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The Experience of Consensus: Video as an Effective Medium to Communicate Scientific Agreement on Climate Change

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Abstract

Research on the gateway belief model indicates that communicating the scientific consensus on global warming acts as a "gateway" to other beliefs and support for action. We test whether a video conveying the scientific consensus on global warming is more effective than a text transcript with the same information. Results show that the video was significantly more effective than the transcript in increasing people's perception of scientific agreement. Structural equation models indicate indirect increases in the beliefs that global warming is happening and is human-caused, and in worry about global warming, which in turn predict increased global warming issue priority.

Keywords

consensus, gateway belief model, descriptive norms, video

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Climate change is one of the most pressing issues of our time, and there is near unanimous consensus among climate scientists that human activities are the primary cause (Cook et al., 2016). Because a significant proportion of Americans do not think global warming is happening (30%) or that it is human-caused (42%; Leiserowitz et al., 2018a), there is an urgent need for communication strategies that can increase public understanding of climate change, concern about the consequences, and priority of the issue for the President and Congress (van der Linden, Maibach, & Leiserowitz, 2015).

Gateway Belief Model

One promising avenue for public engagement is the gateway belief model (GBM) of opinion change (van der Linden, Leiserowitz, Feinberg, & Maibach, 2015; van der Linden, Leiserowitz, & Maibach, 2019). The GBM is a dual-process model that proposes that beliefs about expert consensus (e.g., climate scientists) can act as a "gateway" to other key cognitive and affective judgments, such as understanding that global warming is happening and human-caused, and the level of worry people have about the issue. For example, van der Linden and colleagues (van der Linden, Leiserowitz, et al., 2015; van der Linden, Leiserowitz, et al., 2019) showed that highlighting the scientific consensus led people across the political spectrum to update their beliefs about the issue, which in turn led to increased understanding that climate change is happening and human-caused, and an increase in worry about climate change. As a result of these shifts, people became more supportive of policies to address the issue. The GBM and its downstream effects on public opinion have been applied across a range of contexts, from vaccines (van der Linden, Clarke, & Maibach, 2015) and GMOs (Dixon, 2016; Kerr & Wilson, 2018) to climate change (Bolsen & Druckman, 2018; Brewer & McKnight, 2017; Goldberg, van der Linden, Ballew, Rosenthal, & Leiserowitz, 2019; Goldberg, van der Linden, Maibach, & Leiserowitz, 2019; van der Linden, Leiserowitz, & Maibach, 2018, van der Linden, Leiserowitz, et al., 2019).

Accordingly, many scholars regard the GBM as a promising foundation on which to base the design of persuasive climate messages. Indeed, many experimental studies have provided evidence that such messages can be effective (Brewer & McKnight, 2017; Goldberg et al., 2019; Kerr & Wilson, 2018; Lewandowsky et al., 2013; Myers et al., 2015; van der Linden, Leiserowitz, et al., 2019).[1] Importantly, however, as a theory of mass communication, it is plausible that consensus messages are not equally effective for all audiences, especially for those who are strongly motivated to doubt the message. For example, although Bolsen and Druckman (2018) find support for the GBM among all partisan subgroups, they did note an exception for

high-knowledge Republicans. Similarly, Cook and Lewandowsky (2016) found a backfire effect among a U.S. subsample of high free-market endorsers, though they did not replicate this effect in later studies (Cook, Lewandowsky, & Ecker, 2017). Furthermore, Dixon (2016) finds that people with low prior support toward GMOs are less affected by the consensus message, and Ma, Dixon, and Hmielowski (2019) report reactance among skeptical conservatives when exposed to the scientific consensus. In contrast, van der Linden Leiserowitz, et al. (2019) and van der Linden, Maibach, and Leiserowitz (2019) find in a large national sample ($N = 6{,}301$) balanced on ideology that the consensus message had a greater positive effect on conservatives with skeptical prior attitudes toward climate change, with no evidence of psychological reactance.

Accordingly, because some studies have found that consensus messages have effects that may vary across target audiences, it is pertinent to examine how to communicate the scientific consensus most effectively. Thus, although this is not a study about the GBM per se, we use the framework to investigate the *means* by which the scientific consensus is most effectively communicated, which will advance theory as well as inform the strategies of climate change communicators.

The Psychological Experience of Consensus

At its core, the GBM posits a "debiasing" process in norm perception. In other words, the scientific consensus is typically represented as a descriptive (statistical) norm: "97% of climate scientists have concluded that human-caused global warming is happening" (van der Linden et al., 2018, p. 2) so that people's perception of the norm becomes more aligned with the actual norm. This basic procedure follows a rich line of research in social psychology on norm perception as a vehicle for social change (Miller & Prentice, 2016; Prentice & Miller, 1993; Tankard & Paluck, 2017).

Although this could be construed as an information-deficit approach (correcting misconceptions), an important psychological property of consensus (as a fact) is that it can be "experienced." For example, based on the decision-making literature, Harris, Sildmäe, Speekenbrink, and Hahn (2018) note the now-infamous distinction between describing versus experiencing probabilistic statements (Barron & Erev, 2003), with the implication that people may underestimate the scientific consensus when described rather than experienced (Harris et al., 2018). More generally, it is well known that in the face of uncertainty, people can process factual statements in both analytical and experiential formats (Marx et al., 2007; or "risk as analysis" vs. "risk as feeling," see Slovic, Finucane, Peters, & MacGregor, 2004). As such, the "motivation"

versus "cognition" debate perpetuates a false dichotomy (van der Linden et al., 2017). Indeed, the presentation of expert consensus need not be limited to a "cold" analytical fact; it can be framed in ways that more effectively appeal to people's intuitive, cultural, and experiential understanding of the world.

The basic power of metaphors and analogies lies in the fact that they offer the possibility "to understand and experience one kind of thing in terms of another" (Lakoff & Johnson, 1980, p. 5). Metaphors and analogies are known to enhance persuasion (Goode, Dahl, & Moreau, 2010; Sopory & Dillard, 2002), can reduce psychological distance (Schnall, 2012), and abound in climate change communication (Flusberg, Matlock, & Thibodeau, 2017). For example, van der Linden, Leiserowitz, Feinberg, and Maibach (2014) were the first to test several variations of the same consensus message including descriptive text, a pie chart, or text with an accompanying analogy (e.g., "If 97% of doctors concluded that your child is sick, would you believe them? Ninety-seven percent of climate scientists have concluded that human-caused climate change is happening"). In this way, they harnessed the power of analogy by reframing the source (an abstract scientific consensus) into a more culturally familiar and emotional target experience (e.g., "if 97% of doctors concluded . . ."). Interestingly and somewhat surprisingly, results showed that the various analogies were effective, but not necessarily more effective at increasing people's perception of scientific agreement than were simple descriptive text or a pie chart. Other approaches have similarly offered mixed evidence. For example, Harris et al. (2018) found mixed evidence when they presented participants with 10 silhouettes of experts agreeing on a particular statement in an attempt to simulate consensus (although the authors noted that this may have been a relatively weak manipulation of "experience"). Using a more vivid manipulation, Brewer and McKnight (2017) found that exposing participants to a satirical viral clip from *Last Week Tonight with John Oliver*, in which 97 experts were brought into the room, significantly increased perceptions of the scientific consensus and belief that global warming is human-caused.

One possibility for the limited influence of consensus analogies in prior studies is that analogies may be more persuasive when accompanied by narration and evocative imagery. The importance of iconic imagery in climate change communication is well-established (Leiserowitz & Smith, 2017; O'Neill, Boykoff, Niemeyer, & Day, 2013; O'Neill & Nicholson-Cole, 2009). At the same time, the social psychological literature has revealed mixed findings on the effect of vividness. Vividness is usually defined as information that is emotionally interesting, concrete, provoking, or proximal to the senses, time, or space (Nisbett & Ross, 1980). An older review of

vividness studies finds little support for the common intuition that "vividly presented information is more persuasive" (Taylor & Thompson, 1982) with some studies suggesting that the effect on persuasion is largely illusory (Collins, Taylor, Wood, & Thompson, 1988). In contrast, more recent work finds that vividness manipulations do enhance message persuasiveness when the vividness supports rather than distracts from the central thesis of a message (Guadagno, Rhoads, & Sagarin, 2011). Accordingly, in the current study, we return to the question of how to best represent and communicate the scientific consensus on climate change using basic analogies that leverage vivid experiential imagery.

The Current Research

In the current study, we explore whether a video conveying the scientific consensus on climate change is more effective than a text transcript containing the same information in increasing people's perception of agreement among climate scientists. This allows us to test whether the scientific consensus communicated through experiential analogies in an engaging video is more persuasive than the same information conveyed in textual form. Furthermore, as predicted by the GBM (van der Linden, Leiserowitz, et al., 2015, van der Linden, Leiserowitz, et al., 2019), we use causal modeling to trace downstream consequences of the message, such as increases in people's beliefs that climate change is happening and is human-caused, and their worry about climate change, which in turn predict people's rating of climate change as a priority for the president and Congress.

Method

Participants

Participants were recruited from Prime Panels ($N = 624$), an online sampling platform with a large diverse panel of participants of over 20 million people (TurkPrime; https://www.turkprime.com/). Because some samples recently recruited from Prime Panels have been disproportionately female (e.g., Goldberg et al., 2019), we included a quota for males and females in order to have equal sex representation. Participants were only included in analyses if they correctly identified the primary task they completed as part of the survey (*Watched a video on the scientific consensus on climate change; Read about the scientific consensus on climate change; Did a word-sorting task*). This resulted in the inclusion of 507 participants in the final analyses (52% female, 48% male).

The sample was diverse in age, education, and political ideology. Twenty-four percent of participants were 18 to 29 years old, 34% were 30 to 44 years old, 20% were 45 to 59 years old, and 22% were 60 years or older. For education, 3% did not have a high school degree, 22% had a high school degree, 38% attended some college, and 36% completed a bachelor's degree or higher. For political ideology, 33% of participants identified as liberal, 37% as moderate, and 30% as conservative.

Materials and Procedure

Participants opted into the survey. They were thanked for their participation on the opening screen and were instructed to click the button at the bottom of their screen to begin the survey. Next, participants read a cover story to hide the true purpose of the study: "We would like you to answer some questions about a recent news topic. Out of 20 possible topics, you will be asked, at random, to answer questions about one particular topic. To find out what topic has been randomly selected for you, please click next." Participants always received the topic of global warming.

To maximize power of the experiment (Huck & McLean, 1975), we used a mixed design with three between-subjects conditions (Video vs. Transcript vs. Control) while all measures were within-subjects (pretreatment vs. posttreatment). First, participants were asked whether they believe global warming is happening: "On a scale from 1 to 7, how strongly do you believe that global warming is or is not happening?" (1 = *I strongly believe global warming is NOT happening*, 7 = *I strongly believe global warming IS happening*). Then they were asked if they believe global warming is human-caused: "Assuming global warming IS happening: How much of it do you believe is caused by human activities, natural changes in the environment, or some combination of both?" (1 = *I believe global warming is caused entirely by natural changes in the environment*, 7 = *I believe global warming is caused entirely by human activities*). To gauge participants' initial estimate of the scientific consensus, they were asked: "To the best of your knowledge, what percentage of climate scientists have concluded that human-caused global warming is happening? (0% to 100%)." They indicated their estimate on a slider scale that ranged from 0 to 100. To measure worry, we asked participants: "How worried are you about global warming?" (1 = *not at all worried*, 4 = *very worried*). For issue priority, we asked, "Do you think the following should be low, medium, high, or very high for the president and Congress?" [Global warming] (1 = *low*, 2 = *medium*, 3 = *high*, 4 = *very high*). We included other measures for exploratory purposes (e.g., social norms, message familiarity), which can be found in Supplemental Table 1 (available online).

After completing the pretreatment set of questions, participants were randomly assigned to either watch a video on the scientific consensus on climate change, read the video transcript, or complete a word-sorting task (the control condition). The video was 30 seconds long and is available at https://youtu.be/KtiEpO7FC3k. The speaker in the video (and in text for the transcript) read:

> If 97% of all dentists told you a tooth couldn't be saved, you'd pull that tooth.
>
> If 97% of all engineers told you your house was unstable, you'd move.
>
> And if 97% of all airline workers told you not to get on a plane, you wouldn't.
>
> So, when 97% of the world's climate science experts tell you our planet is warming and we're responsible, why would you ignore them?
>
> When you're 97% certain, you're certain. Protect America from climate change.

Importantly, the treatment video combines elements that have been tested separately in prior research, such as satirical narration, groups of experts embodying the consensus, and prototypical climate imagery (e.g., fires, storms, floods). Moreover, to maximize both internal and external validity, we used a real video from the Partnership for Responsible Growth (2017; https://youtu.be/KtiEpO7FC3k).

For the control condition, participants completed a previously validated word-sorting task (see Goldberg et al., 2019) where they were instructed to drag-and-drop words into the correct category. For example, "Pan" would be sorted into the Cookware category, "Yellow" into the Color category, and "Football" into the Sport category. After completing the corresponding condition, participants were given a distractor task where they read a brief paragraph about the upcoming *Star Wars: Episode IX* movie and rated their likelihood of going to see the movie (1 = *very unlikely*, 5 = *very likely*). Finally, as posttest measures, participants answered the same questions that were administered before the treatment.

Results

First, we tested the main effect of the treatment condition on perceived scientific agreement (i.e., consensus). Consistent with prior research (van der Linden, Leiserowitz, et al., 2015; van der Linden, Leiserowitz, et al., 2019),

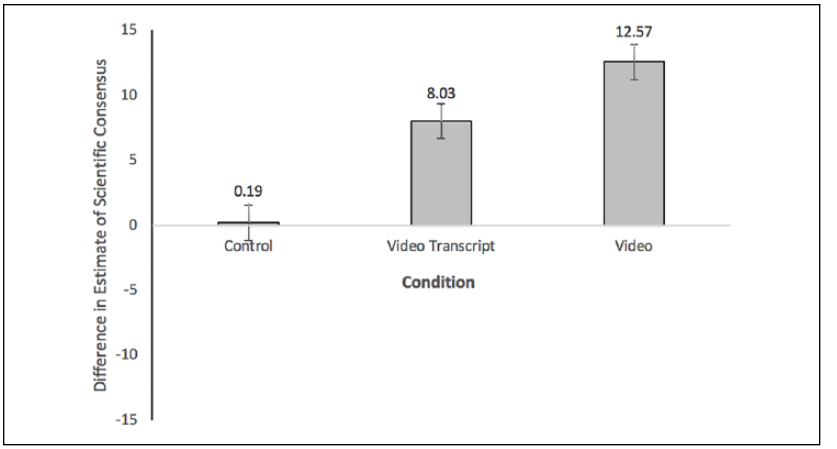

Figure 1. Differences in estimates of the scientific consensus by condition.
Note. Error bars reflect the standard error of the mean (post – preconsensus estimate).

we used the difference of the pre- and postconsensus estimates (post minus pre) as the dependent measure so that the results better reflect belief *change*. The analysis of variance omnibus test was significant, $F(2, 504) = 28.95$, $p < .001$, $\eta^2_{\text{partial}} = .103$. The treatment video led to a significantly greater estimate of scientific agreement compared with the control group (+12 percentage points) ($M_{\text{diff}} = 12.38$, standard error [*SE*] = 1.63), $p < .001$, 95% confidence interval [CI] [9.17, 15.59], $d = .91$. Likewise, the video transcript led to a significantly greater estimate compared with the control group (+8 percentage points, $M_{\text{diff}} = 7.84$, $SE = 1.63$), $p < .001$, 95% CI [4.64, 11.03], $d = .60$. Consistent with our hypothesis, the video led to a significantly greater estimate than did the transcript (+5 percentage points, $M_{\text{diff}} = 4.54$, $SE = 1.53$), $p < .001$, 95% CI [1.54, 7.54], $d = .27$ (Figure 1). Notably, these effects were not moderated by ideology for the video vs. transcript ($b = .00$, $SE = 1.35$), $p = .999$, 95% CI [−2.65, 2.65], transcript versus control ($b = .65$, $SE = 1.37$), $p = .636$, 95% CI [−2.04, 3.34], or the video versus control comparison ($b = .65$, $SE = 1.38$), $p = .639$, 95% CI [−2.08, 3.38]. Main effects of condition on all other variables are presented in the Supplemental Information (available online).

To model the downstream effects of increases in perceived scientific agreement, we used STATA software (Version 15; StataCorp, 2017) to test a structural equation model. We aimed to replicate the original GBM (van der Linden, Leiserowitz, et al., 2015; van der Linden, Leiserowitz, & Maibach,

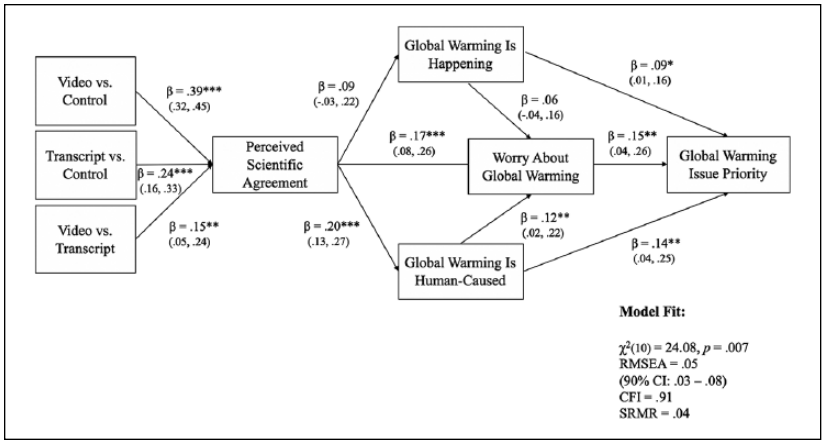

Figure 2. Gateway belief model.

Note. Coefficients are standardized. All measured variables are post – pre difference scores. Path coefficients from each dummy variable to perceived scientific agreement were derived from two separate models, one with the control condition as the reference group and another with the transcript as the reference group. Results from both models are integrated into the same figure for brevity and ease of comparison. Ninety-five percent confidence intervals were generated using bias-corrected bootstrapping procedures with 1,000 resamples and are listed in parentheses below each path coefficient.

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

2019). We used dummy variables to denote the three treatment conditions and ran the model twice, once with the control group as the reference category and once with the transcript as the reference category. This allowed us to assess all pairwise comparisons of treatment groups. Coefficients for all paths were standardized to ease interpretation and comparison of paths with variables on different scales. Results from both models are integrated and presented in Figure 2.

Results from the structural equation model suggest acceptable model fit (Figure 2). As expected, and consistent with our analysis of variance main effects, both the video and the transcript led to significant increases in perceived scientific agreement compared with the control, and the video was significantly more effective in increasing perceived scientific agreement compared with the transcript (Figure 2). Importantly, changes in perceived scientific agreement were associated with increases in key global warming beliefs as well as worry about global warming. Changes in perceived scientific agreement predicted greater, although not significant, belief that global warming is happening, $\beta = .09$, $SE = .06$, $p = .150$, 95% CI [−.03, .22], a

significant increase in the belief that global warming is human-caused, β = .20, *SE* = .04, $p < .001$, 95% CI [.13, .27], and a significant increase in worry, β = .17, *SE* = .05, $p < .001$, 95% CI [.08, .26]. Importantly, although increases in the belief that global warming is happening were not significant, they were associated with significant increases in the belief that global warming should be a higher priority for the president and Congress, β = .09, *SE* = .04, $p = .026$, 95% CI [.01, .16]. Likewise, increases in the belief that humans are causing global warming predicted increases in global warming issue priority, β = .14, *SE* = .05, $p = .003$, 95% CI [.05, .25], as did the effect of worry, β = .15, *SE* = .07, $p = .006$, 95% CI [.04, .26]. As an additional robustness check, we ran the same models with age, gender, education, and political ideology entered as covariates. Results were nearly identical (see Supplemental Figure 1, available online).

Furthermore, we tested the indirect effects of treatment condition on global warming beliefs and worry via changes in perceived scientific agreement. Compared with the transcript, the video had a significant indirect effect on the belief that global warming is human-caused, β = .06, *SE* = .03, $p = .044$, 95% CI [.00, .12], and worry, β = .06, *SE* = .03, $p = .022$, 95% CI [.01, .11], but not on the belief that global warming is happening, β = .03, *SE* = .02, $p = .207$, 95% CI [−.02, .07]. Additionally, compared with the transcript, the video had a significant total indirect effect on global warming issue priority through increases in estimates of scientific agreement, global warming beliefs (happening and human-caused), and worry, β = .02, *SE* = .01, $p = .041$, 95% CI [.00, .04].

Discussion

This study provides results indicating that conveying the "experience" of scientific consensus using narrative and vivid imagery is effective. Compared with a control condition, both a consensus video and the video transcript led to significant increases in perceptions of scientific agreement and, in turn, global warming beliefs, worry, and issue priority. Although the text was identical in the video and transcript, the video was significantly more effective at increasing perceptions of scientific agreement, and therefore the downstream effects, in the GBM. Additionally, and consistent with most prior research (see van der Linden, Leiserowitz, et al., 2019), results were similar across the ideological spectrum (van der Linden, Maibach, et al., 2019). This is especially important, considering that conservative and Republican support for climate action is much weaker than liberal and Democratic support (Leiserowitz et al., 2018b).

These results suggest that videos that use imagery and vividly rendered analogies that translate an unfamiliar, abstract, and "descriptive" source (expert consensus among climate scientists) into a relatable target that "feels" more familiar (e.g., 97% of dentists or airline workers) may enhance the effect of consensus messages beyond that of text alone. This is consistent with perspectives on climate change communication, that "statistical descriptions of the risk of climate change often fail to elicit action because statistical information, by itself, means very little to (most) people" (van der Linden, Maibach, et al., 2015, p. 759). Conversely, communication that capitalizes on experiential processes and makes information more relatable, concrete, and personal (e.g., using narratives and analogies) can be quite powerful in influencing beliefs, perceptions, and behavior (Marx et al., 2007). These findings also support other work that shows that vividness can enhance persuasion when the imagery is used specifically to support the central thesis of a particular message (Guadagno et al., 2011).

The results of this study also raise several additional questions as to *why* the video was more effective than the transcript alone. Which facets of the video most strongly drive its effects on beliefs and attitudes? In general, the theoretical mechanisms underlying the persuasive effects of vividness include memorability, imageability, and affective impact (Taylor & Thompson, 1982). Vivid messages can encourage agreement through increased cognitive elaboration so that the message links more readily to other cognitions in memory (Guadagno et al., 2011; Petty & Cacioppo, 1986). For example, it is plausible that the video quality led people to believe that the message is from a more credible and trustworthy source, a factor that has an important impact on the persuasiveness of a message (e.g., Harris et al., 2018; Petty & Cacioppo, 1986). Another possibility is that the video was more engaging, enhancing attention and central processing of the message. For example, unlike the text alone, the video may have made the imagery of climate change risk more concrete by showing wildfires and storms. The video may have also elicited conformity by watching groups of experts nodding their heads in agreement with the message. Given the nature of the video, these explanations are not mutually exclusive and may work in combination to produce its effects.

Although the effects are clear and positive, the current study cannot adjudicate the mechanisms driving the main experimental effects. Thus, future research should measure potential mediators of the effect that could distinguish key processes and mechanisms that may differentiate the effects of the video from those of the transcript, such as affect, engagement, memory recall, thought-listing, and perceived credibility and persuasiveness of the message.

The evidence from the current study suggests that "experiencing" consensus through a short video represents a promising strategy for informing the public about the scientific consensus on climate change, which, in turn, can strengthen public understanding of climate change and support for it as a policy priority. We hope these findings spur further research investigating the ways in which scientific consensus and other important climate science facts are not only described to the public but also communicated in ways that more closely resemble how people navigate the social world, namely through language, experience, and basic metaphors and analogies.

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Note

1. For an informal overview of published studies on the GBM please see Cook (2019).

References

Barron, G., & Erev, I. (2003). Small feedback-based decisions and their limited correspondence to description-based decisions. *Journal of Behavioral Decision Making*, *16*, 215-233.

Bolsen, T., & Druckman, J. N. (2018). Do partisanship and politicization undermine the impact of a scientific consensus message about climate change? *Group Processes & Intergroup Relations*, *21*, 389-402. doi:10.1177/1368430217737855

Brewer, P. R., & McKnight, J. (2017). "A statistically representative climate change debate": Satirical Television news, scientific consensus, and public perceptions

of global warming. *Atlantic Journal of Communication*, *25*, 166-180. doi:10.1080/15456870.2017.1324453

Collins, R. L., Taylor, S. E., Wood, J. V., & Thompson, S. C. (1988). The vividness effect: Elusive or illusory? *Journal of Experimental Social Psychology*, *24*, 1-18.

Cook, J. (2019). *The consensus on consensus messaging*. Retrieved from https://skepticalscience.com/consensus-consensus-messaging.html

Cook, J., & Lewandowsky, S. (2016). Rational irrationality: Modeling climate change belief polarization using Bayesian networks. *Topics in Cognitive Science*, *8*, 160-179.

Cook, J., Lewandowsky, S., & Ecker, U. K. (2017). Neutralizing misinformation through inoculation: Exposing misleading argumentation techniques reduces their influence. *PLoS One*, *12*, e0175799.

Cook, J., Oreskes, N., Doran, P. T., Anderegg, W. R., Verheggen, B., Maibach, E. W., . . .Nuccitelli, D. (2016). Consensus on consensus: a synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters*, *11*(4), 04800. doi:10.1088/1748-9326/11/4/048002

Dixon, G. (2016). Applying the gateway belief model to genetically modified food perceptions: New insights and additional questions. *Journal of Communication*, *66*, 888-908. doi:10.1111/jcom.12260

Flusberg, S. J., Matlock, T., & Thibodeau, P. H. (2017). Metaphors for the war (or race) against climate change. *Environmental Communication*, *11*, 769-783.

Goldberg, M. H., van der Linden, S., Ballew, M. T., Rosenthal, S. A., & Leiserowitz, A. (2019). The role of anchoring in judgments about expert consensus. *Journal of Applied Social Psychology*, *49*, 192-200. doi:10.1111/jasp.12576

Goldberg, M. H., van der Linden, S., Maibach, E., & Leiserowitz, A. (2019). Discussing global warming leads to greater acceptance of climate science. *Proceedings of the National Academy of Sciences*, *116*(30), 14804-14805.

Goode, M. R., Dahl, D. W., & Moreau, C. P. (2010). The effect of experiential analogies on consumer perceptions and attitudes. *Journal of Marketing Research*, *47*, 274-286.

Guadagno, R. E., Rhoads, K. V. L., & Sagarin, B. J. (2011). Figural vividness and persuasion: Capturing the "elusive" vividness effect. *Personality and Social Psychology Bulletin*, *37*, 626-638.

Harris, A. J., Sildmäe, O., Speekenbrink, M., & Hahn, U. (2018). The potential power of experience in communications of expert consensus levels. *Journal of Risk Research*, *22*, 593-609. doi:10.1080/13669877.2018.1440416

Huck, S. W., & McLean, R. A. (1975). Using a repeated measures ANOVA to analyze the data from a pretest-posttest design: A potentially confusing task. *Psychological Bulletin*, *82*, 511-518.

Kerr, J. R., & Wilson, M. S. (2018). Changes in perceived scientific consensus shift beliefs about climate change and GM food safety. *PLoS One*, *13*, e0200295. doi:10.1371/journal.pone.0200295

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.

Leiserowitz, A., Maibach, E., Roser-Renouf, C., Rosenthal, S., Cutler, M., & Kotcher, J. (2018a). *Climate change in the American mind, March 2018*. New Haven, CT/Fairfax, VA: Yale University/George Mason University.

Leiserowitz, A., Maibach, E., Roser-Renouf, C., Rosenthal, S., Cutler, M., & Kotcher, J. (2018b). *Politics and global warming, March 2018*. New Haven, CT/Fairfax, VA: Yale University/George Mason University.

Leiserowitz, A., & Smith, N. (2017). Affective imagery, risk perceptions, and climate change communication. In *Oxford Research Encyclopedia of Climate Science* (pp. 1-29). doi:10.1093/acrefore/9780190228620.013.307

Ma, Y., Dixon, G., & Hmielowski, J. D. (2019). Psychological reactance from reading basic facts on climate change: The role of prior views and political identification. *Environmental Communication*, *13*, 71-86.

Marx, S. M., Weber, E. U., Orlove, B. S., Leiserowitz, A., Krantz, D. H., Roncoli, C., & Philips, J. (2007). Communication and mental processes: Experiential and analytic processing of uncertain climate information. *Global Environmental Change*, *17*, 47-58. doi:10.1016/j.gloenvcha.2006.10.004

Miller, D. T., & Prentice, D. A. (2016). Changing norms to change behavior. *Annual Review of Psychology*, *67*, 339-361.

O'Neill, S. J., Boykoff, M., Niemeyer, S., & Day, S. A. (2013). On the use of imagery for climate change engagement. *Global Environmental Change*, *23*, 413-421. doi:10.1016/j.gloenvcha.2012.11.006

O'Neill, S., & Nicholson-Cole, S. (2009). "Fear won't do it" promoting positive engagement with climate change through visual and iconic representations. *Science Communication*, *30*, 355-379. doi:10.1177/1075547008329201

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In *Communication and persuasion* (pp. 1-24). New York, NY: Springer.

Prentice, D. A., & Miller, D. T. (1993). Pluralistic ignorance and alcohol use on campus: some consequences of misperceiving the social norm. *Journal of Personality and Social Psychology*, *64*, 243-256.

Schnall, S. (2012). Are there basic metaphors? In *Metaphorical thought in social life*. Washington, DC: American Psychological Association.

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis*, *24*, 311-322.

Sopory, P., & Dillard, J. P. (2002). The persuasive effects of metaphor: A meta-analysis. *Human Communication Research*, *28*, 382-419.

StataCorp. (2017). Stata Statistical Software: Release 15 [Computer software]. College Station, TX: Author.

Tankard, M. E., & Paluck, E. L. (2017). The effect of a Supreme Court decision regarding gay marriage on social norms and personal attitudes. *Psychological Science*, *28*, 1334-1344. doi:10.1177/0956797617709594

Taylor, S. E., & Thompson, S. C. (1982). Stalking the elusive" vividness" effect. *Psychological Review*, *89*, 155-181.

van der Linden, S. L., Clarke, C. E., & Maibach, E. W. (2015). Highlighting consensus among medical scientists increases public support for vaccines: Evidence

from a randomized experiment. *BMC Public Health*, *15*, 1207. doi:10.1186/s12889-015-2541-4

van der Linden, S. L., Leiserowitz, A. A., Feinberg, G. D., & Maibach, E. W. (2014). How to communicate the scientific consensus on climate change: plain facts, pie charts or metaphors? *Climatic Change*, *126*, 255-262.

van der Linden, S. L., Leiserowitz, A. A., Feinberg, G. D., & Maibach, E. W. (2015). The scientific consensus on climate change as a gateway belief: Experimental evidence. *PLoS One*, *10*, e0118489. doi:10.1371/journal.pone.0118489

van der Linden, S., Leiserowitz, A., & Maibach, E. (2018). Scientific agreement can neutralize politicization of facts. *Nature Human Behaviour*, *2*, 2-3. doi:10.1038/s41562-017-0259-2

van der Linden, S., Leiserowitz, A., & Maibach, E. (2019). The gateway belief model: A large-scale replication. *Journal of Environmental Psychology*, *62*, 49-58.

van der Linden, S., Maibach, E., Cook, J., Leiserowitz, A., Ranney, M., Lewandowsky, S., . . . Weber, E. U. (2017). Culture versus cognition is a false dilemma. *Nature Climate Change*, *7*, 457-458. doi:10.1038/nclimate3323

van der Linden, S., Maibach, E., & Leiserowitz, A. (2015). Improving public engagement with climate change: Five "best practice" insights from psychological science. *Perspectives on Psychological Science*, *10*, 758-763. doi:10.1177/1745691615598516

van der Linden, S., Maibach, E., & Leiserowitz, A. (2019). Exposure to scientific consensus does not cause psychological reactance. *Environmental Communication*. Advance online publication. doi:10.1080/17524032.2019.1617763

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