Opening the Political Mind?
The effects of self-affirmation and graphical information on factual misperceptions

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Abstract

People often resist information that contradicts their preexisting beliefs. This disconfirmation bias is a particular problem in the context of political misperceptions, which are widespread and frequently difficult to correct. In this paper, we examine two possible explanations of the prevalence of misinformation. First, people tend to resist unwelcome information because it is threatening to their worldview or self-concept. Drawing from social psychology research, we therefore test whether affirming individuals' self-worth and thereby buttressing them against this threat can make them more willing to acknowledge uncomfortable facts. Second, corrective information is often presented in an ineffective manner. We thus also examine whether graphical corrections may be more effective than text at reducing counter-arguing by individuals inclined to resist counter-attitudinal information. Results from three experiments show that self-affirmation substantially reduces reported misperceptions among those most likely to hold them, suggesting that people cling to false beliefs in part because giving them up would threaten their sense of self. Graphical corrections are also found to successfully reduce incorrect beliefs among potentially resistant subjects and to perform better than an equivalent textual correction. However, contrary to previous research, affirmed subjects rarely differ from unaffirmed subjects in their willingness to accept new counter-attitudinal information.

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Under what circumstances will citizens hold accurate factual beliefs about politics? Numerous studies have found that people tend to interpret information about politics in a manner that is consistent with their predispositions, especially when it is mixed or ambiguous (e.g., Lord, Ross, and Lepper 1979; Edwards and Smith 1996; Taber and Lodge 2006). In particular, they tend to accept information that is consistent with their views and to resist evidence that contradicts their preexisting beliefs. As a result, misperceptions about politics are widespread (e.g., Ramsay et al. 2010) and difficult to correct (e.g., Kuklinski et al. 2000 [study 1]; Nyhan and Reifler 2010). Providing accurate information has been found in some cases to change people's policy preferences (Kuklinski et al. 2000 [study 2], Bullock 2007, Gilens 2001, Howell and West 2009), which suggests that their opinions were distorted by these false or unsupported beliefs.

In this paper, we seek to improve our understanding of misperceptions by testing two possible explanations of their prevalence. The first, which draws on psychological research into the underlying processes that promote disconfirmation bias, is that resistance to corrections is fueled by the threat such information poses to one's self-concept or worldview. If so, then experimentally buttressing people's self-worth should make them more willing to admit politically uncomfortable facts. The second potential explanation for the prevalence of misperceptions is that corrective information is often presented in an ineffective manner. In particular, we test whether it is possible to preempt counter-arguing against unwelcome factual information using graphics instead of text.

Our first experimental approach builds on research into the effects of cognitive dissonance. While early studies focused on individuals' assumed need to reduce the dissonance induced by disconfirming information such as corrections (Festinger 1957),

subsequent research has sought to specify the conditions under which individuals will perceive and respond to dissonance (see Olson and Stone 2005 for a review). We draw on the work of Steele (1988), who argues that individuals are motivated to view themselves as "adaptively and morally adequate" (262). When people encounter dissonant information, it is threatening to their self-concept, which they seek to maintain by either dissonance reduction or other strategies for affirming their self-worth. The implication of Steele's theory is that affirming people's self-worth can buffer the threat to their self-integrity posed by counter-attitudinal information and thereby make them more open-minded. This prediction has been supported in subsequent studies of political persuasion and negotiation behavior (Cohen et al. 2000, Correll et al. 2004, Cohen et al. 2007). However, previous studies have not tested the implication that people may also resist acknowledging unwelcome political facts due to the threat those facts pose to their worldview. If so, self-affirmation should reduce the incidence of misperceptions even among those who we do not expose to corrective misinformation.

Our second experimental approach is to deliver corrective information as graphics rather than text, which may be a more effective means of overcoming people's bias against unwelcome information. One mechanism by which people attempt to defend their existing beliefs is by constructing counter-arguments intended to refute the information they have received (see, e.g., Lodge and Taber 2006). In particular, people who hold misperceptions may seize on ambiguities in corrective messages to construct alternative interpretations that allow them to maintain their existing beliefs. For instance, journalistic efforts to maintain objectivity often result in a "he said," "she said" style of reporting that may enable counter-arguing (Cunningham 2003; Fritz, Keefer, and Nyhan 2004). We

therefore test a new approach in which corrective information is presented graphically, which may reduce the scope for counter-argument and thereby reduce misperceptions more effectively than the verbal or textual corrections used in previous research (e.g., Kuklinski et al. 2000, Nyhan and Reifler 2010), particularly when conveying information about trends or changes in quantities over time (e.g., Meyer, Shamo, and Gopher 1999).[1]

We test both approaches in three experiments concerning issues where some citizens may be unwilling to acknowledge factual information that contradicts their preexisting beliefs – whether insurgent attacks in Iraq decreased after the US troop surge (Study 1), whether the number of jobs in the US increased from January 2010 to January 2011 (Study 2), and whether average global temperatures have increased over the past thirty years (Study 3). In each study, we independently randomize participants to a self-affirmation treatment or a control condition and also manipulate exposure to a line graph depicting the relevant empirical trend. Study 3 also directly contrasts a line graph of average global temperatures with a paragraph of text describing the same information.

In each of these studies, we find that the self-affirmation treatment reduces reported misperceptions among respondents who did not receive corrective information but were potentially motivated to hold false beliefs based on their prior views and perceived issue importance. This result suggests that individuals were uncomfortable acknowledging the correct response and that increasing their feelings of self-worth made it easier for them to do so. In Study 1, supporters of withdrawal from Iraq were much more likely to acknowledge that insurgent attacks had decreased if they received the affirmation treatment. Similarly, respondents who disapproved of President Obama on

[1]Prior (2010) considers visual measures of political knowledge, but does not provide his respondents with corrective information in visual form.

the economy and viewed it as the most important issue were much more likely to state in Study 2 that jobs have increased in the previous year if they had been affirmed. Finally, strong Republicans were more likely to say that global warming is real and human-caused in Study 3 if they were affirmed. We also find that the graph treatment successfully decreases reported misperceptions in each of the studies and that it is more effective than a comparable textual correction in Study 3. However, unlike previous studies, we find little evidence that affirmation increases the persuasive power of corrective information.

Theoretical approach

Motivated reasoning and self-affirmation

Numerous studies have found that people tend to evaluate information with a directional bias toward their previous beliefs (for reviews of the psychology literature on how motives affect reasoning and cognition, see Kunda 1990 and Molden and Higgins 2005). In particular, they tend to interpret ambiguous or mixed information in line with their preexisting views and to resist or reject counter-attitudinal information. For instance, Lord, Ross, and Lepper (1979) found that individuals who were presented with balanced information about the effectiveness of capital punishment rated the counter-attitudinal information to be less convincing and of lower quality than pro-attitudinal information. Edwards and Smith (1996), Munro and Ditto (1997), and Taber and Lodge (2006) also found evidence of disconfirmation bias in subsequent studies. This bias extends to factual

beliefs – corrective information often fails to reduce misperceptions[2] among resistant groups and sometimes actually *strengthens* them (Nyhan and Reifler 2010).

While the tendency toward goal-directed information processing has been well-documented, the reason that it occurs is less well understood. One famous explanation is that people wish to reduce cognitive dissonance induced by perceived contradictions between received information and one's prior beliefs (Festinger 1957). However, psychologists have struggled to specify the conditions under which individuals are motivated to try to reduce dissonance (Olson and Steele 2005).

Steele (1988) offers a theoretical framework that can help us understand why individuals often resist acknowledging particularly uncomfortable facts. According to his account, individuals are motivated to protect their general self-integrity from threat, including unwelcome information that calls into question their beliefs and attitudes. As such, they tend to reject such information or interpret it in a favorable manner. The implication is that dissonance reduction processes are driven by the negative implications of cognitive dissonance for one's self-worth rather than by a specific desire to resolve the inconsistency itself (people hold many inconsistent beliefs). Individuals who encounter dissonant information that is threatening are thus motivated to restore their feelings of self-worth; resolving the dissonance directly is just one of many ways that this goal can be accomplished (see also Tesser 2000). Steele supports this claim with a series of experiments showing that individuals who completed an exercise in which they affirmed

[2] Following Nyhan and Reifler (2010), we define misperceptions as beliefs that are unsupported by clear evidence and expert opinion – a definition that includes both false *and* unsubstantiated beliefs about the world. In this paper, however, we focus primarily on empirical dependent variables that can be directly measured (insurgent attacks in Iraq, payroll jobs in the US, and average global temperatures) so the misperceptions in question are clearly false.

personally important values and thereby felt secure in their self-worth did not engage in dissonance reduction, suggesting that their need to do so had been eliminated. This experimental procedure may not be realistic – we rarely write essays about our own virtues – but it is an elegant way to test the predictions of his theory.

This theoretical framework can help us understand why unwelcome political information is often resisted – it can call into question people's deeply held beliefs and values. By contrast, affirmation mitigates the threat such information poses to their self-concept, allowing them to respond less defensively. For instance, Cohen et al. (2000) show that self-affirmation appears to reduce motivated reasoning about controversial political issues. In experiments modeled on those of Lord, Ross, and Lepper (1979), they exposed death penalty supporters and opponents to a (fabricated) scientific report providing evidence for the opposite perspective. Those subjects who were assigned to a self-affirmation treatment reacted more favorably to the report (Study 1) and were more likely to change their attitudes in the direction of the evidence presented to them (Study 2). A third experiment found similar results in evaluations of a debate about abortion – the self-affirmation treatment reduced denigration of the opposing advocate, bias in favor of the supporting advocate, and attitude polarization. However, previous research has not considered whether people resist corrective information about political misperceptions because it is threatening to their self-worth.

Subsequent studies examining the self-affirmation process more closely have shown that it can be contingent on personal or situational relevance (for a review of the literature, see Sherman and Cohen 2006). In particular, if an issue is not important to an individual, disconfirming information about that issue may pose little threat to their

perceptions of self-integrity. By contrast, challenging information about an issue that is especially important or relevant could be more likely to be perceived as threatening and to provoke defensive processing. Along these lines, Correll et al. (2004) find a debiasing effect of self-affirmation on information processing about a proposed university tuition increase, but only among individuals who viewed the issue as important.[3] We find evidence of such an effect in Study 2 below.

Graphs and counter-arguing

As noted above, a key mechanism for resisting unwelcome information is constructing counter-arguments. While self-affirmation may reduce an individual's need to defend her beliefs in this way, it may also be possible to present counter-attitudinal information in a manner that is more difficult to challenge with counter-arguments.

In particular, when available evidence is mixed or ambiguous (e.g., Lord, Ross, and Lepper 1979), it may be especially easy for individuals to draw on pro-attitudinal information to derogate counter-attitudinal facts. This problem seems especially relevant to the way individuals process mainstream news reports, which are frequently presented in a balanced style that gives roughly equal weight to both sides of a political debate (Cunningham 2003; Fritz, Keefer, and Nyhan 2004). As a result, news reports that fact-check misleading claims may fail to reduce misperceptions or even make them worse (Nyhan and Reifler 2010). One reason these corrections may fail is that individuals can draw on pro-attitudinal claims elsewhere in the story to buttress their preexisting views.

[3] A related study by Cohen et al. (2007) shows that self-affirmation reduces bias and increases concessions in negotiations only in experimental conditions in which individuals' convictions were made salient.

A more effective approach to reducing misperceptions may be to minimize the availability of pro-attitudinal information in corrections, which could increase the difficulty of counter-argument. When the information in question can be measured directly, one especially effective way of presenting this information may be in graphical form. Though findings differ on the relative merits of graphs and tables for information processing, studies have found that graphics can be especially useful in helping people to identify trends or changes in quantities (e.g., Meyer, Shamo, and Gopher 1999), which are frequently the subject of political misperceptions (e.g., the change in an economic indicator under a given president). Presenting factual information graphically may also be an effective means of increasing the impact of a correction while minimizing the availability of pro-attitudinal information. In this way, graphical corrections may reduce the likelihood of counter-argument relative to the verbal or textual information tested in previous studies (e.g., Kuklinski et al. 2000, Nyhan and Reifler 2010).

Expectations

Both of these approaches seek to change respondents' psychological calculus. First, acknowledging a fact that contradicts one's opinion or partisan affiliation on a salient issue can threaten an individual's worldview and thereby motivate them to hold and defend a false or unsupported belief. For instance, the idea of insurgent attacks declining after the troop surge in Iraq may have been threatening to war opponents regardless of how much news they had been exposed to about its success. Buttressing people's self-worth may lower the psychic cost of accepting inconvenient facts they are otherwise unwilling to acknowledge. In this way, self-affirmation may reduce misperceptions even

(or especially) among participants not assigned to receive corrective information in our experiments. If we can validate this prediction using the self-affirmation construct, it could substantially improve our understanding of misperceptions.

Similarly, we expect that presenting corrections in graphical form will increase the difficulty of resisting that information and maintaining an incorrect belief. This approach has the potential to reduce misperceptions and avoid the "backfire effect" found in other research (Nyhan and Reifler 2010).

The psychology literature on self-affirmation argues that it should reduce biased processing of information, which suggests that the affirmation manipulation would change how respondents react to corrections. We therefore test for such an interaction between the affirmation treatment and the corrective information treatments in the studies below. However, the graphical corrective information presented in the studies below may be sufficiently unambiguous that affirmation does not change respondents' receptivity.

Study 1: The troop surge in Iraq

After the 2006 elections, the Bush administration adopted a new war strategy known as "the surge" that included a substantial increase in the number of US troops in Iraq and changes in counterinsurgency strategy (see, e.g, Ricks 2009). Civilian fatalities and insurgent attacks against coalition forces declined dramatically following the adoption of the new strategy (O'Hanlon and Campbell 2009). As a result of this success, the strategy was widely perceived by elites as a success, though some questioned whether the surge was responsible for the decline in violence (see, e.g., Woodward 2008).

It is not entirely clear how much the public knew about conditions in Iraq after the surge began. Perceptions of the success of the surge and war effort more generally did improve somewhat by fall 2008 (the period in which the study was conducted), but they remained relatively low given the magnitude of the decline in violence. For instance, ABC News/*Washington Post* polls found that the number of Americans who thought the US was "making significant progress toward restoring civil order in Iraq" increased from 32% in May/June 2007 to 52% in September 2008. However, these totals mask wide variance along partisan lines. A February 2008 Gallup poll found that 70% of Republicans thought the surge was making the situation in Iraq better, but only 21% of Democrats and 37% of independents agreed (Jones 2008). Meanwhile, 31% of Democrats (along with 21% of independents and 6% of Republicans) said the surge was making the situation *worse*.[4] These differences could be the result of respondents applying differing standards to available evidence, but given the pervasiveness of motivated reasoning, it seems likely that many partisans were selectively interpreting the evidence based on their party affiliation or opinions about the war.

Hypotheses and design

Was the success of the US troop surge at reducing insurgent attacks threatening to supporters of withdrawal from Iraq? To find out, we expose respondents to a self-affirmation treatment that bolsters their perceptions of self-worth and thereby reduces the potentially threatening nature of uncomfortable facts. We also test the effect of providing

[4] Observational studies of college students conducted in 2003 and 2004 by Gaines et al. (2007) found that participants had relatively accurate perceptions of US casualties in Iraq and whether weapons of mass destruction had been found there, but differed widely in their interpretations of these facts.

unambiguous information about the change in insurgent attacks since the beginning of the surge. We expect that this treatment will increase the accuracy of the public's factual beliefs about the surge.

Study 1 is a 2x2 between-subjects survey experiment. One manipulation randomly assigned respondents to either an affirmation condition in which they were asked to recall an experience in which they felt good about themselves (*Affirmation*) or a control no-affirmation condition. The other manipulation randomly assigned respondents to view a graph showing the substantial decline in the number of insurgent attacks in Iraq since the troop surge began (*Graph*) or to a control no-graph condition.

It is important to note that our experimental design differs from the literature that examines whether self-affirmation can successfully short-circuit motivated reasoning. As noted above, these studies typically expose all subjects to a given piece of information and compare groups that did receive an affirmation with those that that did not. In this study, however, our design independently varies both information exposure (*Graph*) and affirmation (*Affirmation*), which allows us to separate the independent effect of affirmation from its interaction with the graph treatment.

Experimental treatments

Our first manipulation, which was adapted from Cohen et al. (2000), was designed to encourage individuals to affirm their self-worth. Respondents in the treatment group were asked to select the value that is most important to them from a list. After making a selection, respondents were asked to write a few sentences about a time in which that

value was "especially important to you and made you feel good about yourself."[5] In the control condition, we asked respondents to report everything they had to eat or drink in the previous 48 hours. (The exact wording is provided in the online appendix.) Cohen et al. (2000; study 1) find that this procedure made participants view counter-attitudinal information about the death penalty more favorably than those who were not affirmed.

Our second experimental treatment is a graph showing the number of weekly insurgent attacks in Iraq against US and coalition forces between January 2004 and August 2008. The graph clearly illustrates the dramatic decrease in the number of attacks against US and coalition forces after the surge began. (See online appendix for graph and instructions.) Respondents assigned to the control condition were given a summary description of the surge but no information about its effects.

Dependent variable

We focus on the following measure of factual belief about changes in the number of insurgent attacks in Iraq since the surge began:

> From what you know about the US involvement in Iraq, what has happened to the number of insurgent attacks in Iraq since the recent increase in troop levels ("the surge") began?

Respondents were provided with a five-point Likert scale for their answers ranging from "decreased substantially" (1) to "increased substantially" (5). As such, lower values

[5] Asking participants to write essays about important values is a common design in self-affirmation studies (the design was used in 19 of 69 articles surveyed by McQueen and Klein 2006).

indicate more accurate beliefs (a perceived decrease in insurgent attacks), while higher numbers indicate less accurate beliefs (a perceived increase in insurgent attacks).

Sample

Study 1 was part of the Duke/UNC module on the 2008 Cooperative Congressional Election Survey, a multi-investigator project bringing together the resources of multiple universities to create a large national election survey. YouGov/Polimetrix administered the pre-election module in which our experiment was included in October 2008. The dataset consists of an Internet sample of 1,000 people. It was constructed from a large pool of more than 50,000 opt-in respondents using a technique called sample matching, which selects and weights respondents according to a set of political and demographic variables so that the final data approximates a random probability sample (Rivers N.d.). Given questions about the validity of opt-in Internet samples (e.g., AAPOR 2010, Pasek and Krosnick 2010, Yeager et al. N.d.), we do not claim that our results are nationally representative[6], but the sample has been constructed to closely resemble those obtained using traditional survey methods.[7] For instance, our data show a partisan distribution of 37% Democratic, 27% independent (including leaners and those who identify as members of other parties), 27% Republican, and 8% not sure, which almost perfectly matches the Pollster.com estimate for telephone polls conducted in October 2008.[8]

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[6] CCES respondents may still be somewhat more sophisticated or likely to participate in politics than respondents contacted via a random probability sample, but such discrepancies should not threaten the internal validity of our results since we randomize exposure to the treatments of interest.

[7] Respondents are 48% male and 52% female. 72% are white, 12% are black, and 8% are Hispanic. Finally, 43% have a high school degree or less, 32% have some college or a two-year degree, and 25% have a four-year college degree or more.

[8] To obtain the relevant estimates (37% Democrat, 29% independent, and 27% Republican), go to http://www.huffingtonpost.com/2009/04/30/party-id_n_725948.html, exclude Internet and automated

Results

Rather than estimate a complicated set of interactions that are difficult to interpret, we estimate separate ordered probit models for respondents who said they oppose withdrawing from Iraq in a pre-treatment question (column 1), those who said they were not sure (column 2), and those who support withdrawal (column 3), which simplifies the presentation of our results**.** To increase the precision of our estimates, we include indicators for black respondents, women, college graduates, Republicans (including leaners), independents, and those who view the war as an "extremely important" issue. Each model is estimated using survey weights and includes linearized standard errors.

[Table 2]

We observe an encouraging result – *Graph* creates more accurate perceptions of the number of insurgent attacks. In particular, it significantly reduces misperceptions among withdrawal supporters who we expect to be most likely to reject news of positive developments on the ground ($p < .01$). The same is true for those who are not sure about withdrawal ($p < .05$). The effect of *Graph* for withdrawal opponents is also negative but just misses statistical significance ($p < .15$). This finding is likely to be the result of a floor effect – 79% of withdrawal opponents said insurgent attacks had decreased substantially in the no-graph, no-affirmation baseline, leaving relatively little scope for further decreases in misperceptions among those who receive *Graph*.

phone polls (under Tools: Filter), and set the date range to October 1, 2008 to October 31, 2008 (under Tools: Date Range). These estimates are derived from a loess regression on partisan ID estimates obtained in polls conducted in the date range selected.

In addition to the encouraging result for *Graph*, our results for the self-affirmation treatment are intriguing. The self-affirmation treatment increases the proportion of respondents providing the correct answer (decreased insurgent attacks) among those who support withdrawing from Iraq ($p < .05$).[9] No other subgroup is significantly affected. In other words, self-affirmation reduces misperceptions for the subgroup that would otherwise experience the greatest discomfort from answering the question correctly.[10] However, there is an offsetting *positive* interaction between *Affirmation* and *Graph* ($p < .05$). As a result, the marginal effect of *Affirmation* is not significant among withdrawal supporters who receive *Graph* (this finding is discussed further below).

These results are best understood using predicted probabilities. For clarity, we focus on the case in which respondents falsely believe that insurgent attacks *increased* after the surge rather than decreased.[11] Figure 1 presents a bar graph of the predicted probabilities of holding this belief based on respondents' pre-treatment position toward withdrawal from Iraq and the experimental condition to which they were assigned.[12]

[Figure 1]

[9] Previous research by Correll et al. (2004) suggests that self-affirmation may have the largest effects among those for whom an issue is extremely important. In this case, however, we found that high issue importance does not moderate the effect of *Affirmation* (results available upon request), which may be the result of our focus on the Iraq war, which was highly salient and relevant politically.

[10] One concern in self-affirmation studies is that the results could be the spurious result of an improvement in mood relative to control conditions. Only a few studies have found support for this claim (McQueen and Klein 2006: 299), but we check for it in this and subsequent studies and find no evidence that *Affirmation* improved mood. We thus do not discuss the issue further (results available upon request).

[11] Our findings are virtually identical if we expand our definition of the misperception to include respondents who falsely believed the number of attacks stayed the same (available upon request).

[12] These values average over the distribution of the other covariates.

As predicted, only a small proportion of withdrawal opponents say that insurgent attacks stayed the same or increased, and there are not dramatic differences within this subgroup across the experimental conditions. By contrast, the effect of *Graph* is dramatic among those who not sure about whether to withdraw from Iraq. The results are most striking, however, for those who support withdrawal. In this group, we see a large effect of *Affirmation* among those who did not receive *Graph*–the percentage saying attacks increased during the surge drops from 38% to 24%. This decline nearly matches the reduction in misperceptions achieved among withdrawal supporters who received the *Graph* treatment and were not affirmed (18% of this group believed attacks increased). However, *Affirmation* has no additional effect on misperceptions among withdrawal supporters who received *Graph* (22% of this group said attacks increased).

Discussion

Despite previous findings that participants tend to resist counter-attitudinal corrective information, we were able to improve the accuracy of judgments about the number of insurgent attacks in Iraq even among those *least* likely to accept such information (supporters of withdrawal). We improved the accuracy of their perceptions via two different mechanisms – a graph of insurgent attacks against US forces in Iraq and an essay task intended to help respondents affirm their self-worth. *Graph* significantly reduced misperceptions for respondents regardless of their position toward withdrawal from Iraq, while the effects of *Affirmation* were concentrated among the withdrawal supporters who were likely to be most threatened by the surge's success.

These results help us understand what happens when people are confronted with information that undermines their political beliefs. We believe that our treatments operate on different sides of the psychic ledger. *Affirmation* reduces the psychic cost of reporting beliefs that clash with one's worldview, while *Graph* increases the costs of maintaining an incorrect belief in the face of clear evidence to the contrary. We found that *Affirmation* has no additional marginal effect among respondents who receive *Graph* – a result we attribute to the clarity of the visual presentation of the data. When the factual correction is obvious and salient in this way, it is difficult for respondents to counter-argue, which reduces misperceptions even among unaffirmed participants and thereby limits the possible effects of *Affirmation* (see Figure 1).

Nevertheless, Study 1 has several limitations. First, it focuses on an issue where the group motivated to hold a misperception was dominated by Democrats (70% including leaners). However, Nyhan and Reifler (2010) found the most intense reaction to corrective information among conservatives, who reported *increased* misperceptions in two experiments. It would therefore be desirable to establish that the positive effects of *Affirmation* and *Graph* hold for a group with more conservatives and Republicans. Second, though our study was designed at a time when the success of the Iraq surge was still a matter of partisan debate, an elite consensus emerged by the time the survey was fielded that the counterinsurgency strategy was a success. As a result, leading Democrats had largely stopped debating the wisdom of the surge by October 2008, which may have reduced counter-arguing among war opponents. Finally, at the time the survey was conducted, the economic crisis had supplanted Iraq and foreign affairs as the dominant campaign issue, which again may have reduced the incentive for motivated reasoning.

It is also important to note that the results we present here are conservative estimates of the effects of our experimental treatments due to non-compliance. Subjects may have failed to closely examine *Graph*, reducing its effects. Similarly, in the *Affirmation* condition, some subjects did not write the essay as directed (21% did not write anything, 43% wrote less than 80 characters), though they may have thought about the prompt. Thus, our treatment effect estimates should be understood as estimates of intent to treat effects rather than average treatment effects on the treated.[13]

Study 2: Job change under President Obama

To address the concerns described above, we designed a second experiment that focused on beliefs about the state of the economy during a period of intense partisan debate over the merits of President Obama's economic policies. In addition, the change in party control of the presidency in 2009 allows us to reverse the partisan dynamic from Study 1.

We selected this issue because the economy has been the most salient issue in national politics since fall 2008. Barack Obama's victory can be attributed in large part to the economy (Scotto et al. 2009), which is the dominant factor in presidential elections (e.g., Hibbs 2008). The state of the economy also appeared to play a key role in the GOP's near-landslide victory in the 2010 elections – a conclusion buttressed by previous studies showing the economy plays a key role in midterm elections (e.g., Jacobson 2008, Hibbs N.d.). During the period in which Study 2 was conducted (February 2011), the economy continued to dominate polls as the most important problem facing the country.

[13]This logic also applies to Studies 2 and 3. All models we report are conservative estimates of intent to treat effects, not estimates of the average treatment effect on the treated (ATT). Instrumental variables estimates of the ATT for *Affirmation* in each study are larger in magnitude (available upon request)

We specifically focused on beliefs about job growth (or losses) since these measures, which are reported each month, are an easily understood indicator of the direction of the economy.[14] We expected to see widespread divergence in beliefs about changes in the number of jobs under Obama since the state of the economy is a factual issue that lends itself to biased processing. For instance, Bartels (2002) finds significant partisan biases in perceptions of economic performance under Reagan and Clinton. In addition, Stanig (N.d) shows that recoveries are especially likely to generate partisan and ideological polarization in factual beliefs about the economy. (By contrast, downturns appear to reduce polarization due to humans' greater sensitivity to negative stimuli.)

In this case, we expect factual beliefs to diverge based on respondents' prior attitudes about Obama's economic policies. Those who approve of the job he is doing on economic matters should be more likely to say that jobs are increasing, whereas those who do not approve of Obama should be less likely to agree. This expectation of divergence in factual perceptions of the economy is supported by a November 2010 WorldPublicOpinion.org poll which found 72% of Republicans believed that the economy is getting worse compared with only 36% of Democrats (Ramsay et al. 2010).

Hypotheses and design

Our approach closely mirrors that of Study 1. We again use a 2x2 design. Participants were independently randomly assigned to either an information condition (a graph

[14] An alternate approach would be to test perceptions of unemployment, but most people do not understand that the unemployment rate excludes people who have left the labor market. In addition, unemployment is a lagging indicator of the state of the economy. Given the difficulty of explaining these concepts in the time we had available with experimental participants, we chose instead to study perceptions of job growth, which is a clearer indicator of the direction and strength of the economy.

showing job growth – *Graph*) or a control condition in one manipulation and assigned to either a self-affirmation condition (*Affirmation*) or a non-affirmation control in the other.

Experimental treatments

The self-affirmation treatment and the corresponding control condition (listing food consumed over the past 48 hours) in this study are virtually identical to Study 1. The only difference of note is that respondents were provided with several more choices of possibly important values in the self-affirmation exercise. By contrast, the graph treatment necessarily differs from Study 1. In this case, we showed participants a line graph showing the number of nonfarm payroll jobs reported each month by the Bureau of Labor Statistics for the January 2010-January 2011 period. During that time, payroll jobs increased from 129.3 million to 130.3 million. (The online appendix presents the stimuli from Study 2.)

Dependent variable

To measure respondents' perceptions of recent job change, we used a dependent variable directly adapted from previous American National Election Study (ANES) questions about perceptions of recent economic trends (including those analyzed in Bartels [2002]):

> Would you say that, compared to January 2010, the number of people with jobs in the country has gone up, stayed about the same, or gone down?

Respondents who answer that the number of jobs had gone up or down were asked branching followups about whether jobs had gone down (or up) "somewhat" or "a lot." We constructed a five-point Likert scale from these responses ranging from "Gone down a lot" (1) to "Gone up a lot" (5). In this case, lower values indicate inaccurate responses since jobs increased over the time period in question (albeit not quickly).

Sample

This study was conducted on Amazon's Mechanical Turk website, which is being increasingly used by experimental researchers as a method to recruit study participants (for an introduction to the use of the website in research, see Mason and Suri N.d.). Recent studies by economists (Horton, Rand, and Zeckhauser N.d.), psychologists (Buhrmester et al. 2011), and political scientists (Berinsky, Huber, and Lenz N.d.) have validated the use of Mechanical Turk by replicating previously published findings using participants recruited on the site. While those recruited are obviously not representative of the US population, all three papers note that study participants from Mechanical Turk are more diverse than typical undergraduate convenience samples (for more on who participates in Mechanical Turk studies and why, see Ross et al. 2010).

For a convenience sample, the 472 study participants recruited on Mechanical Turk were quite diverse. 41% were 18-29, 43% were 30-49, and 16% were 50 and over. 56% were female, 4% were black, and 5% Hispanic. 10% had a high school degree or less, 33% had some college, and 58% had a college degree or greater. 53% identified as Democrats (with leaners), 30% as Republicans (with leaners), and 16% as independents.

Results

We again divide our sample based on their views of the policy in question to simplify interpretation of the results. In this case, we measure attitudes using a pre-treatment question about approval of President Obama's job performance on the economy and split the sample into those who approve, disapprove, and those who neither approve nor disapprove. We also disaggregate by whether respondents selected job creation and economic growth as the most important issue facing the country or not (47% did so). As noted above, Correll et al. (2004) find that the effects of self-affirmation were concentrated among those for whom the issue is most important. In this case, three-way interaction models demonstrate that issue importance moderates the effects of the affirmation treatment among those who disapprove of Obama on the economy (results available upon request). To simplify the presentation of the results, we instead split each subgroup by issue importance

Table 2 presents the results of our ordered probit models of beliefs about job change since January 2010 disaggregated by approval of Obama on the economy and whether the economy was the most important issue.[15]

[Table 2]

As in Study 1, *Graph* has a strong misperception-reducing effect for each subgroup ($p <$ .01 in all cases), while the effects of *Affirmation* are concentrated among respondents whose prior attitude is in conflict with the factual outcome in question. In this case,

[15] In these models and in those reported in Study 3 below, we include heteroskedasticity-robust standard errors, which could not be used in Study 1 due to the need to account for the survey weights from CCES.

Affirmation has a significant positive effect on respondents who disapprove of Obama on the economy and view the economy as the most important issue ($p < .05$). Amazingly, the act of writing an essay about a time in which they upheld an important value substantially reduces these respondents' reported misperceptions about job growth. However, this effect is again offset for respondents in the graph condition as indicated by a marginally significant negative interaction term ($p < .10$); *Affirmation* has no statistically significant effect for respondents who receive the graph.

Interestingly, however, *Affirmation* may have changed how respondents who are neutral toward Obama on the economy and view it as the most important issue reacted to the graph. The self-affirmation treatment has a marginally significant *negative* effect among this group ($p < .10$), but respondents who received *Affirmation* and *Graph* are more likely to report positive job growth than those who receive the graph alone ($p < .05$). Among the subgroups considered in this paper, these are the only respondents who are more likely to accept the information in *Graph* if they are affirmed than not (the result predicted by Cohen et al. 2000).

To illustrate the results above, we calculate predicted probabilities for the four experimental conditions by averaging over the other covariates for subgroups. The predicted probability we report is the proportion who incorrectly state that jobs *decreased* since January 2010. To simplify the presentation of this information, we limit the graph to those who disapprove of Obama on the economy (the group of greatest theoretical and substantive interest). The predicted probabilities are presented in Figure 2.[16]

[16] We again average over the distribution of the remaining covariates.

[Figure 2]

As the figure shows, *Affirmation* substantially reduced misperceptions among disapprovers for whom the economy is the most important problem facing the country. Among respondents who did not receive the graph, the predicted likelihood of saying that the number of jobs declined since January 2010 drops from 66% among those who were not affirmed to 29% among those who were. By contrast, the effect of *Affirmation* among those who received *Graph* was negligible (5% said jobs decreased in each case). By this measure, *Affirmation* closes more than 60% of the gap in misperceptions between the no-affirmation, no-graph baseline and the group of respondents who received *Graph*.

Discussion

These results support what we found in Study 1 – the presentation of graphical corrective information can improve the accuracy of people's factual beliefs. In fact, *Graph* has a significant positive effect in all six subgroup models presented in Table 2. These findings are encouraging given past research showing resistance to counter-attitudinal information. Our results also address a key limitation of the previous study – at the time of the experiment, the economy was the dominant political issue and the subject of considerable elite conflict. Additionally, the improvement in accuracy holds even for those who disapprove of Obama on economic matters (a group dominated by conservatives, who Nyhan and Reifler 2010 found to be most resistant to corrections).

We also find results similar to those of Study 1 regarding the effect of *Affirmation*. As with Study 1, *Affirmation* improves the accuracy of factual perceptions

among those who are most likely to be threatened by the correct answer – respondents who disapprove of Obama's handling of the economy. However, unlike in Study 1, the effect of *Affirmation* is limited to those who say the economy is the most important issue. Issue importance will often moderate the effect of *Affirmation* because those who care most about an issue will be most threatened by information that undermines their preexisting views and thus most likely to respond defensively if they are not affirmed (see Correll et al. 2004: 351). For respondents who disapprove of Obama's handling of the economy and see it as the most important issue facing the country, receiving *Affirmation* appears to make it easier to hold a factual belief that would otherwise impose a significant psychic cost.

Study 3: Global temperature change

We conducted one additional experiment to address several remaining questions. Part of our argument is that graphs may be a more effective means of correcting misinformation about changes in quantities than textual corrections. While some previous studies have found that verbal or textual corrections can be ineffective (Kuklinski et al. 2000, Nyhan and Reifler 2010), both Study 1 and Study 2 found that graphical information significantly improved the accuracy of respondents' factual beliefs. These results are highly suggestive, but do not allow us to directly compare the effects of alternate modes in presenting the same information. In this study, we test the effects of graphical and textual presentations of global temperature data on beliefs about climate change and global warming – another issue with high levels of partisan polarization (e.g., McCright and Dunlap 2011) and strong evidence of motivated reasoning (e.g., Hart and Nisbet

forthcoming). Both treatments were drawn from the same NASA press release to ensure that the underlying information is the same.[17]

This approach also allows us to address several possible concerns about our previous studies. First, both Study 1 and Study 2 presented information that could be seen as good news (insurgent attacks were down, jobs were up). The affirmation condition may help respondents accept positive information, but will it have the same effects when the corrective information is *worse* than respondents expect? In this case, respondents who do not believe global temperatures have increased in recent years will be provided with data indicating that they have indeed gone up. Second, it is possible that the effectiveness of the graphical corrections in Studies 1 and 2 was the result of respondents' willingness to accept information from the government (decrease in insurgent attacks, increase in jobs), irrespective of how it was presented. In this study, the source of the global temperature information is identical in the two correction conditions, allowing us to hold source fixed when comparing graphical and textual modes of presentation. Finally, the two previous studies used between-subjects designs that compared post-treatment beliefs among participants randomly assigned to different experimental conditions. In this study, we assessed respondents' beliefs about global warming before and after treatment, allowing us to control for their pre-existing views.

Hypotheses and design

Our approach closely mirrors that of Studies 1 and 2, but adds a textual information condition. Specifically, we use a 2x3 design in which participants are independently

[17]The press release is available at http://www.giss.nasa.gov/research/news/20110113/.

randomly assigned to either a self-affirmation condition (*Affirmation*) or a non-affirmation control in one manipulation and assigned to a graphical information condition (a graph showing change in global average temperature – *Graph*), a textual information condition (a paragraph describing change in global average temperature – *Text*), or a control condition (neither graph nor text). We therefore can also directly test the hypothesis that the graph will reduce misperceptions more effectively than an equivalent textual correction.

Experimental treatments

The self-affirmation treatment and the corresponding control condition in this study are identical to the one used in Study 2 (and virtually identical to those in Study 1). Our graph treatment is adapted from a line graph in a NASA press release showing the difference in average global temperature (relative to a baseline period) from 1940 to 2010. The graph includes measurements from four sources: NASA's Goddard Institute for Space Studies, NOAA's National Climactic Data Center, the United Kingdom's Met Office Hadley Centre, and the Japanese Meteorological Agency.[18] We also constructed a textual treatment describing the same data using language drawn from the press release. (The stimuli from Study 3 are presented in the online appendix.)

[18]The baseline period is different for each of the four series. As an example, the baseline period for the NASA Goddard data is 1951 to 1980. For additional information, see the NASA press release.

Dependent variables

To measure respondents' perceptions of change in average global temperature, we used two dependent variables. The first, *Temperature change*, is constructed using a similar approach to Study 2 and the ANES questions analyzed in Bartels (2002):

> Would you say that average global surface temperatures have gone up, stayed about the same, or gone down in the last thirty years?

Respondents who answer that global surface temperatures had "gone up" or "gone down" were asked branching followups about whether the temperature had gone down (or up) "somewhat" or "a lot." We constructed a five-point Likert scale from these responses ranging from "Gone down a lot" (1) to "Gone up a lot" (5). In this case, lower values indicate inaccurate responses since temperatures increased during the last thirty years.

Our second dependent variable, *Global warming*, comes from a question used in CNN/Opinion Research Corporation (ORC) surveys that asks respondents to choose which of three statements is closest to their view on global warming:

- Global warming is a theory that has not yet been proven.
- Global warming is a proven fact caused mostly by natural changes that have nothing to do with emissions from cars and industrial facilities.
- Global warming is a proven fact and is mostly caused by emissions from cars and industrial facilities such as power plants and factories.

We ask this question before and after the experimental treatments. (We include the pre-treatment question as a control in the statistical models that follow.) Both variables are coded 1 if respondents said "Global warming is a theory that has not yet been proven," 2 if they said "Global warming is a proven fact caused mostly by natural changes," and 3 if they said "Global warming is a proven fact and is mostly caused by emissions."[19]

Sample

The study was conducted using Qualtrics.com's respondent panel. Qualtrics.com is a commercial vendor of online survey software that also offers researchers the opportunity to purchase online convenience samples for survey and experimental research. As such, the respondent pool is not nationally representative.

We limited our sample in two ways. First, we limited the sample to respondents who had previously self-identified as Republicans. We made this choice because our focus is on how people accept counter-attitudinal information, and recent surveys show that GOP identifiers increasingly reject global warming. For instance, McCright and Dunlap (2011) report that the percentage of Republicans who believe the effects of global warming are already being felt declined from 46% in 2007 to 29% in 2010. By restricting the sample to self-identified Republicans, we maximize our power to detect a treatment effect. Second, we excluded respondents who failed to pass a pre-treatment attention filter designed to make sure that subjects were carefully reading survey questions rather than clicking through mindlessly (the question is available in the online appendix).

[19] We define beliefs that global warming is either unproven or caused by natural factors as misperceptions since both are contradicted by an overwhelming scientific consensus (e.g., Anderegg et al. 2010). However, since our stimuli only concern temperature change, we define the relevant misperception as believing global warming is "a theory that has not yet been proven" in calculating predicted probabilities below.

As a check on data quality, we asked the standard ANES party identification questions. Five respondents (about 1%) self-identify as Democrats or Democratic leaners, while approximately 2% identify as pure independents. The remaining 97% identify as Republicans – 48% are strong Republicans, 43% are weak Republicans, and 5% are Republican-leaning independents. Not surprisingly, this convenience sample of self-identified Republicans exhibits less racial diversity than the Mechanical Turk convenience sample used in Study 2 (which was not pre-screened on party) – nearly the entire sample (95%) is white. However, we still see diversity in other demographics. For instance, the sample is slightly more female (51%) than male (49%) and the sample is more diverse by age than the Mechanical Turk sample – one-fifth (20%) of respondents were 18-29, 32% were 30-49, and 48% were 50 and over.

Results

As in the previous studies, we split our respondents by their pre-existing views before running ordered probit models. We make one important change, however. Studies 1 and 2 focused on so-called "easy" issues (Carmines and Stimson 1980) where subjects were likely to have well-formed opinions about the issues at stake (the war in Iraq and the performance of the US economy). As such, we split respondents in those studies by their position on withdrawal from Iraq and approval of President Obama's performance on the economy, respectively. In the case of climate change, however, the issue is "hard" and respondents' policy attitudes appear to not be well-formed.[20] We therefore instead use party affiliation as the relevant variable, dividing self-identified strong Republicans from

[20] Specifically, a pre-treatment measure of preferences toward regulation of greenhouse gas emissions did not moderate the effects of the *Graph* or *Text* treatments (results available upon request).

other respondents. Our assumption is that strong Republicans are more likely to be threatened by information showing rising global temperatures, which contradicts statements by an increasing number of GOP elites in recent years questioning whether climate change is real (e.g., Samuelson 2010). The set of control variables is nearly identical to Study 1. We include indicator variables for women, college graduates, and those who think the issue is extremely important plus a control variable for respondents' pre-treatment beliefs about global warming. However, we exclude an indicator for black respondents since there are only two in the sample and neither is a strong Republican.

Table 3 presents results of our ordered probit models of *Temperature change* and *Global warming* divided by whether respondents are strong Republicans.

[Table 3]

As in the previous two studies, *Graph* is effective. It reduces misperceptions about global temperature change for both groups ($p < .01$; columns 1 and 2) and makes strong Republicans more likely to acknowledge that global warming is real and man-made ($p < .01$; column 4), though it has no effect on beliefs about global warming among respondents who do not identify as strong Republicans (column 3). By comparison, *Text* does not significantly change respondents' beliefs about global temperature change and is only significant in shifting attitudes about global warming among strong Republicans (column 4). When we directly compare the marginal effects, we find that *Graph* is

significantly more effective at reducing misperceptions about climate change and global warming than *Text* in three of the four models ($p < .01$; columns 1, 2, and 4).[21]

In addition, *Affirmation* reduces misperceptions among those most likely to be threatened by the fact in question. Looking again at Table 3, we see that *Affirmation* increases the likelihood that strong Republicans will agree that global warming is real and man-made. This effect is consistent with what we saw in Study 1 and Study 2. However, we again find that *Affirmation* does not increase receptivity to corrective information. Instead, as in Study 1, the *Affirmation x graph* interaction is negative and marginally significant for strong Republicans on *Global warming* ($p < .10$), indicating that the misperception-reducing effects of *Affirmation* were eliminated among respondents exposed to the graph (specifically, the marginal effect of *Affirmation* was not statistically significant for respondents exposed to *Graph*).

To illustrate the results from the models of *Temperature change* in columns 1 and 2 of Table 3, we again calculate predicted probabilities for the different experimental conditions (six in this case due to our 2x3 design) averaging over the other covariates by experimental subgroup (in this case, strong Republicans and other respondents). Specifically, Figure 3 reports the predicted probability that respondents will say that global temperatures have *decreased* over the past thirty years (the strictest definition of the misperception in question).

[21] These results do not appear to be driven by systematic differences how respondents processed *Text* or *Graph* – a post-treatment check of recall of a primary data source (NASA) found few significant differences between the treatments. Moreover, we observe no significant difference in the length of time respondents spent considering each treatment. These results suggest that the greater effectiveness of *Graph* is not simply a function of ease or depth of processing (results available upon request).

[Figure 3]

The figure shows that the predicted probability that respondents will say that average global temperatures have decreased is much lower among those who received *Graph* than among those who received either *Text* or a control. This relationship holds both among both strong Republicans (for instance, the unaffirmed decline from 37% among controls to 10% in *Graph*) and other respondents (42% among unaffirmed controls, 11% among unaffirmed recipients of *Graph*). By contrast, *Text* and *Affirmation* are ineffective.

Since our stimuli only concern temperature change (and not the role of humans in causing it), we restrict our attention to the predicted probabilities that respondents will agree that "Global warming is just a theory" in Figure 4.

[Figure 4]

Among those who are not strong Republicans, none of the experimental treatments (*Graph*, *Text*, or *Affirmation*) substantially reduces belief that global warming is just a theory. However, for strong Republicans, agreement declines from 57% among unaffirmed respondents in the control group to 39% among those who received *Graph*. (By contrast, *Text* only reduced predicted belief to 53% among unaffirmed strong GOP identifiers.) Likewise, unaffirmed respondents who received *Graph* and were not strong Republicans were also less likely to state that global warming was just a theory than controls. The predicted probability declined from 53% among unaffirmed respondents in the control group to 45% for those who received *Graph*. Finally, *Affirmation* reduced

misperceptions among strong Republicans, decreasing the predicted probability of stating that global warming is just a theory from 57% to 51% among those who did not receive *Graph* or *Text*. This six percentage point decline is approximately one-third of the estimated decline in belief for strong Republicans who were exposed to *Graph*.

Discussion

The results of Study 3 affirm the findings of Studies 1 and 2. When we directly compare the effectiveness of *Graph* and *Text*, we find that a graphical correction reduces misperceptions more effectively than an equivalent text correction. We also find additional evidence that *Affirmation* can reduce misperceptions among a group that is likely to resist acknowledging the misperception in question (in this case, strong Republicans). However, as in Studies 1 and 2, *Affirmation* does not increase respondents' receptivity to corrective information. One reason to conduct Study 3 was to test whether the *Affirmation* treatment increases receptivity to textual information, but not graphical information. We have proposed that graphs may be effective in reducing misperceptions because they are more difficult to counter-argue. If it is easier to counter-argue against text than a graph, than we might expect the *Affirmation* treatment to increase receptivity to the *Text* treatment. However, we find that the *Affirmation* treatment does not increase receptivity to either *Graph* or *Text*.

Our interpretation of these results is that the primary effect of *Affirmation* in the domain of salient factual misperceptions is to makes it easier to cope with dissonant information that one has already encountered. This explanation sheds light on why *Affirmation* works among the subgroups most likely to cling to false beliefs – it relaxes

their need to reject facts that could otherwise be threatening. In contrast, *Affirmation* does not increase receptivity to new information because our treatments (especially *Graph*) appear to overcome counter-argument among unaffirmed participants.

Conclusion

This paper makes two principal contributions to research on motivated reasoning and political misperceptions. First, we show that affirming self-worth can reduce misperceptions among respondents who are most likely to resist acknowledging uncomfortable facts about an issue. Second, we show that it is possible to provide subjects with graphical information that improves the accuracy of their factual beliefs. These results help us understand why individuals resist discordant claims and the means by which they do so.

These results have differing normative implications. On the one hand, they highlight the exciting possibility that graphical corrections can reduce misperceptions more effectively than text. However, the results underscore the psychological factors that make misperceptions so difficult to reduce. Among motivated subgroups, receiving the affirmation treatment (but not any corrective information) leads to better performance on factual questions across three studies. This result suggests that many of these respondents know the correct answers but were unwilling or unable to acknowledge that fact if they were not affirmed. In other words, self-affirmation may be important not because it makes people more open to *new* information, but because it allows them to accept dissonant information they already possess but would otherwise reject. These effects were largest relative to the effect of the graph treatment in our Iraq experiment

(Study 1) but were also significant in our studies of perceptions about job growth under President Obama (Study 2) and global temperature change (Study 3).

Future research should further explore how our results relate to those reported in the psychology literature on self-affirmation and political persuasion, which typically does not explore the effects of affirmation on respondents who do not receive new information or its effects on factual beliefs. It would also be desirable to further specify the conditions under which issue importance moderates the effect of affirmation in politics. Additionally, scholars should continue to examine how various features of corrections aid or inhibit their effectiveness. Many types of corrections cannot be presented graphically. We urge researchers to continue to examine approaches that could improve the effectiveness of corrective information, particularly among subgroups that are likely to be resistant.

It is also worth considering the real-world implications of our findings. Our results suggest that journalists writing stories about changes or trends in a measurable quantity where misperceptions are likely should consider including graphs in their stories. (The same principle applies for civic groups and educators.) By contrast, the prospects for applying self-affirmation in practice are less clear – the manipulation is an experimental construct designed to test a key prediction from a psychological model. While journalists or politicians might try to flatter their audiences, it seems difficult for a third party to affirm people's self-worth outside of this artificial context.[22] Still, we believe that the results are valuable for what they tell us about the processes that fuel misperceptions and lead people to resist corrective information.

[22] Indeed, it may be more likely that politicians who wish to maintain a misperception may seek to increase the issue's perceived importance in order to inoculate their supporters against corrective information.

In the end, these results underscore the challenges faced by those who hope to reduce misperceptions among the public. The idealized democratic citizen is largely a fiction. Ironically, though, it is the importance of politics to (some) people's self-concept that makes it so hard to acknowledge unwelcome facts. Still, all hope is not lost. Unlike previous research, we find that reducing misperceptions is possible even among groups that are most likely to hold false or unsupported beliefs. Given sufficiently unambiguous graphical information, people are much more likely to acknowledge the facts.

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Figure 1

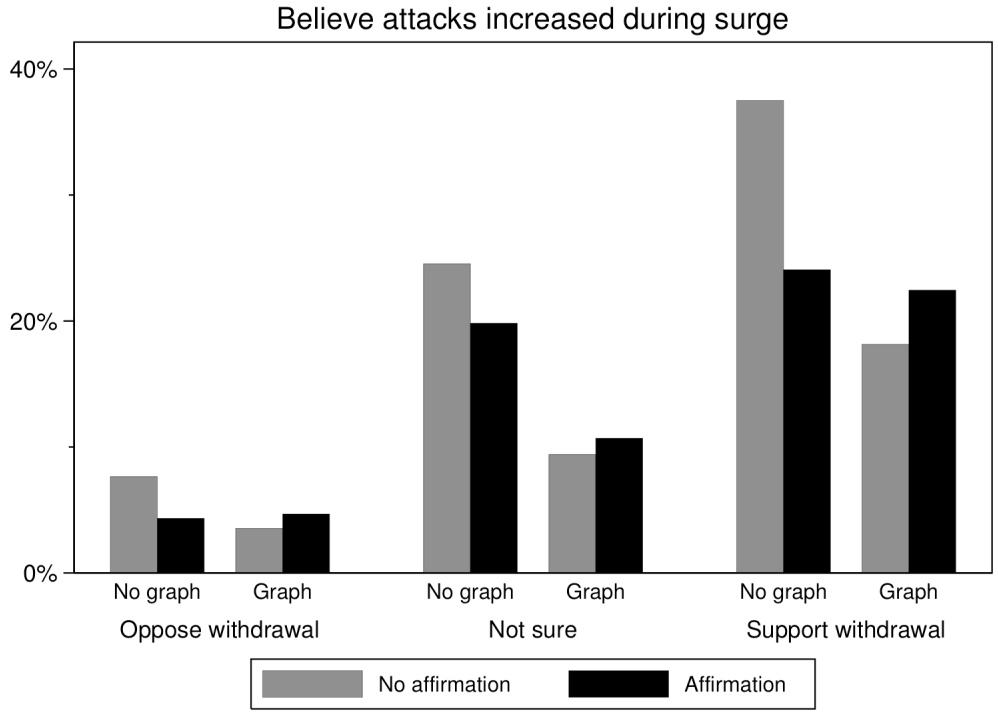

Believe attacks increased during surge
40%
20%
0%
No graph
Graph
No graph
Graph
No graph
Graph
Oppose withdrawal
Not sure
Support withdrawal
No affirmation
Affirmation

Figure 2

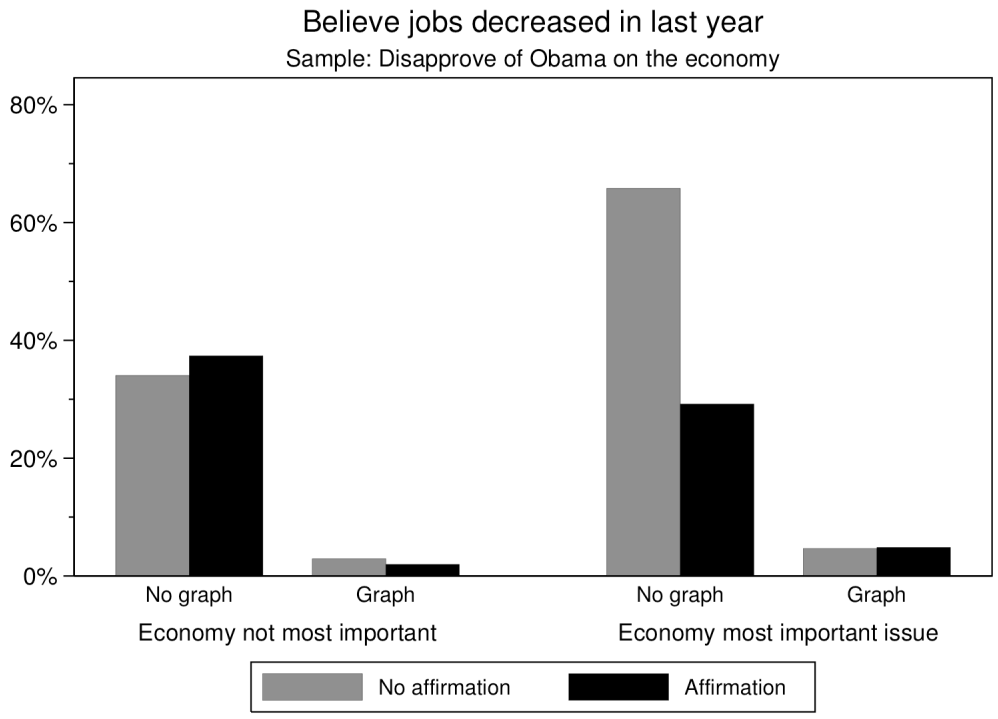

Believe jobs decreased in last year
Sample: Disapprove of Obama on the economy
80%
60%
40%
20%
0%
No graph
Graph
No graph
Graph
Economy not most important
Economy most important issue
No affirmation
Affirmation

Figure 3

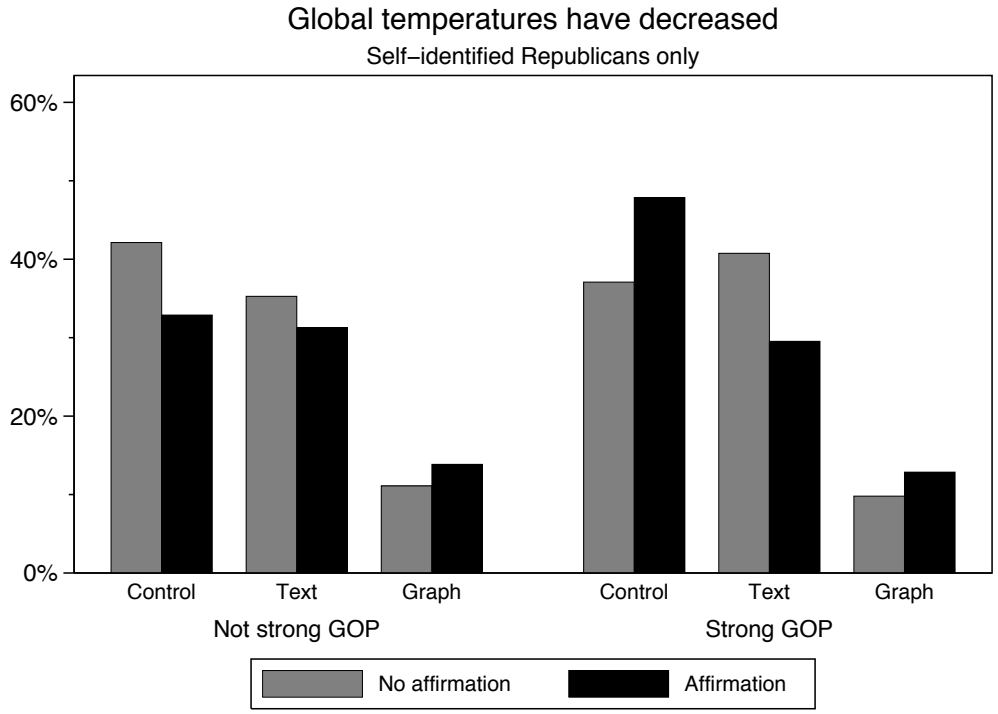

Global temperatures have decreased
Self−identified Republicans only
60%
40%
20%
0%
Control
Text
Graph
Control
Text
Graph
Not strong GOP
Strong GOP
No affirmation
Affirmation

Figure 4

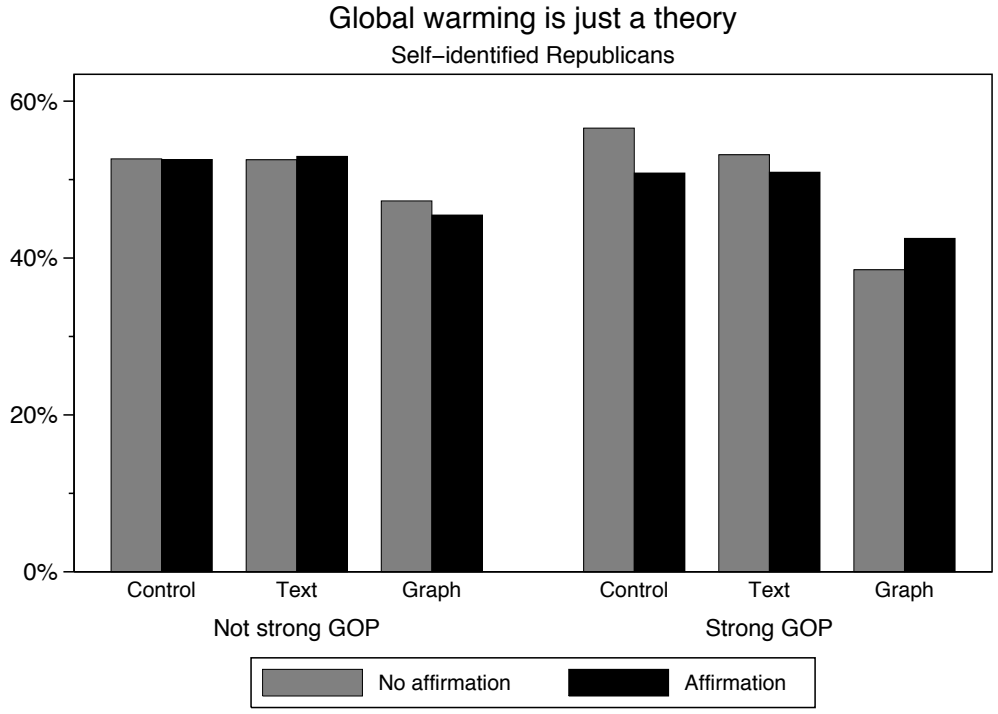

Global warming is just a theory
Self−identified Republicans
60%
40%
20%
0%
Control
Text
Graph
Control
Text
Graph
Not strong GOP
Strong GOP
No affirmation
Affirmation

Table 1: Ordered probit models of beliefs about change in insurgent attacks

	Oppose withdrawal	Not sure	Support withdrawal
Affirmation	-0.31	-0.17	-0.41*
	(0.25)	(0.34)	(0.17)
Graph	-0.41	-0.67*	-0.63**
	(0.28)	(0.32)	(0.16)
Affirmation x graph	0.45	0.25	0.57*
	(0.40)	(0.53)	(0.28)
Black	0.66	-0.32	0.17
	(0.52)	(0.48)	(0.28)
Female	0.47*	0.46	0.22
	(0.20)	(0.33)	(0.15)
College graduate	-0.44	-0.49	-0.41**
	(0.24)	(0.41)	(0.13)
GOP (with leaners)	-0.62*	0.19	-0.11
	(0.24)	(0.29)	(0.27)
Independent	-0.18	0.31	0.47*
	(0.34)	(0.35)	(0.21)
Iraq extremely important	-0.15	-0.19	-0.24
	(0.23)	(0.34)	(0.15)
N	399	121	467

* $p < .05$, ** $p < .01$. Models are estimated using survey weights (as such, the log-likelihoods are not available); linearized standard errors are provided in parentheses. Ordered probit cutpoints are omitted but available upon request.

Table 2: Ordered probit models of beliefs about job change

	Approve		Neither		Disapprove	
	Not MIP	MIP	Not MIP	MIP	Not MIP	MIP
Affirmation	0.39	-0.51	-0.41	-0.61	-0.09	1.04*
	(0.35)	(0.49)	(0.46)	(0.34)	(0.27)	(0.42)
Graph	1.71**	1.52**	0.83*	1.85**	1.69**	2.27**
	(0.43)	(0.38)	(0.36)	(0.38)	(0.31)	(0.51)
Affirmation x graph	-0.94	0.07	0.61	1.29*	0.34	-1.06
	(0.51)	(0.58)	(0.72)	(0.57)	(0.42)	(0.58)
Black	-0.48	-0.24	-0.92	0.46	-2.90**	0.14
	(0.35)	(0.38)	(0.69)	(0.81)	(1.09)	(0.65)
Female	-0.24	-0.33	-0.52	0.14	-0.02	-0.39
	(0.29)	(0.30)	(0.30)	(0.25)	(0.21)	(0.26)
College graduate	0.62	0.17	-0.63*	0.51*	0.16	0.63*
	(0.33)	(0.30)	(0.31)	(0.26)	(0.21)	(0.26)
GOP (with leaners)			-0.25	0.17	-0.26	0.57*
			(0.36)	(0.28)	(0.36)	(0.26)
Independent	-0.97	-0.91	-0.47	-0.43	-0.42	0.43
	(0.65)	(0.47)	(0.40)	(0.32)	(0.41)	(0.61)
Log-likelihood	-66.80	-72.80	-65.51	-88.26	-120.74	-82.02
N	66	72	59	90	113	71

* $p < .05$, ** $p < .01$. Robust standard errors in parentheses. "Approve," "Neither" and "Disapprove" refer to respondents who approve of Obama's handling of the economy, those who neither approve nor disapprove, and those who disapprove, respectively. "Not MIP" and "MIP" refer to those who did not select the economy as the most important issue and those that did so, respectively. Ordered probit cutpoints are omitted but available upon request.

Table 3: Ordered probit models of beliefs about climate change

	Temperature change		Global warming/causes	
	Not strong GOP	Strong GOP	Not strong GOP	Strong GOP
Affirmation	0.28	-0.32	0.01	1.31*
	(0.29)	(0.32)	(0.32)	(0.66)
Graph	1.17**	1.11**	0.33	2.31**
	(0.31)	(0.32)	(0.31)	(0.62)
Text	0.21	-0.11	0.01	0.87*
	(0.27)	(0.30)	(0.33)	(0.43)
Affirmation x graph	-0.43	0.14	0.10	-1.55
	(0.43)	(0.45)	(0.50)	(0.81)
Affirmation x text	-0.16	0.68	-0.03	-0.89
	(0.43)	(0.44)	(0.53)	(0.72)
Female	0.01	0.54**	-0.15	-0.39
	(0.17)	(0.18)	(0.21)	(0.28)
College graduate	0.15	-0.22	-0.20	-0.06
	(0.18)	(0.18)	(0.21)	(0.28)
Extremely important issue	0.00	0.14	0.12	0.09
	(0.10)	(0.09)	(0.13)	(0.13)
Global warming beliefs	0.61**	0.58**	1.61**	4.06**
	(0.11)	(0.12)	(0.18)	(0.48)
Log-likelihood	-165.15	-160.25	-98.75	-43.88
N	181	172	181	172

* $p < .05$, ** $p < .01$. Robust standard errors in parentheses. Ordered probit cutpoints are omitted but available upon request.

Online appendix

Study 1

Affirmation treatment

[Part 1]

In this portion of the study, we would like to ask you some questions about your ideas, your beliefs, and your life. When you respond to these questions, please bear in mind that there are no right or wrong answers.

Below is a list of characteristics and values, some of which may be important to you, some of which may be unimportant. Looking at this list, please circle the characteristic or value that is MOST important to you.

1. Being smart or getting good grades
2. Creativity
3. Relationships with friends or family
4. Social skills
5. Business skills

[Part 2]

In a few sentences, please describe a personal experience in which [value choice from previous question] was especially important to you and made you feel good about yourself. Focus on your thoughts and feelings, and don't worry about spelling, grammar, or how well written it is.

Affirmation control

Please list everything you have had to eat or drink in the last 48 hours. Do not worry about those things you find yourself unable to remember.

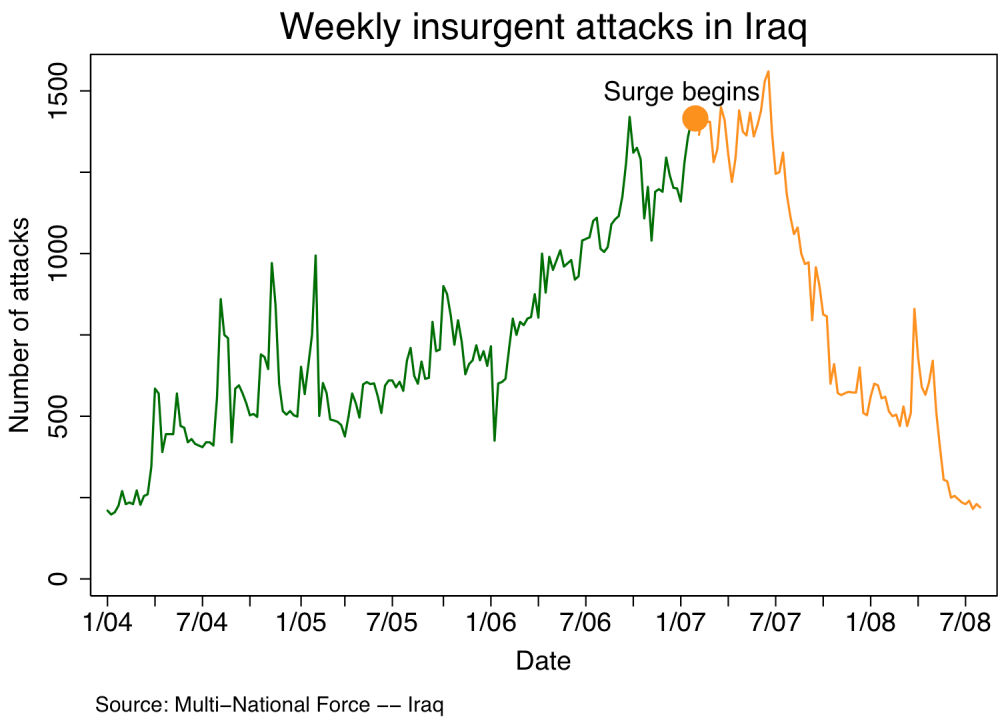
Graph treatment

[All respondents]

Now we would like to turn to a different topic. As you may know, starting in early 2007, the US sent an additional 30,000 troops to Iraq. Many people refer to this increase in the number of US troops in Iraq as "the surge" or "the troop surge."

[Treatment group only]

Below is a graph showing the number of insurgent attacks against US and coalition forces in Iraq per week since January 2004. Please take a moment to study it before proceeding.



Dependent variable

From what you know about the US involvement in Iraq, what has happened to the number of insurgent attacks in Iraq since the recent increase in troop levels ("the surge") began?

- Attacks have decreased substantially [1]
- Attacks have decreased slightly [2]
- Attacks have stayed the same [3]
- Attacks have increased slightly [4]
- Attacks have increased substantially [5]

Study 2

Affirmation treatment

[Part 1]

In this portion of the study, we would like to ask you some questions about your ideas, your beliefs, and your life. When you respond to these questions, please bear in mind that there are no right or wrong answers. Your answers will be kept confidential and not published in any form.

Below is a list of characteristics and values, some of which may be important to you, some of which may be unimportant. Looking at this list, please select the characteristic or value that is MOST important to you.

- Athletic ability
- Being good at art
- Being smart or getting good grades
- Creativity
- Living in the moment
- Musical ability/appreciation
- Relationships with friends or family
- Sense of humor
- Social skills
- Physical attractiveness
- Business skills
- Romantic values

[Part 2]

Please take a few minutes to describe a personal experience in which [value choice from previous question] was especially important to you and made you feel good about yourself. Focus on your thoughts and feelings, and don't worry about spelling, grammar, or how well written it is. Your answers will be kept confidential and not published in any form.

NOTE: The survey will allow you to move to the next page after a reasonable amount of time has elapsed. Please take all the time you need to answer the question thoroughly.

Affirmation control

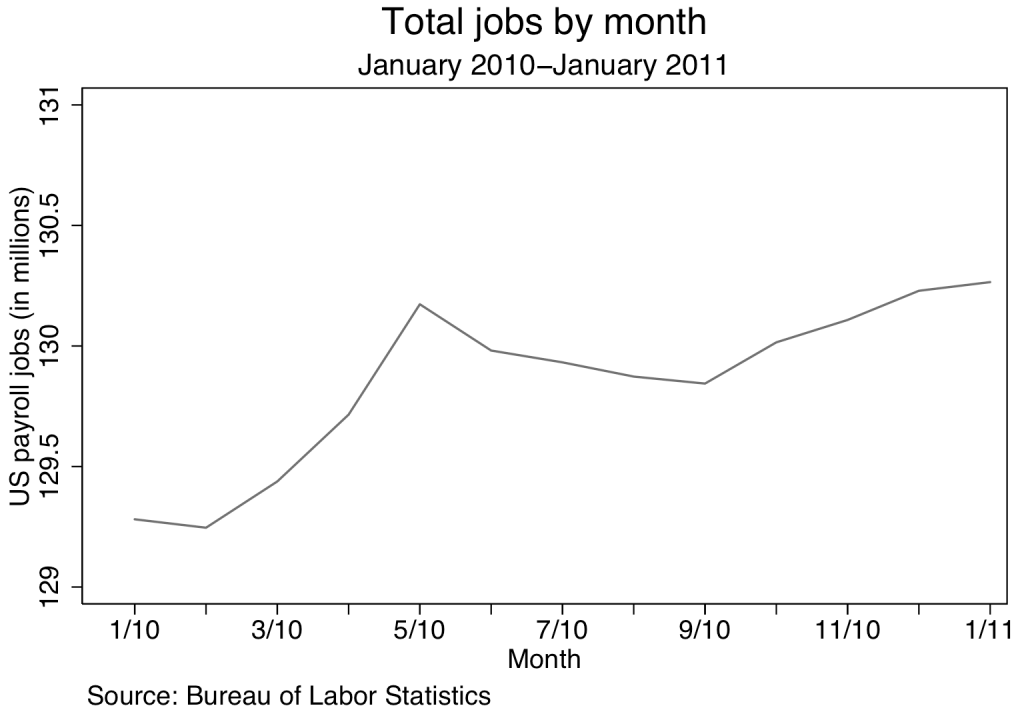
Please take a few minutes to list everything you've had to eat or drink in the last 24 hours. Don't worry about spelling, grammar, or how well written it is. Your answers will be kept confidential and not published in any form.

NOTE: The survey will allow you to move to the next page after a reasonable amount of time has elapsed. Please take all the time you need to answer the question thoroughly.

Graph treatment

Now we would like to turn to a different topic.

Below is a graph showing the total number of jobs in the United States from January 2010 to January 2011. Please take a moment to study it before proceeding.



NOTE: The survey will allow you to move to the next page after a reasonable amount of time has elapsed. Please take all the time you need to study the graph below.

Graph control

Now we would like to turn to a different topic.

Dependent variable

Would you say that, compared to January 2010, the number of people with jobs in the country has gone up, stayed about the same, or gone down?
-Gone up
-Stayed about the same [3]
-Gone down

[branching]
Compared to January 2010, has the number of people with jobs in the country gone up a lot or only somewhat?
-Gone up a lot [5]
-Gone up somewhat [4]

Compared to January 2010, has the number of people with jobs in the country gone down a lot or only somewhat?
-Gone down a lot [1]
-Gone down somewhat [2]

Study 3

Attention filter

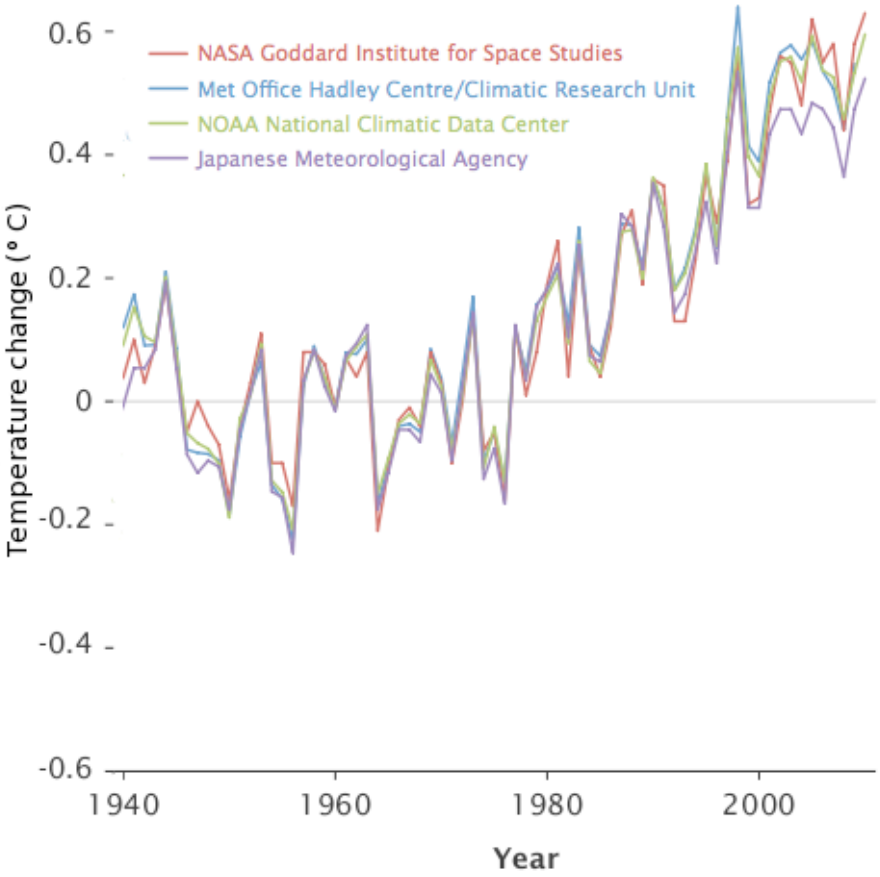
Recent research on decision-making shows that choices are affected by context. Differences in how people feel, their previous knowledge and experience, and their environment can affect choices. To help us understand how people make decisions, we are interested in information about you. Specifically, we are interested in whether you actually take the time to read the directions; if not, some results may not tell us very much about decision making in the real world. To show that you have read the instructions, please ignore the question below about your favorite color and check pink and green as your answers. Again, please answer the question as we have instructed rather than choosing your favorite color. Thank you very much.

Please indicate your favorite color.
-Red
-Pink
-Orange
-Brown
-Yellow
-Green
-Blue
-Purple
-None of the above

Graph treatment

Now we would like to turn to a different topic.

Below is a graph showing changes in average global surface temperatures since 1940. Please take a moment to study it before proceeding. (Note: A change of 1 degree Celsius = 1.8 degrees Fahrenheit.)



Text treatment

Now we would like to turn to a different topic.

Below is information about changes in average global surface temperatures since 1940. Please take a moment to study it before proceeding. (Note: A change of 1 degree Celsius = 1.8 degrees Fahrenheit.)

Groups of scientists from several major institutions — NASA's Goddard Institute for Space Studies, the National Oceanic and Atmospheric Administration's National Climatic Data Center, the Japanese Meteorological Agency and the Met Office Hadley Centre in the United Kingdom — tally data collected by temperature monitoring stations spread around the world. All four records show peaks and valleys that vary in virtual sync with each other. They each show an increase in average global surface temperatures of approximately 0.5 degrees Celsius over the last three decades. Data from each source also indicate that the last decade is the warmest since 1940.

Graph/text control group

Now we would like to turn to a different topic.

Dependent variables

Would you say that average global surface temperatures have gone up, stayed about the same, or gone down in the last thirty years?
-Gone up
-Stayed about the same [3]
-Gone down

[branching]
Have average global surface temperatures gone up a lot or only somewhat in the last thirty years?
-Gone up a lot [5]
-Gone up somewhat [4]

Have average global surface temperatures gone down a lot or only somewhat in the last thirty years?
-Gone down a lot [1]
-Gone down somewhat [2]

Which of the following statements comes closest to your view of global warming?
-Global warming is a proven fact and is mostly caused by emissions from cars and industrial facilities such as power plants and factories. [3]
-Global warming is a proven fact caused mostly by natural changes that have nothing to do with emissions from cars and industrial facilities. [2]
-Global warming is a theory that has not yet been proven. [1]