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How do YouTube videos impact tolerance of wolves?

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ABSTRACT

The internet serves as a dominant source of information and may shape tolerance of wildlife species. Our experimental study examined how respondents' tolerance for wolves (i.e., attitudes, acceptance, and behavior) changed after viewing wolf related YouTube videos. Respondents were randomly assigned to one of three video treatments where wolves were framed positively, neutrally (reference), or negatively. Video treatments affected people's tolerance of wolves: negative videos promoted declines in wolf tolerance and positive videos promoted increases in wolf tolerance. Political identification impacted change in tolerance independent of treatment. We observed an interaction between age and political identification, wherein older individuals at both ends of the political spectrum exhibited larger attitudinal responses than younger individuals, with older liberals becoming more positive and older conservatives more negative regardless of treatment. Our findings suggest the creation and dissemination of positive social media content may improve public tolerance toward controversial wildlife species like wolves.

ARTICLE HISTORY

KEYWORDS

Tolerance; wolves; acceptance; attitudes; behavior; *canis lupus*

Introduction

Carnivores are essential for maintaining biodiversity in an ecosystem (Terborgh & Estes, 2010), but also provide a flashpoint for conflict over wildlife management by competing with humans for space and resources, and less frequently, presenting a safety risk (Treves et al., 2013; Woodroffe et al., 2005). Wolf conservation, in particular, has perpetuated conflict throughout wolves' global range (Bashari et al., 2018; Chapron & Treves, 2016; Peterson et al., 2019; Pohja-Mykrä, 2016). These conflicts emerge from diverse drivers including rural resistance movements (Peterson et al., 2019), and real and perceived threats to human safety and livelihoods (Bashari et al., 2018; Browne-Nuñez et al., 2015; Pate et al., 1996; Slagle et al., 2019).

Ultimately, the success of large carnivore conservation depends on building human tolerance for carnivores (Bruskotter et al., 2015; Frank, 2016; Slagle et al., 2013). Bruskotter et al. (2015) suggest attitudes, acceptance, and both past and intended behaviors are highly correlated measures of tolerance. This model for tolerance builds on previous literature highlighting broad connections between attitudes, acceptance and intended behaviors (Ajzen & Fishbein, 2005; Fishbein & Ajzen, 1974, 2010; Weigel & Newman,

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1976). Intended behaviors may provide the most effective measure of tolerance (Bruskotter et al., 2015), but in most cases these actions cannot be measured in ways that facilitate decision-making because few people regularly operate in contexts where their behaviors impact wolves. Inclusion of attitudes and acceptance, in addition to intended behavior, creates a measure of tolerance that is both relevant to broad groups of the public and subject to change from interventions (Bruskotter et al., 2015; Treves et al., 2013). Researchers can promote long-term support for carnivore conservation by ensuring decision makers adopt conservation practices most likely to elicit positive changes in tolerance.

Social media is an efficient means to communicate globally, and wildlife tolerance could be influenced by content on social media. In 2016, 3.42 billion people worldwide used the internet (Our World In Data, 2019). As of 2018, more than two-thirds of all internet users were accessing social media (Ortiz-Ospina, 2019). YouTube alone boasts 2 billion monthly logged-in viewers worldwide, with 27% of internet users accessing YouTube at least once a day (Clement, 2019). In the U.S. alone, 69% of surveyed adults reported using Facebook and 73% reported using YouTube in 2019 (Perrin & Anderson, 2019). Conversations surrounding attitudes toward, and tolerance of wildlife are already happening on social media platforms (Fidino et al., 2018). Social media can influence social norms (Romer et al., 2017) and also inspire people to act. For example, in Chile, social media use was positively correlated with participation in environmental protests, even when controlling for ideology, political interest, social capital, and traditional media (Scherman et al., 2015). If social media can be leveraged to foster support for controversial wildlife, it presents the opportunity to influence tolerance through one of the world's least expensive and most far-reaching communication channels.

Social media is currently an under-explored avenue for promoting tolerance of carnivore populations. Most people do not directly interact with wolves, but instead view them in symbolic and abstract ways (Slagle et al., 2019). Subsequently, social media, including YouTube, may provide one of the most socially relevant contexts for learning about wolves. Research in closely related domains suggest sharing information about the benefits of carnivores and how to avoid negative interactions with them increases tolerance for carnivore populations, while neutral messaging actually decreases tolerance, perhaps by increasing awareness of the carnivore (Slagle et al., 2013). Emerging research on social media suggest political divides create bubbles where audiences gravitate toward consuming ideologically compatible messaging (Stewart et al., 2018) and selectively accept messages that confirm personal biases (Winter et al., 2016), thereby fueling culturally-biased cognitions (Kahan et al., 2011). Biases in selection and interpretation of social media surrounding controversial environmental topics such as climate change are common (Jang & Hart, 2015; Williams et al., 2015). Similar biases could impact interpretation of social media posts related to large carnivore species that serve as political flashpoints, such as wolves.

Tolerance may also be influenced by message framing. Framing refers to the way in which information is organized, described, and presented to an audience (Kusmanoff et al., 2020; Nisbet & Mooney, 2007). Framing theory posits that how messages are presented to audiences influences information processing and choices based on the information (Chong & Druckman, 2007; Kusmanoff et al., 2020). Previous studies suggest positively framed content elicits larger responses than negatively framed content across a number of subjects, including pro-environmental behaviors, climate change communications, and consumer behaviors (Jacobson et al., 2019; Levin & Gaeth, 1988; Spence & Pidgeon, 2010). However,

negative framing can elicit larger effects in some contexts, such as human-wildlife interactions and sustainable tourism (Bloese et al., 2015; Grazzini et al., 2018; Lu et al., 2018, 2016). Research on message framing within the context of carnivores is limited, often focusing on content analysis and perceptions rather than impacts on tolerance or behavior (Jacobson et al., 2012; Rust, 2015). Still, previous research suggests the impact of framing may be moderated by past experiences and the reference point people view communicates from (e.g., self, family, society; Lu et al., 2018, 2016). The impact of message framing on tolerance for wolves is yet to be determined. It is therefore critical to understand how social media content, message framing, and demographic attributes (e.g., political identification, age, gender) interact to influence a viewer's tolerance of carnivores.

Here we present a case study measuring how social media consumption affects viewers' tolerance of wolves. We used an experimental design, applying Bruskotter et al. (2015) measures of tolerance to determine if popular content on YouTube can change viewers' tolerance of wolves. We also explored the role that political identification and other demographic attributes play in these changes. We hypothesized that (H1) positive YouTube messaging would increase tolerance for wolves while (H2) negative YouTube messaging would decrease tolerance. Furthermore, we expected (H3) liberal respondents to exhibit greater changes in tolerance independent of treatment group, with smaller effects for other demographic variables (e.g., age, gender, education). Previous research has shown that individuals who identify as liberal are more open to changing their opinions than those who identify as conservative (Eriksson, 2018; Mooney, 2012), and this predisposition might also extend to wolves.

Methods

We used a stratified convenience sample of North Carolina residents within the personal social networks of faculty and students in the North Carolina State University Fisheries, Wildlife, and Conservation Biology Program (FWCB). We sampled 300 NC residents, engaging 75 women ≥ 40 years old, 75 men ≥ 40 years old, 75 men 18–39 years old, and 75 women 18–39 years old. This sample excluded students and faculty within the NC State FWCB program. The stratified convenience sample was limited in geographic distribution, consisting primarily of NC residents, and may have included respondents who are more informed about wildlife topics and issues compared to the general public. This potential bias could limit the treatment effect as more informed study participants are less likely to be influenced by social media (Bode, 2016; Theobald et al., 2014).

Three video playlists were developed for use in the survey: a negative or anti-wolf treatment, a positive or pro-wolf treatment, and a neutrally framed reference level. Potential videos were selected using keyword searches in YouTube of the word “wolf” and “wolf” combined with “attack,” “livestock,” “ecosystem,” “hunt,” “friendly,” “beneficial.” The authors collectively selected 41 YouTube videos based on their number of views and the clarity of their positive, negative, or neutral message framing. We then selected the six videos in each category that had the most views; the selected 18 videos ranged from 15,321 to 40,287,902 views. This list was refined to the 11 videos used in the treatments using a panel of 66 undergraduate students at NC State University. Each student watched the 18 videos and responded to four prompts asking how the video portrayed wolves on -3 to $+3$ value scales of “worthless to valuable,” “unpleasant to

pleasant,” “harmful to beneficial,” and “bad to good.” We created aggregate scores for each video, calculated 95% confidence intervals for scores, and selected 5 positive, 5 negative, and 1 neutral video (Table 1). The groupings emerged from the process of eliminating videos that had overlapping confidence intervals with any videos in other categories. The positive and negative treatments were comprised of multiple videos and the neutral reference level included one video portraying both positive and negative messaging. The negative treatment consisted of 13 total minutes of video, the positive treatment 14 total minutes, and the neutral reference level 12 total minutes. For treatments including multiple videos, videos were shuffled and viewed in a random order. Video treatments were randomly assigned to faculty and students in the FWCB program. Respondents were subsequently randomly assigned to treatment groups based on their association with the student or faculty member who recruited them for the study (Lawson et al., 2019).

Each viewer’s tolerance of wolves was measured using a pre-treatment and post-treatment survey. We conducted cognitive interviews ($N = 8$) with graduate and post-doctoral students within the NC State College of Natural Resources to identify and correct comprehension and wording issues with both the pre-treatment and post-treatment survey instruments. Cognitive interviews included discussing each question with participants to iteratively improve alignment between the research team’s intended meaning of questions and interpretations of meaning among the participants. We measured attitudes, acceptance (both using 7-point

Table 1. Wolf videos shown to respondents in the negative treatment, positive treatment, and the neutral reference level.

Video Name and URL	Video Duration	Views (Feb '19)
Negative Treatment		
1. New Mexico Ranchers Fight to Stay Alive with Mexican Gray Wolf URL: https://youtu.be/l_4g-rB2UXk	5:14	28,384
2. Does France have a wolf problem? – BBC News URL: https://youtu.be/Vs6QMIPZZYA	2:06	24,549
3. Wolves vs. Montana Rancher URL: https://youtu.be/csjyKq34a9w	1:52	15,321
4. Huge Wolf Attacks Dog URL: https://youtu.be/_lRe6FZL688	0:50	2,635,221
5. Wolf attack in Indiana URL: https://youtu.be/tRGDvPVaTlc	2:17	140,575
Positive Treatment		
1. Living with Wolves Saved My Life URL: https://youtu.be/q8cdwwgr48w	2:26	8,764,120
2. How Wolves Change Rivers URL: https://youtu.be/ysa5OBhXz-Q	4:33	40,287,902
3. Cute Baby Wolf Puppy Playing at the San Diego Zoo URL: https://youtu.be/XypJqDYqwnw	1:01	2,000,001
4. Wolf Pack Meets a Coyote! URL: https://youtu.be/3lhEWZb3Go4 Note: Coyote is the name of a Wildlife Education focused YouTuber	5:48	11,550,662
5. Cute Baby Wolf Puppies Take First Steps URL: https://youtu.be/Tpo1gNNUnc	1:04	1,375,794
Neutral Reference Level		
1. Wolves at the Door Retro Report The New York Times URL: https://youtu.be/wl1_yCQF6xo	11:39	92,693

scales from $-3 = \textit{strongly disagree}$ to $3 = \textit{strongly agree}$), and intended behavior toward wolves ($-2 = \textit{very unlikely}$ to $2 = \textit{very likely}$) following Bruskotter et al. (2015; (Tables 2–4)). We focused on intended behavior, and did not include measures of past or future behaviors, as most respondents in our sample did not have direct interactions with wolves or live in areas where wolves are prominent taxa on the landscape. Individual measures, scale metrics and summary statistics for pre and post treatment attitudes, acceptance, and intended behaviors are reported in Tables 2–4. Political identification was based on a single question, “how do you identify politically?” and was measured on a 5-point scale from 1 (*very conservative*) to 5 (*very liberal*). Respondents also reported other demographic attributes including gender, age, education, and income.

Survey administration followed three steps. First a pre-treatment survey was administered, then respondents viewed one of the video playlists. After the respondents finished viewing the full playlist, the post-survey was administered. We administered both the pre-treatment and post-treatment survey online using Qualtrics software ($N = 300$) between February and March 2018 and received 273 useable responses. Confirmatory factor analysis and Cronbach’s alpha were used to test for scale validity and reliability. To test our hypotheses, we developed three ordinary least squares regression models for change in attitudes, acceptance, and intended behavior. Each dependent variable was modeled as a function of video treatment, pre-treatment attitude, pre-treatment acceptance, or pre-treatment intended behavior values (to control for a ceiling effect; Theobald et al., 2014), demographic attributes (e.g., age, gender) and political identification. Change in attitudes, acceptance, and intended behavior were calculated as the respective difference between the

Table 2. Individual measures of attitudes toward wolves and associated pre and post treatment confirmatory factor analysis results, mean response values, and Cronbach’s alpha values.

Attitudes Toward Wolves				
Attitude Scales ^a (Pre $\alpha = 0.94$, Post $\alpha = 0.79$)	Factor Loading		Mean Response	
	Pre ^b	Post ^c	Pre	Post
Bad: Good	0.85	0.92	1.37	1.07
Harmful: Beneficial	0.89	0.93	1.24	0.97
Unpleasant: Pleasant	0.76	0.83	0.71	0.68
Worthless: Valuable	0.79	0.88	1.58	1.42

^aMeasured using 7-point scales from -3 (*strongly disagree*) to 3 (*strongly agree*).

^bEigenvalue: 2.71

^cEigenvalue: 3.18

Table 3. Individual measures of acceptance of wolves and associated pre and post treatment confirmatory factor analysis results, mean response values, and Cronbach’s alpha values.

Acceptance of Wolves				
Acceptance Scales ^a (Pre $\alpha = 0.85$, Post $\alpha = 0.81$)	Factor Loading		Mean Response	
	Pre ^b	Post ^c	Pre	Post
Wolf populations in my state should be increased greatly	0.77	0.73	0.11	0.00
Wolf populations in my state should be decreased greatly	0.70	0.74	1.05	0.95
Wolves near populated areas should be removed	0.55	0.67	0.15	-0.01
Wolves near populated areas should be protected from harassment	0.68	0.66	0.93	0.70

^aMeasured using 7-point scales from -3 (*strongly disagree*) to 3 (*strongly agree*).

^bEigenvalue: 1.85

^cEigenvalue: 1.96

Table 4. Individual measures of intended behaviors toward wolves and associated pre and post treatment confirmatory factor analysis results, mean response values, and Cronbach's alpha values.

Intended Behaviors Toward Wolves ^a				
<i>Intended Behavior Scales</i> ^b (Pre α = 0.80, Post α = 0.82)				
	<i>Factor Loading</i>		<i>Mean Response</i>	
	Pre ^c	Post ^d	Pre	Post
<i>Pro-wolf Scales</i>				
Write to your congressperson in support of further wolf recovery effort	0.72	0.69	-0.73	-0.77
Contribute to an organization that supports further wolf recovery	0.58	0.51	-0.05	-0.06
Sign a petition in support of further wolf reintroductions (by the federal government)	0.41	0.41	0.45	0.15
Write a letter to the editor of your local newspaper in support of wolf recovery	0.69	0.72	-0.91	-0.89
Protest in favor of wolves	0.55	0.58	-0.44	-0.44
<i>Anti-wolf Scales</i>				
Write to your congressperson to oppose further wolf recovery	0.65	0.63	-1.19	-1.05
Contribute to an organization that opposes further wolf recovery efforts	0.66	0.64	-1.06	-0.87
Sign a petition to stop any further wolf reintroductions (by the federal government)	0.70	0.70	0.86	0.65
Write a letter to the editor of your local newspaper opposing wolf reintroductions	0.62	0.67	-1.35	-1.26
Protest against wolf reintroductions	0.68	0.67	-1.25	-1.14

^a"Shoot a wolf if you saw one" did not cleanly load on any factor and was eliminated.

^bMeasured using 5-point scale from -2 (*very unlikely*) to 2 (*very likely*).

^cEigenvalue: 2.55

^dEigenvalue: 2.69

^eEigenvalue: 3.20

^fEigenvalue: 3.52

sum of post-treatment values and pre-treatment values. A positive change within any category indicated the respondent became more tolerant after exposure to the video treatment. Video treatment was included as a categorical variable in all models, the neutral video served as the reference level from which the effect of the positive and negative treatments were estimated. Two-way interactions between treatment and political identification, along with demographics and political identification, were tested in all models. The interaction between treatment and political identification was included to determine if political identification effects were independent of treatment group. The interactions between demographics and political identification were included to control for potential generational, income, education and gender differences across the political identification spectrum. Only significant interactions were retained. We calculated standardized beta values to determine effect size within all three models. All analyses were completed using R Version 3.5. The NC State University institutional review board (IRB #15445) approved this study.

Results

Respondent demographics reflected the stratified sampling strategy in terms of self-reported gender (48.4% female) and age (48.4% were 40 years or older). For comparison, North Carolina's population is 51.3% female, and has a median age of 38.6 years (U.S. Census Bureau, 2018). Confirmatory factor analysis confirmed attitudes and acceptance were both single-factor scales, whereas behavioral intentions was a two-factor scale (pro-wolf intentions and anti-wolf intentions; Table 4). To adjust for the reverse coded questions used in the behavioral intention scales, anti-wolf intention scores were flipped (e.g., anti-wolf scale value of -2 flips to a pro-wolf value of +2), allowing for the inclusion of both pro-wolf and anti-wolf intentions into a single behavioral intention model. All scales displayed

high internal validity, with Cronbach's alpha estimates > 0.7 (Tables 2–4). Baseline attitudes, acceptance and intended behaviors were calculated using the pretest aggregate scale means within each category. Baseline attitudes ($M = 4.9$, $SD = 5.45$, Scale: -12 to 12), acceptance ($M = 2.25$, $SD = 4.64$, Scale: -12 to 12), and intended behaviors ($M = 2.32$, $SD = 5.20$, Scale: -20 to 20) were positive, suggesting respondents tolerated wolves prior to receiving any video treatment. Though positive regardless of political identification, these baseline measures did vary between liberals (attitudes: $M = 6.50$, $SD = 5.30$; acceptance: $M = 4.32$, $SD = 4.25$; intended behaviors: $M = 4.70$, $SD = 5.03$) and conservatives (attitudes: $M = 3.79$, $SD = 5.47$; acceptance: $M = 1.21$, $SD = 4.95$; intended behaviors: $M = 0.50$, $SD = 5.04$).

Regression estimates supported Hypothesis 1: positive YouTube messaging increased tolerance for wolves. In all three regression models, receiving the positive video treatment was positively related to changes in attitudes ($\beta = 0.37$), acceptance ($\beta = 0.40$), and intended behavior ($\beta = 0.37$; Table 5). Regression estimates also supported Hypothesis 2: negative YouTube messaging decreased tolerance for wolves. In two of the regression models, receiving the negative video treatment was negatively related to changes in attitudes ($\beta = -0.31$), and acceptance ($\beta = -0.20$). The impact of the negative treatment on intended behaviors ($\beta = -0.09$) was not significant but its directionality matched that of our hypothesis (Table 5).

Our findings supported Hypothesis 3: while most demographic variables had a minimal, insignificant, effect on changes in attitudes, acceptance, or intended behavior, political identification was associated with changes in tolerance independent of treatment. In all regression models, identifying as liberal predicted more positive changes in acceptance ($\beta = 0.20$), intended behavior ($\beta = 0.34$), and attitudes regardless of video treatment. However, within the attitudes model, a significant interaction between age and political identification complicated the interpretation ($\beta = 0.26$; Table 5). This interaction follows the political identification pattern described above, but also suggested that the effect of political identification on attitudes toward wolves increases as age increases. Age and political identification were both continuous variables in the model, therefore the stand-alone beta value is difficult to interpret. For ease of interpretation, we dichotomized the age variable based on our sampling strategy (40 years old or greater and less than 40 years old) and then calculated the estimated change in attitudes between these two age categories across the political spectrum. The resulting estimates suggest that regardless of treatment, an individual over 40 years of age and identifying as liberal will have a positive attitude change ~ 1 point greater than individual under 40 years of age who also identifies as liberal, and an individual over 40 years of age and identifying as conservative will have a negative attitude change ~ 1.5 points greater than individual under 40 years of age who also identifies as conservative. In other words, YouTube videos had the most polarizing effect on the wolf-related attitudes of older individuals at either end of the political spectrum.

Discussion

YouTube videos effectively influenced tolerance of wolves for all respondents, with the direction of this influence directly related to video content. Regardless of demographic attributes and baseline scores, positive messaging resulted in positive increases in tolerance, and vice versa. This contributes to previous findings that content on social media can

Table 5. Summary of ordinary least squares regression analyses for variables predicting change in attitudes toward wolves, change in acceptance of wolves, and change in intended behavior toward wolves.

<i>Variable Name</i>	<i>B</i>	<i>SE</i>	<i>β</i>
Change in Attitudes Toward Wolves (N = 273)			
Constant	1.11	2.51	0.0
Pretest Attitude	-0.42***	0.04	-0.43
Negative Treatment	-3.60***	0.58	-0.31
Positive Treatment	4.25***	0.60	0.37
Political Identification ^a	-0.07	0.47	-0.02
Age	-0.07*	0.03	-0.23
Political Identification ^a * Age	0.02*	0.01	0.26
Adjusted R ²		0.51	
Change in Acceptance of Wolves (N = 273)			
Constant	0.45	1.97	0.0
Pretest Acceptance	-0.29***	0.04	-0.33
Negative Treatment	-1.70***	0.50	-0.20
Positive Treatment	3.48***	0.51	0.40
Political Identification ^a	0.65***	0.18	0.20
Adjusted R ²		0.37	
Change in Intended Behavior Toward Wolves (N = 273)			
Constant	-5.01***	2.29	0.0
Pretest Behavior	-0.41***	0.05	-0.45
Negative Treatment	-0.88	0.58	-0.09
Positive Treatment	3.70***	0.59	0.37
Political Identification ^a	1.33***	0.21	0.34
Adjusted R ²		0.38	

Note: Insignificant control variables including age, income, race, education, and gender are not displayed in the table.

^aPolitical identification is measured on a 5-point scale from 1 (*very conservative*) to 5 (*very liberal*).

* $p < .05$, ** $p < .01$, *** $p < .001$.

effectively influence attitudes of viewers, positively and negatively, on multiple topics including cigarette smoking (Yoo et al., 2016), climate change (Spartz et al., 2017), luxury branding (Lee & Watkins, 2016), vaccinations (Robichaud et al., 2012), and legalization of recreational drugs (Krauss et al., 2017). However, the sustainability of these effects is unknown within the context of this study. It is unlikely a single video treatment will produce long-term effects without repeated exposure to similar content (Bode, 2016). We also found that positive videos about wolves produced a larger impact on respondents' attitudes, acceptance, and intended behaviors than negative wolf videos. This may be due to a psychological response known as psyching numbing, which suggests the more negative a message is, the less likely individuals are to respond (Slovic, 2007).

Although tolerance was impacted for all respondents, the growing role of identity politics in American culture may explain why wolf media was somewhat less effective among politically conservative audiences. Research on United States-based political ideology finds that overall, individuals who identify as conservative are less willing to change as opposed to their liberal counterparts (Eriksson, 2018; Mooney, 2012). In fact, those who identify as liberal are more likely to value change and are open to being swayed in their opinions than those that identify as conservative (Eriksson, 2018). Research on in-group norms, or the accepted guidelines of beliefs and behavior (Wellen et al., 1998), may help explain this phenomenon. Being swayed in any direction by video content may create dissonance with a conservative identity rooted in being resistant to change over time (Coffee, 2015). Within the context of this study, the significance and directionality of the political identification variable paired with the insignificance of the treatment and political

identification interaction reaffirm this notion by suggesting conservatives are more resistant to change regardless of how the video content was framed. Although political identification was the only significant demographic variable across all models, the interaction between age and political identification was significant in the attitudes model. Older individuals at both ends of the political spectrum exhibited larger changes in attitudes compared to younger individuals after video exposure, with older liberals becoming more pro-wolf and older conservatives more anti-wolf. This could stem from older generations being more naive to social media influence compared to their younger counterparts, as evidenced by older Facebook users being more vulnerable to sharing fake news (Guess et al., 2019). Though not measured, our sample may have been more familiar with wildlife conservation and social media than the general public, as it was made up of people within the personal social networks of university faculty and students. This potential bias, however, would likely render the respondents more resistant to influence from social media, dampening the observed treatment effect and suggesting results that did emerge could be even larger among a true random sample of the general public (Bode, 2016; Theobald et al., 2014). Future research could explore the interaction of age and political identification with respect to outreach programs intended to impact wildlife attitudes and tolerance.

Overall, the absence of demographic correlates diverges from previous wildlife research, which often finds strong relationships between demographics and views toward wildlife (Kellert, 1976; Kellert & Berry, 1987). Other studies, however, have found that demographics like gender and ethnicity have relatively little influence on environmental attitudes and behavior when socio-cultural factors, such as political identification, are also taken into account (Floyd et al., 2009; Ojala, 2015; Stevenson et al., 2018). Our study suggests the influence of socio-demographic variables on wildlife-related tolerance may pale in comparison to the influence of social media consumption.

The results from our research add to the growing discussion about factors that influence tolerance of controversial wildlife species such as wolves (Bruskotter et al., 2015; Treves et al., 2013). Reflecting the findings of Bruskotter et al. (2015), we found similar relationships among attitudes, acceptance and intended behaviors, supporting the assertion that these measures are useful and valid measures for tolerance. However, the effect size and statistical significance of the video treatments varied between positive and negative framing, and differed among attitudes, acceptance and intended behaviors. YouTube content impacted all components of tolerance for wolves, but seemed to have the strongest and most consistent impact on attitudes and acceptance. If we only utilized measures of intended behaviors as a proxy for tolerance, we may have underestimated the true impact of negative video content on tolerance, as our results within this specific category were insignificant. These findings underscore the importance of including multiple measures of tolerance when possible, supporting the recommendations of Bruskotter et al. (2015).

Using these assessment tools, our research yielded two clear practical implications for efforts to enhance tolerance for controversial wildlife, including wolves. First, positive frames for conservation outreach on social media platforms may be more effective than negative frames. Second, social media messaging disseminated to broad segments of the general public has the capacity to promote tolerance for wildlife among diverse stakeholders. Our results suggest that YouTube videos, in particular, represent one strategy for disseminating these messages and changing the way people think and act. However, convincing people to view web-based content that challenges their existing beliefs and

attitudes may be more difficult than developing effective content. How do we facilitate access to messages about wildlife conservation that exist outside the content bubbles created for users by social media providers (Bessi et al., 2016; YouTube, 2019)? Wildlife conservation organizations will undoubtedly want to spend time, money, and energy to create new media content that helps direct powerful and influential online conversations, and those efforts are important. Any positive video content may help to enhance tolerance of species such as wolves. But this study also suggests that strategically targeting certain demographic subgroups (e.g., liberals vs. conservatives, younger vs. older consumers) when disseminating this content can be critical too. Future research should aim to understand how social media messaging, including but not limited to YouTube videos, impacts tolerance of other wildlife species and broader support for conservation across diverse audiences.

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References

- Ajzen, I., & Fishbein, M. (2005). The influence of attitudes on behavior. In D. Albarracín, B. T. Johnson, & M. P. Sanna (Eds.), *The handbook of attitudes* (pp. 173–221). Mahwah, NJ: Lawrence Erlbaum Associates.
- Bashari, M., Sills, E., Peterson, M. N., & Cabbage, F. (2018). Hunting in Afghanistan: Variation in motivations across species. *Oryx*, 52(3), 526–536. <https://doi.org/10.1017/S0030605316001174>
- Bessi, A., Zollo, F., Del Vicario, M., Puliga, M., Scala, A., Caldarelli, G., Uzzi, B., & Quattrociocchi, W. (2016). Users polarization on facebook and youtube. *PloS One*, 11(8), e0159641. <https://doi.org/10.1371/journal.pone.0159641>
- Blose, J. E., Mack, R. W., & Pitts, R. E. (2015). The influence of message framing on hotel guests' linen-reuse intentions. *Cornell Hospitality Quarterly*, 56(2), 145–154. <https://doi.org/10.1177/1938965514556480>
- Bode, L. (2016). Political news in the news feed: learning politics from social media. *Mass Communication and Society*, 19(1), 24–48. <https://doi.org/10.1080/15205436.2015.1045149>
- Browne-Núñez, C., Treves, A., MacFarland, D., Voyles, Z., & Turng, C. (2015). Tolerance of wolves in Wisconsin: A mixed-methods examination of policy effects on attitudes and behavioral inclinations. *Biological Conservation*, 189, 59–71. <https://doi.org/10.1016/j.biocon.2014.12.016>
- Bruskotter, J. T., Singh, A., Fulton, D. C., & Slagle, K. (2015). Assessing tolerance for wildlife: clarifying relations between concepts and measures. *Human Dimensions of Wildlife*, 20(3), 255–270. <https://doi.org/10.1080/10871209.2015.1016387>
- Chapron, G., & Treves, A. (2016). Blood does not buy goodwill: Allowing culling increases poaching of a large carnivore. *Proceedings of the Royal Society B: Biological Sciences*, 283(1830), 20152939. <https://doi.org/10.1098/rspb.2015.2939>

- Chong, D., & Druckman, J. N. (2007). Framing theory. *Annual Review of Political Science*, 10(1), 103–126. <https://doi.org/10.1146/annurev.polisci.10.072805.103054>
- Clement, J. (2019). *YouTube - statistics & facts*. statista. <https://www.statista.com/topics/2019/youtube/>
- Coffee, A. M. S. J. (2015). Two spheres of domination: Republican theory, social norms and the insufficiency of negative freedom. *Contemporary Political Theory*, 14(1), 45–62. <https://doi.org/10.1057/cpt.2014.5>
- Eriksson, K. (2018). Republicans value agency, democrats value communion. *Social Psychology Quarterly*, 81(2), 173–184. <https://doi.org/10.1177/0190272518771060>
- Fidino, M., Herr, S. W., & Magle, S. B. (2018). Assessing online opinions of wildlife through social media. *Human Dimensions of Wildlife*, 23(5), 482–490. <https://doi.org/10.1080/10871209.2018.1468943>
- Fishbein, M., & Ajzen, I. (1974). Attitudes towards objects as predictors of single and multiple behavioral criteria. *Psychological Review*, 81(1), 59–74. <https://doi.org/10.1037/h0035872>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior the reasoned action approach*. Taylor and Francis.
- Floyd, M. F., Taylor, W. C., & Whitt-Glover, M. (2009). Measurement of park and recreation environments that support physical activity in low-income communities of color. *American Journal of Preventive Medicine*, 36(4), S156–S160. <https://doi.org/10.1016/j.amepre.2009.01.009>
- Frank, B. (2016). Human–wildlife conflicts and the need to include tolerance and coexistence: An introductory comment. *Society & Natural Resources*, 29(6), 738–743. <https://doi.org/10.1080/08941920.2015.1103388>
- Grazzini, L., Rodrigo, P., Aiello, G., & Viglia, G. (2018). Loss or gain? The role of message framing in hotel guests' recycling behaviour. *Journal of Sustainable Tourism*, 26(11), 1944–1966. <https://doi.org/10.1080/09669582.2018.1526294>
- Guess, A., Nagler, J., & Tucker, J. (2019). Less than you think: Prevalence and predictors of fake news dissemination on facebook. *Science Advances*, 5(1), eaau4586. <https://doi.org/10.1126/sciadv.aau4586>
- Jacobson, S. K., Langin, C., Carlton, J. S., & Kaid, L. L. (2012). Content analysis of newspaper coverage of the florida panther. *Conservation Biology*, 26(1), 171–179. <https://doi.org/10.1111/j.1523-1739.2011.01750.x>
- Jacobson, S. K., Morales, N. A., Chen, B., Soodeen, R., Moulton, M. P., & Jain, E. (2019). Love or loss: Effective message framing to promote environmental conservation. *Applied Environmental Education & Communication*, 18(3), 252–265. <https://doi.org/10.1080/1533015X.2018.1456380>
- Jang, S. M., & Hart, P. S. (2015). Polarized frames on “climate change” and “global warming” across countries and states: Evidence from twitter big data. *Global Environmental Change*, 32, 11–17. <https://doi.org/10.1016/j.gloenvcha.2015.02.010>
- Kahan, D. M., Jenkins-Smith, H., & Braman, D. (2011). Cultural cognition of scientific consensus. *Journal of Risk Research*, 14(2), 147–174. <https://doi.org/10.1080/13669877.2010.511246>
- Kellert, S. R. (1976). Perceptions of animals in American society. *Transactions of the 41st North American Wildlife & Natural Resources Conference*. Washington, DC.
- Kellert, S. R., & Berry, J. K. (1987). Attitudes, knowledge, and behaviors toward wildlife as affected by gender. *Wildlife Society Bulletin*, 15(3), 363–371. https://www.jstor.org/stable/3782542?seq=1#metadata_info_tab_contents
- Krauss, M. J., Sowles, S. J., Sehi, A., Spitznagel, E. L., Berg, C. J., Bierut, L. J., & Cavazos-Rehg, P. A. (2017). Marijuana advertising exposure among current marijuana users in the U.S. *Drug and Alcohol Dependence*, 174, 192–200. <https://doi.org/10.1016/j.drugalcdep.2017.01.017>
- Kusmanoff, A. M., Fidler, F., Gordon, A., Garrard, G. E., & Bekessy, S. A. (2020). Five lessons to guide more effective biodiversity conservation message framing. *Conservation Biology*. Advanced online publication. <https://doi.org/10.1111/cobi.13482>
- Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., Strnad, R. L., & Seekamp, E. (2019). Children can foster climate change concern among their parents. *Nature Climate Change*, 9(6), 458–462. <https://doi.org/10.1038/s41558-019-0463-3>

- Lee, J. E., & Watkins, B. (2016). YouTube vloggers' influence on consumer luxury brand perceptions and intentions. *Journal of Business Research*, 69(12), 5753–5760. <https://doi.org/10.1016/j.jbusres.2016.04.171>
- Levin, I. P., & Gaeth, G. J. (1988). How consumers are affected by the framing of attribute information before and after consuming the product. *Journal of Consumer Research*, 15(3), 374. <https://doi.org/10.1086/209174>
- Lu, H., Siemer, W. F., Baumer, M. S., & Decker, D. J. (2018). Exploring the role of gain versus loss framing and point of reference in messages to reduce human–bear conflicts. *The Social Science Journal*, 55(2), 182–192. <https://doi.org/10.1016/j.sosci.2017.05.002>
- Lu, H., Siemer, W. F., Baumer, M. S., Decker, D. J., & Gulde, A. (2016). Effects of message framing and past experience on intentions to prevent human–coyote conflicts. *Human Dimensions of Wildlife*, 21(6), 506–521. <https://doi.org/10.1080/10871209.2016.1198852>
- Mooney, C. (2012). *The republican brain : The science of why they deny science and reality*. Wiley.
- Nisbet, M. C., & Mooney, C. (2007). Science And Society: Framing science. *Science*, 316(5821), 56. <https://doi.org/10.1126/science.1142030>
- Ojala, M. (2015). Hope in the face of climate change: associations with environmental engagement and student perceptions of teachers' emotion communication style and future orientation. *The Journal of Environmental Education*, 46(3), 133–148. <https://doi.org/10.1080/00958964.2015.1021662>
- Ortiz-Ospina, E. (2019). *The rise of social media*. Our World in Data. <https://ourworldindata.org/rise-of-social-media>
- Our World In Data. (2019). *Number of internet users by country*. Our World in Data. https://ourworldindata.org/grapher/number-of-internet-users-by-country?tab=chart&time=1990.2016&country=OWID_WRL
- Pate, J., Manfred, M. J., Bright, A. D., & Tischbein, G. (1996). Coloradans' attitudes toward reintroducing the gray Wolf into Colorado. *Wildlife Society Bulletin*, 24(3), 421–428. https://www.jstor.org/stable/3783322?seq=1#metadata_info_tab_contents
- Perrin, A., & Anderson, M. (2019). *Share of U.S. adults using social media, including Facebook, is mostly unchanged since 2018*. Pew Research Center. <https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/>
- Peterson, M. N., von Essen, E., Hansen, H. P., & Peterson, T. R. (2019). Shoot shovel and sanction yourself: Self-policing as a response to wolf poaching among Swedish hunters. *Ambio*, 48(3), 230–239. <https://doi.org/10.1007/s13280-018-1072-5>
- Pohja-Mykrä, M. (2016). Illegal hunting as rural defiance. In J. F. Donnermeyer (Ed.), *The routledge international handbook of rural criminology* (pp. 329–337). Routledge.
- Robichaud, P., Hawken, S., Beard, L., Morra, D., Tomlinson, G., Wilson, K., & Keelan, J. (2012). Vaccine-critical videos on YouTube and their impact on medical students' attitudes about seasonal influenza immunization: A pre and post study. *Vaccine*, 30(25), 3763–3770. <https://doi.org/10.1016/j.vaccine.2012.03.074>
- Romer, D., Jamieson, P. E., Jamieson, K. H., Jones, C., & Sherr, S. (2017). Counteracting the influence of peer smoking on YouTube. *Journal of Health Communication*, 22(4), 337–345. <https://doi.org/10.1080/10810730.2017.1290164>
- Rust, N. A. (2015). Media framing of financial mechanisms for resolving human–predator conflict in Namibia. *Human Dimensions of Wildlife*, 20(5), 440–453. <https://doi.org/10.1080/10871209.2015.1037027>
- Scherman, A., Arriagada, A., & Valenzuela, S. (2015). Student and environmental protests in Chile: The role of social media. *Politics*, 35(2), 151–171. <https://doi.org/10.1111/1467-9256.12072>
- Slagle, K. M., Wilson, R. S., Bruskotter, J. T., & Toman, E. (2019). The symbolic Wolf: A construal level theory analysis of the perceptions of Wolves in the United States. *Society & Natural Resources*, 32(3), 322–337. <https://doi.org/10.1080/08941920.2018.1501525>
- Slagle, K. M., Zajac, R., Bruskotter, J., Wilson, R., & Prange, S. (2013). Building tolerance for bears: A communications experiment. *The Journal of Wildlife Management*, 77(4), 863–869. <https://doi.org/10.1002/jwm.515>

- Slovic, P. (2007). "If I look at the mass I will never act": Psychic numbing and genocide. *Judgement and Decision Making*, 2(2), 79–95. <http://journal.sjdm.org/jdm7303a.pdf>
- Spartz, J. T., Su, L. Y. F., Griffin, R., Brossard, D., & Dunwoody, S. (2017). YouTube, social norms and perceived salience of climate change in the American mind. *Environmental Communication*, 11(1), 1–16. <https://doi.org/10.1080/17524032.2015.1047887>
- Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change*, 20(4), 656–667. <https://doi.org/10.1016/j.gloenvcha.2010.07.002>
- Stevenson, K. T., Nils Peterson, M., & Bondell, H. D. (2018). Developing a model of climate change behavior among adolescents. *Climatic Change*, 151(3–4), 589–603. <https://doi.org/10.1007/s10584-018-2313-0>
- Stewart, L. G., Arif, A., & Starbird, K. (2018). *Examining trolls and polarization with a retweet network. Proceedings of WSDM Workshop on Misinformation and Misbehavior Mining on the Web (MIS2)*. ACM. New York, NY. <http://faculty.washington.edu/kstarbi/examining-trolls-polarization.pdf>
- Terborgh, J., & Estes, J. A. (2010). *Trophic cascades: predators, prey and the changing dynamics of nature*. Island Press.
- Theobald, R., & Freeman, S. (2014). Is it the intervention or the students? Using linear regression to control for student characteristics in undergraduate STEM education research. *CBE—Life Sciences Education*, 13(1), 41–48. <https://doi.org/10.1187/cbe-13-07-0136>
- Treves, A., Naughton-Treves, L., & Shelley, V. (2013). Longitudinal analysis of attitudes toward Wolves. *Conservation Biology*, 27(2), 315–323. <https://doi.org/10.1111/cobi.12009>
- U.S. Census Bureau. (2018). *North Carolina ACS demographic and housing estimates, 2018 American Community survey 5-year estimates*. U.S. Census Bureau. <https://data.census.gov/cedsci/table?d=ACS.5-Year.Estimates.Data.Profiles&table=DP05&tid=ACSDP5Y2018.DP05&g=0400000US37>
- Weigel, R. H., & Newman, L. (1976). Increasing attitude-behavior correspondence by broadening the scope of the behavioral measure. *Journal of Personality and Social Psychology*, 33(6), 793–802. <https://doi.org/10.1037/0022-3514.33.6.793>
- Wellen, J. M., Hogg, M. A., & Terry, D. J. (1998). Group norms and attitude-behavior consistency: The role of group salience and mood. *Group Dynamics: Theory, Research, and Practice*, 2(1), 48–56. <https://doi.org/10.1037/1089-2699.2.1.48>
- Williams, H. T. P., McMurray, J. R., Kurz, T., & Hugo Lambert, F. (2015). Network analysis reveals open forums and echo chambers in social media discussions of climate change. *Global Environmental Change*, 32, 126–138. <https://doi.org/10.1016/j.gloenvcha.2015.03.006>
- Winter, S., Metzger, M. J., & Flanagin, A. J. (2016). Selective use of news cues: A multiple-motive perspective on information selection in social media environments. *Journal of Communication*, 66(4), 669–693. <https://doi.org/10.1111/jcom.12241>
- Woodroffe, R., Thirgood, S., & Rabinowitz, A. (2005). The impact of human-wildlife conflict on natural systems. In R. Woodroffe, S. Thirgood, & A. Rabinowitz (Eds.), *People and wildlife* (pp. 1–12). Cambridge University Press. <https://doi.org/10.1017/CBO9780511614774.002>
- Yoo, W., Yang, J., & Cho, E. (2016). How social media influence college students' smoking attitudes and intentions. *Computers in Human Behavior*, 64, 173–182. <https://doi.org/10.1016/j.chb.2016.06.061>
- YouTube. (2019). *Discovery optimization tips*. YouTube. <https://support.google.com/youtube/answer/141805?hl=en>