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Boomerang Effects in Science Communication: How Motivated Reasoning and Identity Cues Amplify Opinion Polarization About Climate Mitigation Policies

P. Sol Hart[1] and Erik C. Nisbet[2]

Abstract

The deficit-model of science communication assumes increased communication about science issues will move public consensus toward scientific consensus. However, in the case of climate change, public polarization about the issue has increased in recent years, not diminished. In this study, we draw from theories of motivated reasoning, social identity, and persuasion to examine how science-based messages may increase public polarization on controversial science issues such as climate change. Exposing 240 adults to simulated news stories about possible climate change health impacts on different groups, we found the influence of identification with potential victims was contingent on participants' political partisanship. This partisanship increased the degree of political polarization on support for climate mitigation policies and resulted in a boomerang effect among Republican participants. Implications for understanding the role of motivated reasoning within the context of science communication are discussed.

Keywords

science communication, climate change, social identity, boomerang effects

The traditional paradigm for science communication about issues like embryonic stem-cells, climate change, and evolution is the deficit model, which assumes that increased communication and awareness about scientific issues will move public consensus toward the scientific

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consensus and reduce political polarization around science-based policy. However, drawing on the theories of motivated reasoning, social identity, and persuasion, our study presents an alternative theoretical framework for understanding how some forms of science communication may amplify political polarization and result in "boomerang effects" on policy attitudes held by the general public.

In this study, we employ climate change as a context for examining how message exposure within a politically polarized issue environment may have unintended consequences on audience attitudes. The American public remains largely divided about how to approach climate change despite widespread scientific consensus that global climate change is largely caused by anthropogenic sources and has the potential to create substantial ecological, social, and economic harm worldwide (Parry, Canziani, Palutikof, van der Linden, & Co-authors, 2007). The disagreement in public opinion largely reflects political and ideological divisions—most Democrats believe that climate change is caused by humans and support government policies to address the issue, whereas most Republicans do not. This divide between Republicans and Democrats has widened significantly over the past 10 years on dimensions such as the belief that climate change is caused by humans, that climate change will pose a serious threat in the respondent's lifetime, and that the effects of climate change have already begun (Dunlap & McCright, 2008).

As beliefs about climate change become strongly associated with partisan orientations, individuals are more likely to pay attention to and interpret information in ways that reinforce their political views. In addition, within this polarized environment, structural characteristics of messages about climate change may also serve to amplify partisan differences on the issue, depending on what elements of climate change are highlighted in the story. An important dynamic in many science messages is the question of *who* is affected by an identified problem or issue. For example, some stories may focus on the impact of global climate change on local communities or for the United States as a whole, whereas others may examine the impact of global climate change on groups of people located in areas such as Zimbabwe or Vietnam. However, to the best of our knowledge, previous research has not investigated how the identity of potential victims may influence audience polarization regarding controversial science issues. We begin to address this research gap with the current study.

We begin by presenting a theoretical framework for understanding how motivated reasoning may lead to political partisanship interacting with available identity cues to influence identification with potential victims of climate change, which in turn may influence support for climate mitigation policy. We propose that the nature of the interaction between political partisanship and victim identification is likely to cause a boomerang effect among Republicans and amplify political polarization about climate mitigation policies. Next, we present the results of our study, which tests our theoretical propositions regarding the influence of partisanship and social identification on the processing of messages about climate change. We conclude by discussing the implications of these results for understanding the theoretical linkages between the information environment and political polarization about science issues like climate change as well as lessons for communicating science issues to the general public.

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Literature Review

Theoretical Considerations About Communicating Science

In recent years, scholars have examined how mass media messages can influence public beliefs and perceptions of science and science issues. Scholars have examined dynamics such as how real-world exposure to science stories influences science beliefs (Hwang & Southwell, 2009), how narrative structure may affect interpretation (Dahlstrom, 2010; Yaros, 2006), and how various mediums may differentially affect public perceptions (Nisbet et al., 2002). In the domain of climate change, scholars have increasingly paid attention to how different message themes and structures may alter the public support for climate mitigation policies (e.g., Maibach, Roser-Renouf, & Leiserowitz, 2008; Moser & Dilling, 2007; Schuldt, Konrath, & Schwarz, 2011). The research presented here follows this line of inquiry by examining how changes in the description of *who* is affected by climate change may interact with party affiliation to amplify political polarization about proposed climate mitigation policies; this proposition is drawn in contrast to the predictions of the deficit model of science communication.

To date, the dominant approach used for communicating about science issues is the *deficit model* of science communication (Bauer, Allum, & Miller, 2007), in which media and education programs are used to provide the public with more facts and increase general knowledge about science issues such as climate change. The underlying assumption of these efforts is that if the general public has more information about climate change, they will adopt views consistent with scientific experts. However, some recent scholarly work has been critical of this approach (e.g., Nisbet, 2005; Nisbet & Goidel, 2007) and points to errors in the assumptions underlying the scientific literacy approach. Critics assert that strong value and ideological orientations may act as a perceptual screen (Goidel, Shields, & Peffley, 1997) that influences audiences to select and privilege a subset of considerations that are consistent or reinforce their predispositions. For example, Nisbet (2005) found that ideological and religious worldviews strongly moderated the impact of increased information awareness on public support for embryonic stem cell research. Likewise, Druckman and Bolsen (forthcoming) found that audience responses to factual messages about emerging technologies were heavily contingent on their ideological predispositions.

The proposition that partisan audiences are motivated to interpret and process information in a biased manner that reinforces their predispositions is termed *motivated reasoning* and has been found to operate across a wide range of contexts (Kunda, 1990; Taber & Lodge, 2006). Though scholars often point to self-selection into partisan information sources (Bennett & Iyengar, 2008) as a reason for issue polarization, Mutz (2008) asserts exposure to any information, regardless of the source, about contentious issues such as climate change is likely to activate political predispositions and increase issue polarization due to motivated reasoning among audiences. Thus, we expect that audiences with strong partisan beliefs may interpret the same message about a controversial scientific issue in very different manners, reinforcing their preexisting beliefs and increasing public polarization rather than promoting the consensus postulated by the deficit model.

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One factor that may interact with motivated reasoning is the identity of *who* will be affected by a scientific issue or policy. For example, newspaper stories often focus on different population groups that will be affected by climate change, such as communities in the Mekong Delta (Mydans, 2009), the Himalayas (Chhibber & Schild, 2009), and the United States (Broder, 2009). These stories each focus on how climate change may affect different groups of potential victims with various types of social identity cues embedded in messages (i.e., location, pictures, names, headlines, etc.) possibly influencing the degree of social identification between the reader and victims/exemplars highlighted within the message (Kogut & Ritov, 2005a, 2005b; Slovic, 2007). As will be explained below, how individuals respond to these identity cues may depend, in part, on individual predispositions such as political partisanship. We argue that the degree of identification with groups featured in a message or story can play a role in whether individuals are willing to help those in need and what problem responses they may support (Cuddy, Rock, & Norton, 2007).

Scholarship in political psychology and public opinion have long recognized the important role that group identification and social identity cues may play in shaping public opinion and policy preferences, especially when made salient in messages (Converse, 1964; Nelson & Kinder, 1996; Sniderman, Brody, & Tetlock, 1991). Most citizens are cognitive misers with limited resources for decision making about complex policy issues and often rely on a range of heuristic devices or mental shortcuts to make decisions about policy preferences (Downs, 1957; Popkin, 1991; Sniderman et al., 1991). Group-centric decision making has been demonstrated across a range of policy contexts and groups (e.g., Brewer, 2003; Hutchings & Valentino, 2004; Kinder & Sanders, 1996; Kinder & Winter, 2001; Nelson & Kinder, 1996; Sullivan, Piereson, & Marcus, 1982). In some cases, the degree of *identification* with the group(s) that may be affected, either favorably or unfavorably, by government policy may be a heuristic device that citizens employ to form policy preferences and decisions (Nelson & Kinder, 1996; Sniderman et al., 1991).

The Potential for Boomerang Effects

Examining the interplay between these two mechanisms—motivated reasoning and social identification—highlights the potential for boomerang effects in science communication. A boomerang effect occurs when a message is strategically constructed with a specific intent but produces a result that is the opposite of that intent (for a review, see Byrne & Hart, 2009). For example, antismoking messages can increase predispositions to smoke (Wolburg, 2006), antilitter messages can increase predispositions to litter (Reich & Robertson, 1979), and appeals for donations to impoverished children can lower donation rates (Small, Loewenstein, & Slovic, 2007). Furthermore, boomerang effects may be specific to only certain segments of an audience based on individual predispositions or context. For example, Schultz, Nolan, Cialdini, Goldstein, and Grisevicius (2007) found that appeals to increase energy efficiency created a boomerang effect among households that were already very energy efficient and increased average energy use for this population segment.

The boomerang effect may occur because unintended constructs are activated in the receiver and drive the resulting attitude and behavioral change (Byrne & Hart, 2009). The

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integrated theoretical framework proposed by Byrne and Hart (2009) states that when an individual receives a message, he or she will engage in competitive processing of different components of the message with certain aspects of the message becoming more salient than others. Within this framework, motivated reasoning and identity cues may both play a role.

Motivated reasoning among strong partisans may lead to the activation of unintended constructs that reinforce partisan predispositions. For example, Nyhan and Reifler (2010) conducted a series of experiments examining whether exposure to factual information would correct participants' misperceptions and factually incorrect beliefs about a range of issues, including stem cell research. Their results indicated that exposure to factual information failed to correct misperceptions among ideological partisans and in some cases resulted in boomerang effects on beliefs and attitudes and greater ideological polarization. Similarly, Gollust, Lantz, and Ubel (2009) found exposure to health messages about the social determinants of diabetes aimed at influencing public support for diabetes-prevention programs lead to a boomerang effect on attitudes about diabetes prevention and a greater ideological polarization between Republicans and Democrats.

Likewise, social identity cues may activate the unintended construct that an issue or problem is not applicable to the group to which a message receiver belongs, and thus the message may be ineffective or result in a negative impact (from the sender's perspective) on audience attitudes. Furthermore, motivated reasoning and social identity cues may interact, with motivated reasoning generated by political partisanship amplifying or dampening the potential effect of social identity cues on audience attitudes. We assert that political partisanship will motivate individuals to process available identity cues embedded in a message in a biased manner that influences their degree of identification with potential victims of featured in that message. In turn, their degree of social identification with the potential victims will influence their level of support for policies or behaviors that may aid the featured victims.

For example, due to motivated reasoning, individuals exposed to counterattitudinal messages, such as Republicans receiving a message promoting climate change as problem and calling for climate mitigation policies, may be motivated to interpret available social identity cues, such as geographic location or group membership, in ways that lower their social identification with potential victims of climate change featured in the message. In turn, low social identification with potential victims may decrease the effectiveness of the persuasive impact of the message, possibly resulting in a boomerang effect.

Thus, within the context of a controversial science issue, science communication has the potential to boomerang and (a) increase political polarization rather than create consensus and (b) dampen, rather than increase, support for policies addressing a science-based issue or problem among some segments of the public.

Communicating About Climate Change and Political Partisanship

To examine the potential for science messages to boomerang within a politically polarized policy environment, we employ the issue of climate change and public support for government policies mitigating climate change. Scientists have formed a general consensus that anthropogenic sources of greenhouse gas emissions play a significant role in climate change,

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and the negative consequences of climate change may be mitigated by lowering global greenhouse gas emissions (Parry et al., 2007).

As scientists have become increasingly certain about the human causes of climate change and the urgent need to address it, one might expect that public opinion about climate change would follow a similar pattern in beliefs about human causation, perceptions of the threat of climate change, and support for government policies mitigating climate change. However, polling data show modest changes across these measures for the public as a whole and an increasing polarization between Democrats and Republicans (Dunlap & McCright, 2008). For example, the partisan gap in opinion between Democrats and Republicans on whether "temperature changes over the last century are due more to human activities than natural changes in the environment" has almost doubled from 16 percentage points in 2003 to 29 percentage points in 2008 (Dunlap & McCright, 2008). Similar examples of political polarization over the past 10 years have occurred for beliefs on whether the effects of global warming have already begun, the scientific consensus on global warming, the threat that global warming will pose in the respondent's lifetimes, and the exaggeration of global warming in the news (Dunlap & McCright, 2008).

This broad polarization in opinion about climate change is not only due to increased policy polarization in general between political parties (Layman, Carsey, & Horowitz, 2006) but also due to a specific party divide on environmental issues that has been developing since the 1980s (Dunlap & McCright, 2008). Although policy positions for a political party arise through an interactive process between party leaders, political activists, and members of the general public who identify with political parties, scholars (Fiorina & Abrams, 2008; Layman et al., 2006) suggest that the adoption of policy positions is driven primarily through a top-down process with party elites providing cues, or *identity markers* on what it means to be associated with a political party such as the Republicans or Democrats.

Identity markers may be any "characteristics associated with an individual that they might choose to present to others" to support an identity claim, or alternatively they may also be the "characteristics that people look to in others when they seek to attribute" an identity to them (Kiely, Bechhofer, Stewart, & McCrone, 2001, p. 35). These identity markers are woven into identity schema and provide the interpretive cues that differentiate the "self" from the "other." In the case of climate change, based on the political context and polarization that has emerged in the last decade, we argue that opinions about climate change and climate mitigation, much like the issue of abortion, has become a fundamental identity marker for how Republicans and Democrats politically define themselves and others (Dunlap & McCright, 2008; Nisbet, 2009a). Thus, strong political partisans are likely to employ motivated reasoning when exposed to messages about climate change with ideological predispositions moderating information effects on policy attitudes.

Hamilton and his colleagues (Hamilton, 2011; Hamilton, Colocousis, & Duncan, 2010; Hamilton & Keim, 2009) have demonstrated across a series of studies that political partisanship moderates the influence of education on beliefs and attitudes about climate change. For example, as educational attainment increased among Democrats, the perceived threat of climate change increased while the converse was true for Republicans (Hamilton, 2011).

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Schuldt et al. (2011) found similar results—political partisanship moderated framing effects on belief that climate change was occurring. Framing manipulation had no impact on Democrats' and Independents' belief whether climate change was occurring or not, but Republicans' belief in climate change varied significantly depending on the framing manipulation. In their framing experiment, the term *global warming* activated Republican skepticism about whether climate change was occurring more than the term *climate change*. They partially credit this difference in Republican response to the fact that the term global warming "entails a directional prediction of rising temperatures that is easily discredited by any cold spell, whereas 'climate change' lacks a directional commitment and easily accommodates unusual weather of any kind" (Schuldt et al., 2011, p. 122). In other words, Republican participants were motivated to employ available cues in the "global warming" condition to discount the counterattitudinal information, whereas the lack of available cues in the "climate change" condition mitigated motivated reasoning and discounting by Republicans.

Hypotheses

Taking our theoretical discussion of motivated reasoning and the influence of social identification on policy attitudes, and combining it with previous studies examining the challenges of communicating about climate change, we predict a moderated-mediation model of message effects on audience attitudes about climate change policy. A moderated-mediation model occurs when audience predispositions moderate the influence of our message exposure on an intervening mediating variable, which in turn influences our ultimate dependent variable of interest. Specifically, we propose that audience political partisanship will moderate the influence of message exposure on audience identification with the victims featured in messages about climate change, which in turn, influences audience support for proposed climate mitigation policies.

Two sets of relationships within our model are formally hypothesized. First, based on prior literature discussed above, we expect greater social identification with the victims featured in the message will lead to greater support for climate mitigation. Formally, we state as follows:

Hypothesis 1 (H1): Social identification with potential victims of climate change will influence support for climate mitigation policies.

Second, we expect an individual's strength of political partisanship will moderate the relationship between message exposure and victim identification. Republican partisans, due to motivate reasoning, are more likely to interpret a message about climate mitigation in a manner that reduces their perceived need to take action on climate change and consequently will employ available identity cues to lessen their identification with potential victims of climate change. Conversely, Democrat partisans, who are predisposed to accept messages about the need for climate change mitigation, will be motivated to process available identity cues in a manner that increases identification with potential victims of climate change. Furthermore, the more socially distant the available identity cues are from the audience's

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own context, the more likely they are to be processed in a biased manner, especially in the case of counterattitudinal messages.

In sum, this biased processing of climate messages by both Democrats and Republicans will result in (a) increased opinion polarization between Republicans and Democrats and (b) lead to a boomerang effect among Republicans in response to proclimate messages containing high social distance cues. Formally stated, we hypothesize as follows:

Hypothesis 2 (H2): Political partisanship will moderate the influence of social distance cues on identification with the potential victims of climate change.

Hypothesis 3 (H3): Republican participants exposed to messages with embedded high social distance identity cues will be less supportive of climate change mitigation policies than Republicans participants who are not exposed to any message (i.e., a boomerang effect will occur for Republicans from exposure to climate change messages with high social distance identity cues).

Method

Experimental Design

Our study to test the proposed hypotheses was conducted by randomly assigning participants to one of two stimulus conditions or to a control condition. Participants were nonstudent adults (N = 240; mean age = 38.42 years; age range = 18-80 years; 54% female) recruited via mall intercepts in an upstate, rural New York state community and provided a US$5 gift card incentive for completing the experiment.

In the two stimulus conditions, participants read a simulated news story about climate change; no story was read in the control condition. The simulated new story was designed to be "nonpolitical" as it did not contain any explicit political partisan cues and focused on the potential health impacts of climate change, an increasingly salient and important aspect of climate change (Frumkin, Hess, Luber, Malilay, & McGeehin, 2008; Maibach, Nisbet, Baldwin, Akerlof, & Diao, 2010). The story discussed the potential for climate change to increase the likelihood that diseases such as West Nile virus will infect individuals who spend a lot of time working outdoors, like farmers. The news story was generated explicitly for the experiment but was based on facts reported by the Associated Press. The story included pictures and names of eight farmers who were potentially at risk.

The two experimental conditions varied by manipulating the identity of the potential victims and story exemplars into conditions of relative low and high social distance by altering the story's headline, body text, and exemplar names while keeping the exemplar photos in each story constant in order to guard against different facial expressions or other individual cues. In the low social distance condition, the potential victims of climate change were described as being located in the general locality of where the experimental participants resided (upstate New York). In the high social distance condition the potential victims were located either in the state of Georgia or the country France. Multiple high social distance stimuli were used to help ensure the manipulation was influencing social identification

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with the exemplars rather than unintended group characteristics. Examples of the stimulus used in both conditions are provided in the appendix.

Data Analysis

First, a moderated-mediation model was used to test the formally proposed hypotheses that (a) social identification with potential victims of climate change will influence support for climate mitigation policies and (b) political partisanship will moderate the influence of available identity cues on identification with the potential victims of climate change. Bootstrapped 95% confidence intervals were taken to identify the conditional indirect effects of the interaction between political partisanship and experimental condition at each level of political party. This analysis only compares the two stimulus conditions; it does not use the control condition because participants in the control condition did not receive a story discussing potential victims of climate change that the participants could identify with.

Second, OLS regression analysis was employed to test our third hypothesis that Republican participants exposed to counterattitudinal messages with high social distance cues would be less supportive of climate change mitigation policies than Republicans participants who were not exposed to any message. OLS regression was used in order to avoid the increased risk of type I and type II errors that can occur when continuous independent variables are converted into categorical variables for use in ANOVA tests (see Hayes, 2005, pp. 473-479 for discussion). Sociodemographics, beliefs, and knowledge were used as control variables, political party affiliation, experimental conditions, and the interaction between party affiliation and experimental conditions were used as independent variables, and support for government climate mitigation policies was used as the dependent variable; these variables were assessed with identical questions for both stimulus conditions and the control condition. The mean and standard deviation for each variable included in both of these analyses is presented in Table 1, and the wording for the questions is provided below.

Independent Variables

Control Variables

Sociodemographics. Sociodemographics were measured by asking subjects their age (M = 38.4, SD = 17.9), gender (1 = *male*, 2 = *female*; M = 1.54, SD = 0.5), and level of education (1 = *none or Grades 1-8*, 7 = *postgraduate training or professional schooling after college*; M = 4.7, SD = 1.6) for control variables in the subsequent analysis.

Knowledge and beliefs. Belief in human-induced global warming was assessed with a dichotomous variable indicating whether participants agreed with the statement "global climate change is occurring and we humans are the primary cause" (65%). Factual knowledge about global warming was assessed by asking respondents two true/false questions, whether "the hole in the ozone layer is the main cause of global climate change" (false) and "the average temperature of the earth has increased over the past 100 years" (true) and combined into an additive index ranging from 0 to 2 (M = 1.2, SD = 0.57). General scientific knowledge was measured by asking respondents two true/false questions, whether "antibiotics kill

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Table 1. Mean and Standard Deviation of Variables in Analysis

Variable	*M*	*SD*
Age	38.4	17.9
Education	4.7	1.6
Gender (female)	1.54	0.5
Partisanship	2.6	1.9
Factual knowledge about global warming	1.2	0.57
Belief in human-induced global warming	0.65	0.48
General scientific knowledge	1.2	0.71
Social identification with victims	12.5	6.5
Support for climate mitigation	16.4	4.3

viruses as well as bacteria" (false) and "the position of the stars and planets can affect people's lives" (false) and combined into an additive index ranging from 0 to 2 ($M = 1.2$, $SD = 0.71$).

Experimental Conditions

Dummy variables were coded to indicate whether the subject was in the low social distance condition (33.3%), high social distance condition (33.3%), or control condition, with the control condition as the reference group.

Moderating Variable

Political partisanship. Political partisanship was included as a moderator on the relationship between message condition and policy support for the first analysis and as a moderator on the relationship between message condition and identification with victims in the second. Political partisanship was measured by asking participants "when it comes to political parties in the United States, how would you best describe yourself?" The question was measured on a 7-point continuous scale that ranged from *a strong Democrat* (0) to *a strong Republican* (6; $M = 2.6$, $SD = 1.9$).

Mediating Variable

Social identification with potential victims. Social identification with the victims featured in the story was included as the mediator in the moderated-mediation model. Social identification was measured by asking participants how much they agreed with the following statements: (a) "The people in the story have problems like my own"; (b) "I identify with the people featured in the story"; (c) "The people featured in the story are like me"; and (d) "I feel connected to the people featured in the story." The questions were measured on a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly disagree*) and aggregated into a single social identification scale (range = 4-28, $M = 12.5$, $SD = 6.5$, Cronbach's $\alpha = .92$).

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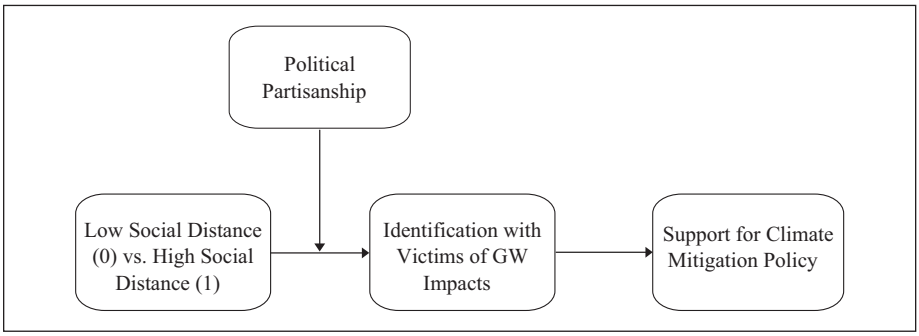

Figure 1. Proposed moderated-mediation model

Dependent Variable

Support for government action on climate mitigation. The dependent variable in the analysis was overall support for government action on climate mitigation. Participants were asked how much they agreed with the following statements: (a) "We should immediately increase government regulation on industries and businesses that produce a great deal of greenhouse emissions"; (b) "We should immediately increase taxes on industries and businesses that produce a great deal of greenhouse emissions"; and (c) "Concern about global climate change is unwarranted and no action is needed" (reverse coded). The questions were measured on 7-point Likert-type scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) and combined into an additive index ($M = 16.4$, $SD = 4.3$, Cronbach's $\alpha = .71$).

Results

Analysis 1: The Influence of Message Condition and Political Partisanship on Identification With Victims, and the Influence of Identification With Victims on Policy Support: A Moderated-Mediation Model

In order to evaluate our first two hypotheses, we probed the role of identification with potential victims of climate change as a mediator for the influence of the interaction between message condition and political partisanship interaction on policy support. We examined this relationship by testing whether identification with the potential victims of climate change differed between the high and low social distance conditions, whether the change in identification with the victims was moderated by political partisanship, and the role of identification with victims in influencing policy preferences. This proposed moderated-mediation model is outlined in Figure 1.

The moderator-mediation model was tested using the MODMED macro outlined in Preacher, Rucker, and Hayes (2007). The results demonstrate that the effects of message exposure on support for climate mitigation policies were mediated by social identification with the victims of climate change. In addition, the influence of experimental condition on

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Table 2. Results From Moderated-Mediation Analysis

Predictor	B
Equation predicting mediator (Identification with victims)	
Intercept	6.23
Gender	0.399
Age	0.081*
Education	–0.153
Belief in human-induced global warming	1.355
General scientific knowledge	–0.474
Global warming knowledge	–0.387
Message condition (high social distance)	4.909*
Political partisanship (Strong Republican)	1.938*
Message condition × Partisanship	–1.743**
Equation predicting dependent variable (Policy support)	
Intercept	15.804***
Gender	–0.002
Age	–0.004
Education	0.096
Belief in human-induced global warming	3.389***
General science knowledge	0.396
Global warming knowledge	–1.036
Identification with victims	0.109*
Message condition (high social distance)	–0.232
Political partisanship (Strong Republican)	–0.705
Message condition × Partisanship	–0.029

Note: Unstandardized coefficients are reported.
*$p < .05$. **$p \leq .01$. ***$p \leq .001$.

identification with the potential victims of climate change was moderated by party affiliation. This pattern of results is consistent with both H1 and H2 (see Table 2).

The nature of this moderation was further probed by testing bootstrapped (bias corrected and accelerated) conditional indirect effects at different levels of party (see Table 3). The results show that individuals who expressed greater Democrat partisanship (party levels of 0, 1, or 2) expressed the same levels of identification of the victims *regardless of the presence of high and low social distance cues in the messages*. However, Independents (party level of 3) and Republicans (party levels of 4, 5, or 6) viewing messages with high social differentiation cues expressed lower levels of social identification with victims than Independents or Republicans who viewed messages with low social distance cues. The results demonstrate that compared with the low social distance message, the high social distance message increased political polarization on identification with potential victims of climate change, which in turn increased political polarization in policy support. These results provide the basis for understanding the mechanism of the potential boomerang effect of message exposure on Republican support for climate mitigation we test in Analysis 2.

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Table 3. Indirect Effect of Viewing a High Social Distance Message (Compared With a Low Social Distance Message) on Support for Climate Mitigation Policy Through Identification With Victims at Various Levels of Political Partisanship

	Unstandardized 95% bootstrapped confidence intervals (bias corrected and accelerated)	
Party affiliation	Lower	Upper
Strong Democrat (0)	–0.030	1.257
Democrat (1)	–0.108	0.804
Lean Democrat (2)	–0.393	0.224
Independent (3)	–0.687	–0.010
Lean Republican (4)	–1.056	–0.063
Republican (5)	–1.504	–0.092
Strong Republican (6)	–1.911	–0.132

Analysis 2: Influence of Social Differentiation and Political Partisanship on Policy Support

The results of the OLS regression predicting support for government climate mitigation policy are presented in Table 4 with standardized beta coefficients and incremental explained variance reported. Model 1 tests the effects of relative low social distance and high social distance message exposure on support for climate mitigation compared with control, whereas Model 2 tests for the contingent effects of message conditions by political partisanship on support for climate mitigation.

The results in Model 1 found that the main effects of low social distance ($\beta = .06$, *ns*) and the high social distance ($\beta = .00$, *ns*) message conditions did not differ significantly from the control group in policy preferences. The only significant predictors of support for government action on climate mitigation in Model 1 were political partisanship ($\beta = -.25$, $p \leq .001$) and belief in human-induced global warming ($\beta = .38$, $p \leq .001$).

Model 2 tested whether political partisanship moderated the influence of message exposure on support for climate mitigation (H3). Interaction terms with political partisanship were created for both message conditions and entered into the model (following the recommendation of Hayes, 2005, the variables are not mean centered), with regression diagnostics indicating multicollinearity within acceptable tolerances (variance inflation factor less than 5; see O'Brien, 2007). The results from Model 2 indicate the influence of message exposure on support for climate mitigation was contingent upon political partisanship. Exposure to the high social distance message condition decreased support ($\beta = -.34$, $p \leq .01$) for climate mitigation as Republican partisanship increased. However, political partisanship was only a marginally significant moderator on identification when comparing the low social distance message condition with the control condition ($\beta = -.19$, $p \leq .10$).

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Table 4. OLS Regression Predicting Support for Climate Mitigation Policy

Predictors	Model 1	Model 2
Demographics		
Gender (men)	0.04	0.04
Age	0.12	0.10
Education	0.01	0.01
% incremental explained R^2	2.9	2.9
Beliefs and knowledge		
Political partisanship (Strong Republican)	–0.25***	–0.06
Belief in human-induced global warming	0.38***	0.37
General science knowledge	0.04	0.04
Global warming knowledge	0.00	0.00
% incremental explained R^2	25.8**	27.1**
Experimental conditions		
Low social distance message	0.06	0.20#
High social distance message	0.00	0.25*
% incremental explained R^2	0.03	0.03
Interactions		
Low social distance × Partisanship		–0.19*
High social distance × Partisanship		–0.34**
% incremental explained R^2		2.2*
Total % explained R^2	29.0	31.2

Note: Standardized betas are reported.
#$p < .10$. *$p < .05$. **$p \leq .01$. ***$p \leq .001$.

The nature of the interaction was probed as suggested by Hayes (2005) by comparing the effects of exposure for both the low and high social distance messages for strongly partisan Democrats (1 standard deviation below the mean of the partisanship scale), Independents (mean of the partisanship scale), and strongly partisan Republicans (1 standard deviation above the mean of the partisanship scale) with the control group. As Figure 2 demonstrates, for Democrats in the high social distance message, and to a lesser degree the low social distance message, message exposure significantly increased support for climate mitigation compared with the control group. In contrast, for Republicans, message exposure significantly decreased support for climate mitigation policies compared with control—a boomerang effect consistent with H3. The result was a significant increase in opinion polarization between Democrats and Republicans about climate mitigation after exposure to messages designed to highlight the health risks of climate change.

Discussion

This study demonstrates the importance of deepening our understanding of how audience predispositions may interact with the characteristics of informational science messages. In

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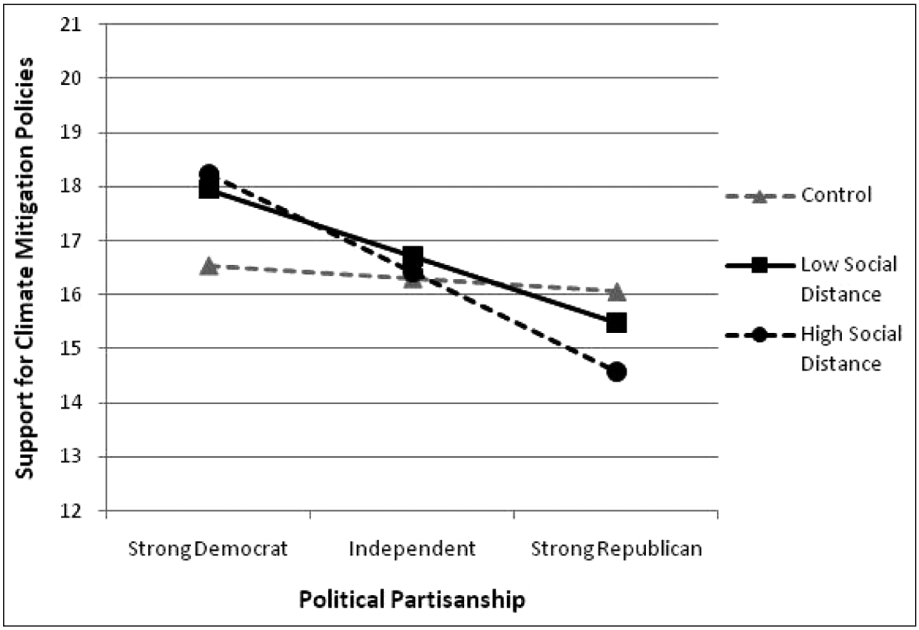

Figure 2. Support for climate mitigation policies by Condition × Political partisanship

this case, embedded social identity cues interacted with political orientations to amplify public polarization on the controversial science issue, climate change. Furthermore, neither factual knowledge about global warming nor general scientific knowledge was associated for support for climate mitigation policies. These findings demonstrate the important role motivated reasoning plays in the interpretation and application of messages discussing scientific issues and calls into question the traditional deficit model of science communication.

Analysis 1, which focused on the interaction between party affiliation and social identification may influence policy support, demonstrated that compared with offering no message (the control group), climate change messages, especially those talking about impacts on socially distant groups, are likely to amplify polarization about the issue. Probing of the role of identification with victims of climate change through the moderated-mediation model in Analysis 2 found that both H1 and H2 were supported: the effect of message exposure on identification with victims was contingent on political partisanship (H1) and identification with victims influenced policy support (H2). The results indicate that message exposure activated motivated reasoning in participants, which increased polarization between Democrats and Republicans in policy preferences by causing polarization in identification with victims of climate change. Among Democrats, exposure to messages that contained either low or high social distance cues increased support for climate mitigation. At the same time, support for climate mitigation among Republican participants exposed to messages with low social distance cues were unmoved in their support for climate mitigation compared with control

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while exposure to messages with high social distance cues resulted in decreased support among Republicans for climate mitigation policy.

We note that there was no main effect of condition on policy preferences; effects were contingent on political partisanship. A possible explanation for the lack of a main effect is that the difference between the two stimulus conditions was very subtle. Future research may build from this study to examine how different levels of vividness of social identity cues may moderate message effects and also generally examine how social identity cues have been embedded in climate change news frames, as this analysis has not been included in recent content analyses (e.g., Boykoff & Boykoff, 2004, 2007; Weingart, Engels, & Pansegrau, 2000). In addition, it may be the case that social identification with potential victims may play a greater role on audience perceptions about science issues with little or no political polarization, thus examining the role of social identity cues within other less polarized science contexts is also required. With these limitations in mind, this is the first study, to the best of our knowledge, to demonstrate that the identity of potential victims in science-based messages may amplify audience polarization regarding controversial science issues.

Strengths of this study include a carefully controlled experimental design and a diverse, nonstudent adult group of participants. The application of the results to actual citizen political behavior is limited, however, as our dependent variable focuses on policy preferences rather than behavioral intentions or actual political behaviors (e.g., voting, campaigning, etc.). Furthermore, though the study captures how exposure to science-based messages about climate change may influence policy preferences, it does not take into account how individual differences (e.g., ideology, values, interest, etc.) may drive selective attention to such messages and the implications for attitude formation. It also does not evaluate how additional factors, such as depth of processing, may affect the role of motivated reasoning. However, previous research has demonstrated that biased processing as a result of motivated reasoning occurs regardless of the depth of processing. For example, Redlawsk (2002) found that politically "motivated reasoners" exposed to counterattitudinal messages about their preferred political candidates actually spent more processing time on the message (counterarguing/integrating new information) but still processed the information in a biased manner that increased, rather than decreased, their support for their preferred candidate. Thus, our primary concern for this study is how motivated reasoning, regardless of processing route, affects social identification with victims. Moving forward, future research may examine whether biased processing within different routes (i.e., central/peripheral) may result in different outcomes.

Overall, it is important to note that this is only one study of how individuals interpret climate messages and caution should be taken in generalizing. The study focused on health impacts that are largely curable in the stimulus and policy support for the dependent variable—future research may explore additional domains of impacts and dependent variables.

Nevertheless, these findings have important implications for science communicators and our understanding of how media coverage of climate change is likely to influence public opinion. As previously mentioned, Mutz (2008) asserts that exposure to media messages, regardless of the source, about contentious issues such as climate change is likely to activate political predispositions and increase political polarization about the issue due to the

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activation of biased information processes among audiences. Our study's findings are consistent with previous research demonstrating that political polarization increases significantly after message exposure (Hamilton, 2011; Hamilton & Keim, 2009; Hamilton et al., 2010; see Figure 2).

Furthermore, as climate change is a global phenomena, news stories often highlight the impact that climate change is having and will likely have in the future on different parts of the world. While media messages are often created with an informational, rather than persuasive intent, our results suggest that broad public exposure to news stories discussing the impacts of climate change on other groups outside the United States (e.g., Chhibber & Schild, 2009; Mydans, 2009) is likely to amplify the partisan divide on climate mitigation policies as motivated reasoning drives political polarization in identification with those affected by climate change.

What lessons does our study provide for science communication? Science communicators may be effective by focusing on messages that target specific segments of the public and reduce the likelihood of activating unintended constructs. Audience segmentation analysis (Maibach, Roser-Renouf, & Leiserowitz, 2008) and ongoing framing research on science and technology issues (Nisbet, 2009b; Nisbet & Scheufele, 2009) may provide useful tools for targeting messages to different population segments. However, at the same time, the results of our study, as well as the aforementioned Gollust et al.'s (2009) study on diabetes prevention, indicate framing climate mitigation policies as a public health issue may not be the universal panacea for the deep political polarization infesting the public debate about climate change as some scholars recently suggest (see Maibach et al., 2010). In addition, this study suggests that when creating general messages for the public, science communicators and environmental organizations can lower the risk of creating a boomerang effect among conservative segments of the population by focusing on local effects and including implications for local areas when discussing the impact that climate change may be having on distant populations. The adoption of this practice is uncertain, as generating localized coverage requires additional resources by newspapers or advocacy organizations to conduct area-specific research and to limit coverage to the area of impact. Failure to adopt this recommendation, however, is likely to deepen the gap between Republicans and Democrats on climate change.

In conclusion, this study demonstrates the weaknesses of the deficit model of science communication and how message effects about climate change may be influenced by political partisanship and social identification. As research on effective science communication continues, it will be important to identify how messages may amplify or attenuate political polarization about controversial science issues. The current elite discourse, in which Democratic political leaders have continued to push for legislation on greenhouse gases while Republican leaders have argued against government regulation, suggests that climate change beliefs will continue to serve as indicators for party affiliation in the foreseeable future. Of course, this party sorting may be altered as the effects of climate change become more prominent. Communication researchers can contribute in the current polarized environment, and as future changes occur in the political landscape, by continuing to examine the role of science communication and journalism in public opinion formation on climate change and investigating how best to communicating scientifically accurate climate change messages to different segments of the lay public.

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Appendix

Stimulus Materials
Low Social Distance Condition

AP Health News Wire
March 5, 2008

Does Upstate NY Have a Fever?

Global Climate Change May Lead to Health Crisis

According to scientific experts, global climate change is expected to have dramatic changes on the weather, ecosystems, and health. For instance, global climate change is expected to dramatically raise average temperatures in Upstate New York, which in turn will substantially increase the number of insects like mosquitoes and ticks. Unfortunately, more bugs means significantly more risk from West Nile Virus and other infectious diseases that are transmitted by mosquito and tick bites.

Health organizations believe this is a worrisome prospect for residents of Upstate New York who work in the agricultural sector. New York farmers who spend a considerable amount of time outdoors, like those pictured right, are especially vulnerable to catching a life-threatening disease like West Nile virus.

Recovering from a severe case of West Nile Virus is a long process. Hospitalization can last for weeks, and even then the effects often linger. Health organizations are currently researching effective methods to both prevent and treat West Nile Virus. Costly treatments include extensive muscle rehabilitation and nerve therapy.

However, researchers are now investigating how to reduce global climate change in order to avoid disastrous impacts on Upstate New York like dangerous diseases from insects. Dr. David Nichols, a noted climatologist, states, "There is an urgent need to fund research, use government regulation, and promote individual action to keep these farmers and other New York residents safe from infectious diseases and other hazardous effects of climate change."

Some farmers in Upstate NY at risk of infection

Derrick Brown

Peter Bailey

John Gutierrez

Lisa Walker

Henry Turner

Richard Ciminelli

Mark Lynch

Paul Glovak

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High Social Distance Condition

AP Health News Wire
March 5, 2008

Does France Have a Fever?

Global Climate Change May Lead to Health Crisis

According to scientific experts, global climate change is expected to have dramatic changes on the weather, ecosystems, and health. For instance, global climate change is expected to dramatically raise average temperatures in Southern France, which in turn will substantially increase the number of insects like mosquitoes and ticks. Unfortunately, more bugs means significantly more risk from West Nile Virus and other infectious diseases that are transmitted by mosquito and tick bites.

Health organizations believe this is a worrisome prospect for residents of Southern France who work in the agricultural sector. French farmers who spend a considerable amount of time outdoors, like those pictured right, are especially vulnerable to catching a life-threatening disease like West Nile virus.

Recovering from a severe case of West Nile Virus is a long process. Hospitalization can last for weeks, and even then the effects often linger. Health organizations are currently researching effective methods to both prevent and treat West Nile Virus. Costly treatments include extensive muscle rehabilitation and nerve therapy.

However, researchers are now investigating how to reduce global climate change in order to avoid disastrous impacts on Southern France like dangerous diseases from insects. Dr. David Nichols, a noted climatologist, states, "There is an urgent need to fund research, use government regulation, and promote individual action to keep these farmers and other French residents safe from infectious diseases and other hazardous effects of climate change."

Some farmers in Southern France at risk of infection

Marc Guillaume

Adrien Sommer

Jacques Guischard

Colette Badeau

Henri Folliot

Gérard Delaflote

Thierry Bontecou

Bernard Wischard

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References

Bauer, M. W., Allum, N., & Miller, S. (2007). What can we learn from 25 years of PUS survey research? Liberating and expanding the agenda. *Public Understanding of Science*, *16*(1), 79-95.

Bennett, W. L., & Iyengar, S. (2008). A new era of minimal effects? *Journal of Communication*, *58*, 707-731.

Boykoff, M. T., & Boykoff, J. M. (2004). Balance as bias: Global warming and the US prestige press. *Global Environmental Change*, *14*(2), 125-136.

Boykoff, M. T., & Boykoff, J. M. (2007). Climate change and journalistic norms: A case-study of US mass-media coverage. *Geoforum*, *38*, 1190-1204.

Brewer, P. R. (2003). The shifting foundations of public opinion about gay rights. *Journal of Politics*, *65*, 1208-1220.

Broder, J.(2009, June 16). Government study warns of climate change effects. *The New York Times*. Retrieved from http://www.nytimes.com/2009/06/16/science/earth/16climate.html

Byrne, S., & Hart, P. S. (2009). The "boomerang" effect: A synthesis of findings and a preliminary theoretical framework. In C. Beck (Ed.), *Communication Yearbook 33* (pp. 3-38). Mahwah, NJ: Lawrence Erlbaum.

Chhibber, A., & Schild, A. (2009, October 30). Melting mountains. *The New York Times*. Retrieved from http://www.nytimes.com/2009/10/31/opinion/31iht-edchhibber.html

Converse, P. E. (1964). The nature of belief systems in mass publics. In D. E. Apter (Ed.), *Ideology and discontent* (pp. 206-261). New York, NY: Free Press.

Cuddy, A. J., Rock, M. S., & Norton, M. I. (2007). Aid in the aftermath of hurricane Katrina: Inferences of secondary emotions and intergroup helping. *Group Processes & Intergroup Relations*, *10*, 107-118.

Dahlstrom, M. F. (2010). The role of causality in information acceptance in narratives: An example from science communication. *Communication Research*, *37*, 857-875.

Downs, A. (1957). An economic theory of political action in a democracy. *The Journal of Political Economy*, *65*(2), 135-150.

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Dunlap, R. E., & McCright, A. M. (2008). A widening gap: Republican and Democratic views on climate change. *Environment*, *50*(5), 26-35.

Druckman, J. N., & Bolsen, T. (forthcoming). Framing, motivated reasoning, and opinions about emergent technologies. *Journal of Communication*.

Fiorina, M. P., & Abrams, S. J. (2008). Political polarization in the American public. *Annual Review of Political Science*, *11*, 563-588.

Frumkin, H., Hess, J., Luber, G., Malilay, J., & McGeehin, M. (2008). Climate change: The public health response. *American Journal of Public Health*, *98*, 435-445.

Goidel, R. K., Shields, T., & Peffley, M. (1997). Priming theory and RAS models: Toward an integrated perspective of media influence. *American Politics Quarterly*, *25*, 287-318.

Gollust, S. E., Lantz, P. M., & Ubel, P. (2009). The polarizing effect of news media messages about the social determinants of health. *American Journal of Public Health*, *99*, 2160-2167.

Hamilton, L. C. (2011). Education, politics, and opinions about climate change: Evidence for interaction effects. *Climatic Change*, *104*, 231-242.

Hamilton, L. C., & Keim, B. D. (2009). Regional variation in perceptions about climate change. *International Journal of Climatology*, *29*, 2348-2352.

Hamilton, L. C., Colocousis, C. R., & Duncan, C. M. (2010). Place effects on environmental views. *Rural Sociology*, *75*, 326-347. doi:10.1111/j.1549-0831.2010.00013.x

Hayes, A. F. (2005). *Statistical methods for communication science*. Mahwah, NJ: Lawrence Erlbaum.

Hutchings, V. L., & Valentino, N. A. (2004). The centrality of race in American politics. *Annual Review of Political Science*, *7*, 383-408.

Hwang, Y., & Southwell, B. G. (2009). Science TV news exposure predicts science beliefs: Real world effects among a national sample. *Communication Research*, *36*, 724-742.

Kiely, R., Bechhofer, F., Stewart, R., & McCrone, D. (2001). The markers and rules of Scottish national identity. *Sociological Review*, *49*(1), 33-55.

Kinder, D. R., & Sanders, L. M. (1996). *Divided by color: Racial politics and democratic ideals*. Chicago, IL: University of Chicago Press.

Kinder, D. R., & Winter, N. (2001). Exploring the racial divide: Blacks, Whites, and opinion on national policy. *American Journal of Political Science*, *45*, 439-453.

Kogut, T., & Ritov, I. (2005a). The "identified victim" effect: An identified group, or just a single individual? *Journal of Behavioral Decision Making*, *18*, 157-167.

Kogut, T., & Ritov, I. (2005b). The singularity of identified victims in separate and joint evaluations. *Organizational Behavior and Human Decision Processes*, *97*, 106-116.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*, 480-498.

Layman, G. C., Carsey, T. M., & Horowitz, J. M. (2006). Party polarization in American politics: Characteristics, causes, and consequences. *Annual Review of Political Science*, *9*, 83-110.

Maibach, E., Roser-Renouf, C., & Leiserowitz, A. (2008). Communication and marketing as climate change intervention assets: A public health perspective. *American Journal of Preventive Medicine*, *35*, 488-500.

Maibach, E., Nisbet, M. C., Baldwin, P., Akerlof, K., & Diao, G. (2010). Reframing climate change as a public health issue: An exploratory study of public reactions. *BMC Public Health*, *10*, 299.

Moser, S. C., & Dilling, L. (Eds.). (2007). *Creating a climate for change: Communicating climate change and facilitating social change*. New York, NY: Cambridge University Press.

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Mutz, D. (2008). How the mass media divide us. In P. Nivola & D. Brady (Eds.), *Red and blue nation?* Washington, DC: Brookings Institution Press.

Mydans, S. (2009, September 23). Vietnam finds itself vulnerable if sea rises. *The New York Times*. Retrieved from http://www.nytimes.com/2009/09/24/world/asia/24delta.html

Nelson, T. E., & Kinder, D. R. (1996). Issue frames and group-centrism in American public opinion. *Journal of Politics*, *58*, 1055-1078.

Nisbet, M. C. (2005). The competition for worldviews: values, information, and public support for stem cell research. *International Journal of Public Opinion Research*, *17*(1), 90-112.

Nisbet, M. C., & Goidel, R. K. (2007). Understanding citizen perceptions of science controversy: Bridging the ethnographic-survey research divide. *Public Understanding of Science*, *16*, 421-440.

Nisbet, M. C. (2009a). Communicating climate change: Why frames matter to public engagement. *Environment*, *51*, 514-518.

Nisbet, M. C. (2009b). Framing science: A new paradigm in public engagement. In L. Kahlor & P. Stout (Eds.), *Communicating science: New agendas in communication* (pp. 40-67). New York, NY: Routledge.

Nisbet, M. C., & Scheufele, D. A. (2009). What's next for science communication? Promising directions and lingering distractions. *American Journal of Botany*, *96*, 1767-1778.

Nisbet, M. C., Scheufele, D. A., Shanahan, J., Moy, P., Brossard, D., & Lewenstein, B. V. (2002). Knowledge, reservations, or promise? A media effects model for public perceptions of science and technology. *Communication Research*, *29*, 584-608.

Nyhan, B., & Reifler, J. (2010). When corrections fail: The persistence of political misperceptions. *Political Behavior*, *32*, 303-330.

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality and Quantity*, *41*, 673-690.

Parry, M. L., Canziani, O. F., Palutikof, J. P. & Co-authors. (2007). *Technical summary. Climate change 2007: Impacts, adaptation and vulnerability*. In M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden and C. E. Hanson, (Eds.),*Contribution of working group II to the fourth assessment report of the Intergovernmental Panel on Climate Change* (pp.23-78). Cambridge, UK: Cambridge University Press.

Popkin, S. L. (1991). *The reasoning voter: Communication and persuasion in presidential campaigns*. Chicago, IL: University of Chicago Press.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research*, *42*, 185-227.

Redlawsk, D. P. (2002). Cognition or cool consideration? Testing the effects of motivated reasoning on political decision making. *Journal of Politics*, *64*, 1021-1044.

Reich, J. W., & Robertson, J. L. (1979). Reactance and norm appeals in antilittering messages. *Journal of Applied Social Psychology*, *9*, 91-101.

Schuldt, J. P., Konrath, S. H., & Schwarz, N. (2011). "Global warming" or "climate change"? Whether the planet is warming depends on question wording. *Public Opinion Quarterly*, *75*(1), 115-124.

Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Grisevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, *18*, 429-434.

Slovic, P. (2007). "If I look at the mass I will never act": Psychic numbing and genocide. *Judgment and Decision Making*, *2*, 1-17.

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Small, D. A., Loewenstein, G., & Slovic, P. (2007). Sympathy and callousness: The impact of deliberative thought on donations to identifiable and statistical victims. *Organizational Behavior and Human Decision Processes*, *102*, 143-153.

Sniderman, P. M., Brody, R. A., & Tetlock, P. E. (1991). *Reasoning and choice*. New York, NY: Cambridge University Press.

Sullivan, J. L., Piereson, J. E., & Marcus, G. E. (1982). *Political tolerance and American democracy*. Chicago, IL: University of Chicago Press.

Taber, C. S., & Lodge, M. (2006). Motivated skepticism in the evaluation of political beliefs. *American Journal of Political Science*, *50*, 755-769.

Weingart, P., Engels, A., & Pansegrau, P. (2000). Risks of communication: Discourses on climate change in science, politics, and the mass media. *Public Understanding of Science*, *9*, 261-283.

Wolburg, J. M. (2006). College student's responses to antismoking messages: Denial, defiance, and other boomerang effects. *Journal of Consumer Affairs*, *40*, 294-323.

Yaros, R. A. (2006). Is it the medium or the message? Structuring complex news to enhance engagement and situational understanding by nonexperts. *Communication Research*, *33*, 285-309.

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