutions, such as highlighting corrective videos in YouTube when an individual searches for tobacco videos; and educational solutions, such as teaching teens how to resist protobacco persuasion and the influence of peer modeling (Hansen & Graham, 1991). Recently, YouTube has taken some preliminary steps to address misinformation (Matsakis, 2018), such as a feature that directs viewers to Wikipedia when searching for controversial topics. For example, before showing the results for the search *flat earth*, YouTube now directs audiences to the Wikipedia value of Flat Earth, where it is described as misinformation. However, as opposed to the intervention we offered in this study, YouTube's approach requires the user to actively click on the link before or after viewing the misleading content. Empirical research is needed to examine whether users indeed click on the Wikipedia links, and whether they ameliorate the negative effects of misleading YouTube videos. Meanwhile, misinformed content on scientific content, from tobacco to climate change, prevails on YouTube and often is even promoted by its engine (Nugent, 2020).

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