

**Moral Conviction as an Equal Opportunity Motivator of Science Denial Across the
Political Divide**

BY

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THESIS

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This thesis is dedicated to my wife, Lathie, and our families. Without their continual support and encouragement this thesis would have never been accomplished.

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SUMMARY

The current study tested if conservatives and liberals are equally likely to deny scientific claims that conflict with their preferred conclusions. Although conservatives have often been credited with being skeptical of scientific information (e.g., climate change, Dunlap, 2008), some evidence suggests that liberals may also be motivated to deny certain scientific claims (e.g., Braman, Kahan, Slovic, Gastil, & Cohen, 2007). Because people are motivated to assess information in ways that bolster their ideological positions (Kahan, 2013) and may be especially motivated to defend attitudes held with moral conviction (Skitka, Bauman, & Sargis, 2005), I hypothesized that conservatives and liberals would be equally likely to deny scientific claims that conflict with their preferred conclusions, especially conclusions held with strong moral conviction.

Participants were randomly assigned to read about a fabricated study where the results were either consistent or inconsistent with their attitudes regarding one of several issues (carbon emissions, gun control, same-sex marriage, etc.). Participants were asked to interpret the results and decide what the study concluded (e.g., a gun ban either reduced crime or not). After being informed of the correct interpretation, participants rated how much they agreed with, found knowledgeable, and trusted the researchers' correct interpretation.

Overall, both liberals and conservatives were equally likely to engage in motivated interpretation of study results and deny the correct interpretation of those results when that interpretation conflicted with their attitudes. These results were not meaningfully moderated by political orientation or moral conviction. My study suggests that liberals and conservatives may be more alike than different when it comes to science denial and that the same motivational processes underlie differences in the political priorities of those on the left and the right.

1. INTRODUCTION

On Monday, May 12, 2014, the journal *Science* published two articles detailing the trajectory of the cataclysmic melting of the West Antarctica ice sheet, providing one of the most extensive portrayals of the effects of global warming. Among the most alarming details from the two independently conducted studies was that the melting could potentially cause as much as a ten feet rise in the sea level. A rise of this magnitude would have monumental impact on America's coastline. Florida in particular would suffer some of the worst flooding (Gillis & Chang, 2014). In the same week, Florida Republican Senator Marco Rubio, a presidential candidate in the 2016 election, said in an interview that he disagreed with accepted scientific wisdom regarding climate change and did not believe that human activity was responsible for changes in the climate (Huetteman, 2014). How can an elected official maintain such a contrary stance to an overwhelming scientific consensus? What is it about our strongly held beliefs that inoculate us from seemingly persuasive and convincing scientific evidence?

The goal of this project is to examine how political partisans can deny scientific claims in the defense of their cherished beliefs and attitudes. This project will examine two potential and competing explanations for the perceived asymmetry in science denial between conservatives and liberals: (1) the *dispositional hypothesis* predicts that conservatives are dispositionally inclined to deny attitude inconsistent science more than liberals, and (2) the *motivated reasoning hypothesis* predicts that conservatives and liberals are equally likely to be motivated to deny scientific claims when those claims conflict with their preferred conclusions, perhaps especially when their preferences are experienced as moral convictions. Because moral convictions are seen as objective (Morgan, Skitka, & Lytle, 2014), inherently motivating (Skitka & Bauman, 2008; Skitka, Bauman, & Sargis, 2005), and for the most part equally endorsed on both sides of the

political spectrum (Skitka, Morgan, & Wisneski, in press), both liberals and conservatives may be equally likely to engage in science denial when scientific conclusions conflict with their morally convicted attitudes. Before turning to the specifics of the proposed studies, I first review evidence of ideological differences in acceptance of climate change. I then review theoretical accounts that predict that ideological differences in science denial may be likely to generalize across issues, before turning to alternative theoretical accounts that predict that science denial is likely to be a special case of motivated reasoning.

1.1 **Climate Change Science Denial**

Despite near unanimous scientific consensus that Earth's climate is changing and that human behavior (e.g., fossil fuel consumption) plays a significant role in causing it (Anderegg, Prall, Harold, & Schneider, 2010; Doran & Zimmerman, 2009; Oreskes, 2004), many more conservatives than liberals deny that global warming is real, and/or that humans are the cause—a result repeatedly found in dozens of polls conducted over the last 15 or so years (e.g., Dunlap, 2008; Gallup Poll, 2009; Pew Research Center, 2012b). For example, Republicans are more likely than Democrats to deny that human activity has contributed to global warming. In a similar vein, liberals are more likely than conservatives to express concerns about the changing climate and are more responsive to education efforts on global warming (Pew Research Center, 2012b). Conservative elites and think tanks claim that climate scientists' findings represent liberal bias, and emphasize non-peer reviewed findings from climate change deniers instead of mainstream peer reviewed research (Brown, 1997; Jacques, Dunlap, & Freeman, 2008; McCright & Dunlap, 2010; McCright & Dunlap, 2011a; McCright & Dunlap, 2011b). This ideological asymmetry in acceptance of the science of climate change has expanded in the past decade (McCright & Dunlap, 2011b; Pew Research Center, 2013). Although ideological asymmetry in

climate change science denial is well documented, the cause of the asymmetry is still up for debate. Whereas national opinions polls provide a useful depiction of the current landscape, they are often unable to specify the processes causing such patterns. Recent research in personality, social, and political psychology point to at least two possible explanations for asymmetry in climate change science denial and, potentially, science denial in general: dispositional and motivated denial.

1.1.1 **Dispositional Denial**

The dispositional denial account suggests that conservatives are dispositionally inclined to be skeptical of scientific conclusions regarding climate change. The idea that science denial is a result of who conservatives (namely Republicans) are at their core has been perpetuated throughout the media and recently in a popular book, *The Republican Brain: The Science of Why They Deny Science* by Chris Mooney. Intrinsic differences between conservatives and liberals on specific psychological traits, like personality characteristics and other cognitive style constructs, are robustly documented. Conservatives are generally lower in openness to experience, intellectual flexibility, and intellectual curiosity than liberals (Kruglanski, Webster, & Klem, 1993; McCrae, 1996; Tetlock, 1983), traits typically associated with lower pro-environmental attitudes (Markowitz, Goldberg, Ashton, & Lee, 2012). These results suggest that conservatives' personality characteristics may limit their openness to scientific conclusions, perhaps especially within the domain of climate change.

Conservatives also exhibit greater system justifying tendencies, or desires to protect the status quo and rationalize stagnation in the social system, than liberals (Feygina, Jost, & Goldsmith, 2010; Jost, Blount, Pfeffer, & Hunyady, 2003; Jost, Glaser, Kruglanski, & Sulloway, 2003; Jost, Nosek, & Gosling, 2008). Conservatives may, consequently, deny climate change

science because of an inherent need to view the current system as legitimate and stable (Jost & Hunyady, 2005), an undoubtedly difficult task if one is to accept evidence in support of climate change. Indeed, higher system justification tendencies are linked with more negative attitudes toward helping the environment and may be a precursor to denial that environmental problems exist in the first place (Feygina et al., 2010). In summary, the dispositional account for ideological asymmetry in climate change science denial suggests that conservatives (compared to liberals) have psychologically rooted tendencies that cause them to be more likely to deny the credibility of scientific consensus information about climate change, and possibly other scientific claims as well.

If conservatives are dispositionally inclined to deny scientific evidence, one should see ideological asymmetry in science denial across all aspects of scientific inquiry, not just science supporting climate change. Research supporting this implication of the dispositional hypothesis is relatively mixed. For example, a longitudinal study of Americans' general trust in science from 1974 to 2010 (Gauchat, 2012) found that liberals' and moderates' trust in science was quite stable overtime. Conservatives, however, moved from being the highest to the lowest in trust of the scientific community over the same time period. The relative stability of liberals' and moderates' trust in science overtime is consistent with the idea that science beliefs may relate to stable individual differences. Conservatives' change in trust over time, however, suggests that other factors besides stable individual differences affect people's general tendency to trust science. For example, the climate change debate has been getting much more attention over the last 30 years in the media and popular discourse. Conservatives' distrust of climate change science may therefore lead them to distrust the scientific community more generally, perhaps

because conservatives are motivated to deny climate change science in particular. I turn to this alternative hypothesis, that is, that science denial is motivated rather than dispositional, next.

1.1.2 **Motivated Denial**

Another possible explanation for ideological asymmetry in climate change science denial is that liberals and conservatives are differentially motivated to deny or accept climate change related scientific claims. People on both the left and the right are motivated to assess information in ways that bolster their ideological positions (Kahan, 2013; Kahan, Jenkins-Smith, & Braman, 2011; Peterson, Skov, Serritzlew, & Ramsay, 2013). Motivated reasoning suggests that liberals and conservatives may be equally inclined to be receptive and open to scientific discoveries but differ in their motivation to deny *specific* scientific claims (e.g., climate change for conservatives). When a scientific claim is inconsistent with one's core values or preferred conclusions, one will be motivated to deny the validity, trustworthiness, or impact of those scientific findings (Lewandowsky, Oberauer, & Gignac, 2013).

Evidence for ideologically motivated reasoning comes from work on attribution tendencies for those on the political left and right, that is, the ideo-attribution effect. The ideo-attribution effect is the tendency for conservatives to rely on dispositional explanations (e.g., personal discipline) for social problems and for liberals to rely on situational explanations (e.g. unjust social structures) for the same problems (see Skitka & Washburn, in press, for a review). However, sometimes conservatives' dispositional attributions and liberals' situational attributions conflict with their core values (Morgan, Mullen, & Skitka, 2010). Because both liberals and conservatives are motivated to make attributions for the behavior of others that are consistent with their values and beliefs, reversals of the ideo-attribution effect sometimes occur such that liberals make dispositional attributions for others' behavior and conservatives make

situational attributions (Morgan et al., 2010; Skitka, Mullen, Griffin, Hutchinson, & Chamberlin, 2002; Skitka & Washburn, in press).

The observed ideological asymmetry in climate change science denial could similarly be the result of a motivated strategy to deny facts that contradict important conservative values and policy preferences. Admitting that human activity is contributing to global warming would force conservatives to agree that environmental restrictions should be put in place to curb greenhouse gas emissions. Imposing and endorsing extra government regulations and restrictions to free enterprise would go against core conservative ideological tenets (Jacques, 2006). Therefore, conservatives are likely to be motivated to deny any scientific claims that stand in the way of sanctioning policies that promote free markets and reduced government regulation (Lewandowsky et al., 2013; McCright & Dunlap, 2011b). Similar to the role that motivated reasoning plays in relation to the ideo-attribution effect, when conservative values conflict with scientific evidence, conservatives should be more likely to deny those scientific claims. Although a conservative bias in science denial has been robustly documented for climate change, the same motivated processes could account for science denial in any area where scientific evidence conflicts with preferred conclusions (e.g., gun control).

Consistent with a motivated reasoning explanation for science denial, there is some evidence that liberals challenge the validity of science when it is at odds with their ideologically preferred conclusions. For example, liberals dispute claims that nuclear waste can be disposed of in a safe and environmentally responsible manner despite evidence that it can (Braman, Kahan, Slovic, Gastil, & Cohen, 2007; Jenkins-Smith, Silva, & Murray, 2009; Newport, 2012). Additionally, liberals question the environmental safety of the gas drilling technique known as fracking more than conservatives, despite evidence that the actual practice of fracking does not

have any deleterious consequences on the surrounding natural environment (e.g., drinking water) (Mooney, 2012; Pew Research Center, 2012a).¹

In addition to these real world examples of liberals denying scientific claims more than conservatives, carefully controlled experiments show that the psychological processes that drive liberals' and conservatives' reasoning are often more similar than they are different. Perhaps the most convincing study to demonstrate the powerful effect of ideologically motivated reasoning on opinions about scientific evidence comes from recent work by Dan Kahan and colleagues (Kahan et al., 2012; Kahan et al., 2013). In an effort to show that motivated reasoning can impact perceptions of scientific evidence even for those who are skilled in interpreting and using quantitative information (those high in numeracy), Kahan et al. (2013) had people evaluate results of an experiment that tested the effectiveness of a skin-rash treatment. Participants, especially those high in numeracy, were able to interpret and use the results from the skin-rash treatment study to reach the appropriate conclusions about the effectiveness of the treatment (regardless of whether the treatment worked). However, when the same data—the *exact* same numbers—represented the effects of a citywide gun control ban, responses became politically polarized. Conservatives were more likely to misinterpret results that indicated that the gun ban reduced crime (a non-preferred conclusion from a conservative perspective), whereas liberals were more likely to misinterpret results that indicated that a gun ban increased crime (a non-preferred conclusion from a liberal perspective). Even more remarkable, those high in numeracy, with the greatest ability to accurately understand the data, were even more likely to misinterpret the results when the data was inconsistent with their preferred conclusions (Kahan et al., 2013).

¹ Although there is no direct link between hydraulic fracturing and drinking water contamination, there is new evidence suggesting that fracking can cause increased seismic activity in the form of low magnitude earthquakes (Ellsworth, 2013; Keranen, Weingarten, Abers, Bekins, & Ge, 2014).

These results signify that not only are people motivated to construe scientific evidence in ideologically consistent ways, but also that those especially adept at examining and interpreting scientific information are not inoculated from the power of motivated reasoning. Instead, people especially skilled with interpreting numbers were even more likely to “twist” the evidence to support their view than those with weaker numeracy skills. Therefore, expertise in a given domain exacerbates rather than attenuates the probability of engaging in biased political reasoning about science. However, because Kahan et al.’s (2013) study only examined two issues (gun control and skin rash treatment), it is difficult to generalize these motivated reasoning effects across more domains. Therefore, a logical next step is to test the generalizability of their conclusions across a wider range of stimuli, a point addressed in the current study.

In summary, this research provides strong support for the notion that motivated reasoning plays a role in science denial. When conservative values conflict with scientific findings, conservatives appear to be more likely to deny the validity, trustworthiness, or utility of that scientific evidence. Conversely, when liberal values conflict with scientific claims, liberals appear to be more likely to deny the science behind those claims. However, what is providing the motivational force behind the science denial for those on the political left and right? The examples provided thus far concern issues that are highly publicized on each side of the political spectrum. In other words, issues that are ripe for science denial seem to be issues that partisans care deeply about and have strong attitudes towards. For example, conservatives and liberals do not often argue the scientific credibility or utility of using antibiotics to treat bacterial infections (Kahan, Peters, Dawson, & Slovic, 2013). However, those on the political right and left do often argue in domains where their opinions and attitudes are rooted in a sense of morality, or a perception that a given attitude or stance on an issue is fundamentally right or wrong.

Consistent with the idea that people may be especially likely to deny scientific claims when these claims challenge perceivers' cherished moral beliefs is evidence that moral beliefs and values can influence people's factual beliefs and perceptions (Braman et al., 2007; Kahan, 2010; Kahan et al., 2011). For example, egalitarian communitarians (i.e., people with a cherished value that society has the obligation to secure collective welfare and prevent individuals from harming themselves) were twice as likely as those who did not have such a value to say that most expert scientists disagree about the safety of nuclear waste disposal—a practice viewed by egalitarian communitarians as harmful (Kahan et al., 2011). However, the assertion that nuclear waste disposal is potentially harmful counters scientific consensus on that issue (Jenkins-Smith et al., 2009; Newport, 2012). Therefore, it appears that people's core values and convictions can sometimes color perceptions of facts. In addition to these findings, there are many reasons why deeply cherished beliefs or moral convictions might enable denial of scientific or factual evidence, a point discussed next.

1.2 **Moral Conviction**

Moral convictions comprise a unique class of strong attitudes that have many downstream behavioral consequences (Skitka, 2013) and may even influence the degree to which individuals are willing to deny scientific conclusions that counter those attitudes. Attitudes held with moral conviction constitute an evaluation of an attitude object with a sense of right or wrong, morality or immorality (Skitka, 2010; Skitka, 2013; Skitka, Bauman, & Sargis, 2005). Moral convictions predict behavior (e.g., preferred social and physical distance, intolerance of attitudinally dissimilar others, low group cooperativeness) over and above other facets of attitude strength like attitude importance, attitude centrality, or attitude extremity (Skitka, 2010; Skitka et al., 2005). Moral convictions are also seen as objective and universally applicable

(Morgan et al., 2014; Skitka, 2010; Skitka, 2013), a characteristic important to consider for science denial.

1.2.1 Perceived Objectivity

Scientific arguments tend to appeal to facts and numbers to persuade the public of the validity of a claim. The perceived objectivity of moral convictions can help explain how these strong attitudes can motivate individuals to resist scientific claims. In short, moral convictions provide people with the sense that they already know the “facts.” In fact, people asked to write about something that they view as morally right or wrong rated their responses as objectionably true and universally applicable as people asked to write about a piece of scientific knowledge. Moral attitudes and scientific knowledge were both rated as more objective and universal than preferences or likes (Morgan et al., 2014). These findings suggest that people not only feel very strongly about their morally convicted attitudes, but also see them as equal in objectivity to scientifically derived facts.

Imbuing an attitude with moral conviction may provide people with psychological ammunition against counter claims and arguments. For example, if a person has a morally convicted attitude in opposition to climate change science, that stance is more easily defensible (than a strong but nonmoral attitude) in the face of a scientific, factually driven counter argument because the moral conviction serves as a fact in and of itself. Theoretically it would be easier to resist being persuaded by scientific consensus because one sees his morally convicted attitude as equally as valid as scientific evidence.

Although having the sense that one’s attitude is as objective and undeniable as scientific or mathematical facts can enable denial of counter claims, moral convictions have another

characteristic that can turn that objective stance into action. Moral convictions are inherently motivating (Skitka, 2013; Skitka et al., 2005).

1.2.2 **Motivational Guide**

Attitudes held with moral conviction are theoretically predicted to be inherent motivations for behavior and reasoning (Skitka, 2013). A moral conviction about a specific issue (e.g., that global warming is not caused by humans) conveys a need, when given the opportunity, to engage in some sort of action, or something that one ought or ought not do (Skitka & Bauman, 2008; Skitka et al., 2005). The inherent motivational quality of moral convictions has been demonstrated in multiple studies looking at the relation between moral conviction about political issues and political engagement. People with morally convicted attitudes regarding social issues (e.g., abortion, same-sex marriage, etc.) or their preferred candidate are more likely to have greater intentions to and actually vote in elections (Morgan, Skitka, & Wisneski, 2010; Skitka & Bauman, 2008) and to engage in activism (e.g., van Zomeren, Postmes, & Spears, 2012; Zaai, Van Laar, Ståhl, Ellemers, & Derks, 2011). As a result, people with moral convictions regarding scientifically disputed stances on issues (e.g., that global warming is caused by humans) may be especially motivated to actively deny scientific claims.

Moral motivations can also surpass competing motivations, like a motivation to appear fair or honest. For example, participants asked to divide raffle tickets between themselves and another participant who disagreed with them on a morally convicted attitude kept significantly more tickets for themselves compared to those who were paired with a partner who disagreed with them on a nonmoral attitude (Wright, Cullum, & Schwab, 2008). These results are telling because most of the time people are motivated via fairness concerns to divide raffle tickets

roughly equally in these contexts (Fehr & Fishbacher, 2004), thus showing that moral convictions sometimes, if not often, trump other salient motivations.

In another experiment, when people learned of an outcome of a proposed legal trial that opposed their moral conviction (e.g., that a doctor who performed a late term abortion was found guilty of breaking the law), they were more likely to subsequently steal a pen from the experimenter (Mullen & Nadler, 2008). These results also confirm that moral convictions can motivate people to engage in behavior that conflicts with competing motivations, like the motivation to follow social norms (e.g., not stealing) (Cialdini & Trost, 1998). For example, most Americans report that they have confidence and trust in the scientific community (Gauchat, 2012) which would suggest that trusting in the scientific process is viewed, at least somewhat, as a social norm. Therefore, people who elect to counter the social norm of trusting the scientific process (by denying scientifically derived claims) would, theoretically, need an alternative motivation to do so. Moral convictions may provide that alternative motivation and enable people to deny scientific claims that counter their preferred conclusions.

Although the evidence presented thus far suggests that moral conviction is a prime candidate for motivating people to engage in denial of scientific evidence that counters their preferred conclusions, can moral conviction also provide an alternative explanation for the ideological asymmetry observed in certain realms of science denial (e.g., climate change)? Initial evidence suggests that, yes, selective engagement of the moral domain for certain issues can potentially explain partisan gaps in science acceptance and denial, a point discussed next.

1.3 **Moral Conviction and Political Orientation**

Many different opinions exist on whether liberals or conservatives are more likely to engage the moral domain when it comes to political decision making and political engagement.

Some suggest that conservatives may have a broader sense of morality because they endorse more moral foundations than liberals (Graham, Haidt, & Nosek, 2009) and because the Republican party has taken considerable effort to brand themselves as the more moral political party (Frank, 2004; Lakoff, 2002; 2004). Additionally, liberals are more morally relativistic than conservatives, allowing for cultural variance in people's perceptions of right and wrong (Van Kenhove, Vermeir, & Verniers, 2001), which implies that liberals may be less likely than conservatives to engage the moral domain when advocating a political stance on an issue.

Liberals and conservatives are equally likely to root their political opinions and stances in moral conviction, although they sometimes vary in strength of moral conviction for specific issues. A recent meta-analysis looking at ideological differences and similarities in moral conviction across a wide range of social and political issues found that, overall, there seems to be no difference in the degree to which liberals and conservatives engage the moral domain when forming their attitudes and opinions (Skitka, Morgan, & Wisneski, in press). However, when ideological differences in moral convictions do emerge, it is for a small subset of issues.

Conservatives tend to be more morally convicted than liberals about immigration and gun control, for example, whereas liberals tend to be more morally convicted than conservatives about climate change and health care reform. Liberals and conservatives are equally likely to be morally convicted about a host of other issues, including same-sex marriage and building more nuclear power plants (Skitka et al., in press). Therefore, liberal and conservative patterns of science denial may follow the pattern of their moral convictions. Consistent with this idea, conservatives, who tend to be more morally convicted than liberals about opposing gun control, were more likely than liberals to misinterpret scientific evidence suggesting that increased gun control reduces crime (Kahan et al., 2013). Likewise, liberals, who tend to be more morally

convicted than conservatives about protecting the environment (Skitka et al., in press), are more likely than conservatives to question scientific evidence suggesting that fracking is a safe, environmentally friendly process (Mooney, 2012; Pew Research Center, 2012a). Taken together, ideological asymmetry in science denial may simply be a reflection of ideological asymmetry in the degree to which liberals and conservatives see a given issue in moral terms.

The goals of the current research are therefore three-fold: 1) to test if conservatives and liberals are equally or differentially likely to engage in science denial, and 2) to test if moral conviction about a political issue serves as a motivator for science denial for those on the political left and right, and if so, 3) whether we can successfully predict when either liberals or conservatives are more likely to engage in science denial.

1.4 **The Current Research**

The current research experimentally tested whether moral conviction about a social issue serves as a motivator of science denial for both liberals and conservatives. Study 1 tested whether people who are highly morally convicted about a social issue (e.g., climate change) are more likely than those low in moral conviction to interpret fabricated scientific evidence in attitudinally consistent ways when the evidence counters their ideologically preferred conclusions (e.g., for liberals—climate change regulations increase instead of decrease CO₂ emissions) compared to when it affirms their preferred conclusions (the converse). Study 2 was designed to test whether moral conviction serves as a motivator for science denial by manipulating the strength of partisans' moral convictions about an issue. This study was intended to test if people with attenuated moral conviction about a social issue were just as likely as those

who are not morally convicted about said issue to correctly interpret scientific evidence that counters their preferred conclusions.²

The current research tested three main hypotheses: 1) the *dispositional hypothesis*, which states that conservatives are dispositionally inclined to deny attitude inconsistent science more than liberals across all contexts; 2) the *motivated reasoning hypothesis*, which states that both liberals and conservatives who are morally convicted about a given social issue will be equally likely to deny scientific evidence that counters their preferred conclusions; and 3) the *motivated denial hypothesis*, which states that people are motivated to interpret scientific information in ways that fit with their preferred conclusions, which in turn leads to greater science denial for any interpretation that counters their preferred conclusions.

If moral conviction motivates science denial, given that liberals tend to moralize the issues of climate change and health care reform more than conservatives, liberals should also be more likely to deny scientific claims about these issues than conservatives. Similarly, given that conservatives tend to moralize the issues of immigration and gun control more than liberals, conservatives should be more likely to deny scientific claims about these issues than liberals. Finally, if moral conviction motivates science denial, there should be no ideological differences in science denial in the control condition (a non-politicized issue) or in domains where liberals and conservatives are equally likely to moralize the issue (i.e., nuclear power and same-sex marriage).

² The results of Study 1 indicated that moral conviction does not moderate the effect of attitude inconsistency on motivated interpretation of results or science denial. As a result, manipulating moral conviction in Study 2 no longer seemed useful. Additionally, results from a pilot study testing the moral conviction manipulation to be used in Study 2 indicated that the manipulation was not successful at attenuating moral conviction. Therefore, only the method and results of Study 1 are reported and discussed.

2. METHOD

The current study was a 7 (issue: control, immigration, gun control, climate change, health care reform, nuclear power, same-sex marriage) by 2 (results: consistent, inconsistent) between subjects design. The social issues listed were selected based on previous research showing a wide range of levels of moral conviction across the political spectrum on these issues. For example, liberals tend to be more morally convicted about climate change and health care reform whereas conservatives tend to be more morally convicted about immigration and gun control. Alternatively, both liberals and conservatives tend to be morally convicted about same-sex marriage and not morally convicted about nuclear power (see Skitka et al., in press). By including all six of these social issues, I was able to take a more holistic look at the influence of moral conviction on ideologically motivated reasoning.

2.1 Participants

A total of 613 adult participants from the United States were recruited and paid between \$0.40-\$0.50 to participate in a web-based survey via Amazon.com's Mechanical Turk crowdsourcing website. Sixty-two participants were removed because they indicated neutral or uncertain attitudes on the issue to which they were assigned.³ An additional 13 participants were removed for failing both instructional manipulation checks, leaving a final sample size of 538 participants ($M_{\text{age}} = 38.68$, $SD = 13.94$; 51% female; 78.3% European American, 8.2% African American, 4.8% Asian, 4.5% Latino/a, 3.2% multiracial, 0.7% Native American, remainder other or unknown).⁴ I over recruited conservatives because MTurk workers tend to skew liberal (Berinsky, Huber, & Lenz, 2012).

³ Because one of my main variables of interest was attitude consistency, I needed participants who indicated some level of support or opposition for the issue.

⁴ Leaving these participants in the analyses did not change the pattern of results.

2.2 **Procedure**

Participants were informed that they were participating in a study about attitudes toward public policies. Participants were randomly assigned to one of fourteen experimental conditions where they were given a short excerpt describing a recent scientific study with results presented below it. There were two versions for each of the seven issues presented (six social issues and one control issue). One version presented results that were consistent with the participant's attitude on that issue and one version presented results that were inconsistent with their attitude. Participants were asked to interpret the data and decide which conclusion the study results supported. After providing their interpretation, participants were informed of the correct interpretation of the results and were then asked to rate how much they agreed with, found knowledgeable, and trusted the researchers' correct interpretation. Participants then completed demographic information. After completing demographic information, participants reported their attitude stance, strength, and level of moral conviction for the six social issues and one control issue (immigration, gun control, climate change, health care reform, nuclear power, same-sex marriage, and skin rash treatment/control).

2.3 **Measures**

Participants were given a number of demographic items to answer after partaking in the experimental portion of the study. Participants were asked to indicate their age, gender, ethnicity, education level, religious affiliation, and political orientation. After completing the demographic items participants answered items measuring attitude stance, attitude strength, and moral conviction associated with the targeted issue.

2.3.1 **Political Orientation**

Political orientation was assessed using two items asking participants, “What is your political orientation?” Participants responded by selecting whether they were conservative, liberal, or neither/uncertain. Participants who indicated that they were conservative or liberal branched to a question that assessed their degree of conservatism/liberalism by asking, “To what extent are you conservative (liberal)?” with response options ranging from 1 = *slightly* to 4 = *very much*. Those who responded that they were neither/uncertain branched to an item that asked whether they leaned more toward conservative or liberal, or were still neutral/uncertain. Those who indicated leaning toward conservative or liberal were coded as 1 or -1, respectively, and those who again marked neither or uncertain were coded as 0. These items were combined to form a single liberal/conservative bipolar measure ranging from -4 = *very much liberal* to +4 = *very much conservative*.

2.3.2 **Attitude Stance and Strength**

Participants’ attitudes toward the various issues were assessed using two items (e.g., “Do you support or oppose immigration reform making it easier for undocumented immigrants to attain citizenship in the U.S.?”). Participants responded by selecting whether they supported, opposed, or were uncertain. Their degree of support/opposition was then assessed (e.g., “How strongly do you support (oppose) immigration reform making it easier for undocumented immigrants to attain citizenship in the U.S.?”). Response options ranged from 1 = *slightly* to 4 = *very much*. Those who responded that they were uncertain branched to an item that asked whether they leaned more toward support or opposition, or were still uncertain. Those who indicated leaning toward supporting or opposing were coded as 1 or -1, respectively, and those who again marked uncertain were coded as 0. These items were combined to form a single

support/opposition bipolar measure ranging from -4 = *very much oppose* to +4 = *very much support* (see Appendix A for wording of all attitude items).

2.3.3 **Moral Conviction**

Participants' level of moral conviction about their attitudes was measured with two items (e.g., "To what extent is your position on [issue] 1) connected to your beliefs about fundamental right and wrong? and 2) a reflection of your core moral beliefs and convictions?" with a response scale ranging from 1 = *not at all* to 5 = *very much* ($\alpha = .86$).

2.4 **Manipulations and Critical Dependent Measures**

The manipulation stimulus material described a fabricated experiment and reported the results of that experiment in a two by two table with the columns representing the positive and negative results and the rows representing the different levels of the experimental treatment (adapted from Kahan et al., 2013). In the control condition, participants were informed that "medical researchers have developed a new cream for treating skin rashes," and that "new treatments often work but sometimes make rashes worse," and "skin rashes sometimes get better and sometimes get worse on their own." The participants were then told that the medical researchers divided the patients with skin rashes into two groups—one that was administered the skin cream, and another that was not—and then observed the number of patients that got better and got worse in each of the two conditions. Based on the results reflected in the table, participants were asked to indicate whether the "people who used the skin cream were likely to get better than those who didn't" or instead "people who used the skin cream were more likely to get worse than those who didn't" (see Appendix A for stimulus materials).

2.4.1 **Issue Manipulation**

Participants were randomly assigned to only one of the seven issues (control/rash, immigration, gun control, climate change, health care reform, nuclear power, or same-sex marriage). The same basic construction and layout of the stimulus remained the same for each issue with details adapted to make the fabricated experiment and results plausible (adapted from Kahan et al., 2013). For example, in the gun control issue, the participants were told that a “city government was trying to decide whether to pass a law banning private citizens from carrying concealed handguns in public.” They were then told that government officials were “unsure whether the law will be more likely to decrease crime by reducing the number of people carrying weapons or increase crime by making it harder for law-abiding citizens to defend themselves from violent criminals. To address this question, researchers divided cities into two groups: one consisting of cities that had recently enacted bans on concealed weapons and another that had no such bans. They then observed the number of cities that experienced decreases in crime and those that experienced increases in crime in the next year.” Participants were then instructed to indicate whether “cities that enacted a ban on carrying concealed handguns were more likely to have a decrease in crime” or instead “more likely to have an increase in crime than cities without bans” (see Appendix A for materials for other issues).

2.4.2 **Results Manipulation**

The supported results of the fabricated experiment were manipulated by switching the labels of the two columns of the results table. Each of the seven fabricated studies had two versions: one where the first column was labeled as the “increase” column and one where the first column was labeled as the “decrease” column. In all conditions, the actual numbers in each of the cells did not change, nor did the labels for each of the rows. Also, in all conditions the label of the column on the right indicated the correct interpretation of the data. Whether the

results were consistent or inconsistent with the participant's preferred conclusion depended on that participant's attitude stance on the issue. For example, if a participant was randomly assigned to the gun control condition where the correct interpretation of the data implied that a gun ban decreased crime, and that participant opposed gun control laws, that participant was in the "inconsistent results" condition. Concurrently, a participant assigned to that same condition who supported gun control laws was in the "consistent results" condition. The construction of this "results condition" variable is discussed in greater detail in the next section.

2.4.3 **Operationalization of Attitude Consistency**

A new variable for each participant was created that is a combination of the issue that they were assigned to, the results that they were given, and their attitude toward that issue. This "results condition" variable has two levels: results consistent with attitude stance and results inconsistent with attitude stance. Participants who opposed gun control laws, opposed laws restricting carbon emissions, opposed an individual health insurance mandate, supported more lenient immigration reform, opposed government investment in nuclear power, supported same-sex marriage, or opposed medical research for skin rashes assigned to the "increases" condition for any of these issues were categorized into the "consistent" results condition. Participants with these same attitude stances assigned to the "decreases" condition for any of these issues were categorized into the "inconsistent" results condition. Participants who supported gun control laws, supported laws restricting carbon emissions, supported an individual health insurance mandate, opposed more lenient immigration reform, supported government investment in nuclear power, opposed same-sex marriage, or supported medical research for skin rashes assigned to the "increases" condition for any of these issues were categorized into the "inconsistent" results condition. Participants with these same attitude stances assigned to the "decreases" condition for

any of these issues were categorized into the “consistent” results condition. Again, participants who indicated that they were uncertain regarding any of their attitudes for the issues were not included in any analyses ($N = 62$).

2.4.4 **Motivated Reasoning**

Motivated interpretation of scientific information was measured with the dichotomous choice variable that participants used to decide which interpretation the study supported. To correctly interpret the results, participants were required to assess not just the *absolute number* of subjects (or cities) who experienced positive outcomes (e.g., “rash got better”) and negative ones (e.g., “rash got worse”) in each condition (the heuristic strategy) but instead were required to compare the *ratio* of those who experienced a positive outcome to those who experienced a negative one in each condition (the deliberative strategy). Using the deliberative strategy to correctly interpret the results, therefore, required greater cognitive effort than using any heuristic strategy (Kahan et al., 2013; Stanovich & West, 1998). The numbers used in the cells of the tables were selected so that using the heuristic strategy always resulted in an incorrect interpretation. This variable served as a measure of motivated reasoning because participants were expected to first use the heuristic strategy to interpret the results. If the heuristic strategy provided an attitude consistent interpretation then participants were expected to stop reasoning and not engage in the effortful process of comparing the ratios of the results correctly. However, if the heuristic strategy provided an attitude inconsistent result then participants were expected to continue to expend cognitive effort and engage in the deliberative process to try to reach their desired conclusion. Therefore, participants should have been more likely to engage in the deliberative strategy in the “results consistent” conditions because the heuristic interpretation of the results in these conditions was always inconsistent with the participant’s attitude. Participants

in these conditions should expend greater effort, and as a result get the interpretation right, because they are motivated to reach a conclusion that is not the heuristic interpretation. However, participants in the “results inconsistent” condition should have been satisfied with the heuristic interpretation of the results because the heuristic interpretation was consistent with their attitude, leading them to incorrectly interpret the results as a result (see Figure 1 for an example interpretation). Scores on this measure were recoded such that 1 = correct interpretation of the results (deliberative strategy) and 0 = incorrect interpretation of the results (heuristic strategy).

	Result	
	Increase in CO ₂ Emissions	Decrease in CO ₂ Emissions
Cities that <u>did</u> enact strict CO ₂ emissions standards	(A) 223	(B) 75
Cities that <u>did not</u> enact strict CO ₂ emissions standards	(C) 107	(D) 21

What result does the study support?

- _____ Cities that enacted strict CO₂ vehicle emissions standards were more likely to have a decrease in CO₂ emissions than cities without such standards.
- _____ Cities that enacted strict CO₂ vehicle emissions standards were more likely to have an increase in CO₂ emissions than cities without such standards.

Figure 1. Example of interpretation. Participants could interpret these results in one of two ways. The heuristic strategy involves either comparing box A to box B or comparing box A to box C. Comparing box A to box B results in an incorrect interpretation because it does not take into account the control group (cities that did not enact strict emissions standards). Comparing box A to box C results in an incorrect interpretation because it does not include information that disentangles the effect of the strict emissions standards from other factors leading to increases or decreases in carbon emissions. The deliberative strategy involves comparing the ratios of either increases or decreases in emissions for each group [$A / (A + B)$ vs. $C / (C + D)$]. A participant who supports strict emissions standards would be more likely to engage in the deliberative strategy for interpreting these results because the heuristic strategies lead to a conclusion that conflicts with the participant's attitude (cities that enacted strict emissions standards experienced a greater increase in emissions compared to cities that did not). Therefore, these results would be a "results consistent" condition for strict emissions standards supporters. However, a participant who opposes strict emissions standard would find the conclusions derived from the heuristic strategies agreeable and be more likely to get the interpretation wrong as a result. Therefore, these results would be a "results inconsistent" condition for strict emissions standards opposers.

2.4.5 Science Denial

Science denial was measured using four items that were assessed after participants were shown how to correctly interpret the results of the study. Example items include, "How much do you agree or disagree with the researchers' interpretation?" on a scale ranging from 1 = *completely disagree* to 6 = *completely agree*, and "How trustworthy or untrustworthy are the

researchers?” on a scale ranging from 1 = *completely untrustworthy* to 6 = *completely trustworthy*. The items were combined and recoded such that higher scores indicated less agreement, less trust, etc. and this served as our measure of science denial ($\alpha = .94$).

3. RESULTS

Means, standard deviations, and zero-order correlations between all dependent variables are presented in Table I.

TABLE I
MEANS, STANDARD DEVIATIONS, AND CORRELATIONS BETWEEN ALL
DEPENDENT MEASURES

	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Interpretation of Results	.45	.50	-				
2. Science Denial	2.62	1.32	-.40**	-			
3. Political Orientation	-.33	2.38	.003	-.003	-		
4. Moral Conviction	3.11	1.33	-.01	.07	-.08	-	
5. Moral Rationality ⁵	4.72	1.19	.06	-.05	-.12**	.20**	-

Note. * $p < .05$. ** $p < .01$

3.1 Moral Conviction and Political Orientation

Based on a meta-analysis of ideological differences in moral convictions (Skitka, Morgan, & Wisneski, in press), we selected two issues for this study that conservatives are more morally convicted about than liberals (gun control and immigration), two issues that liberals are more morally convicted about than conservatives (climate change and health care), and two issues that liberals and conservatives are equally morally convicted about (nuclear power and same-sex marriage), thus creating a four level issue variable (conservative MC, liberal MC, both MC, and control). As a manipulation check to see if moral conviction about the selected issues conformed to the expected ideological patterns, a hierarchical multiple regression analysis was conducted predicting moral conviction from dummy coded issue (6 variables: immigration, gun

⁵ See Appendix B for supplemental analyses using the moral rationality variable.

control, climate change, health care reform, nuclear power, same-sex marriage with the skin rash control condition as the reference category for all variables) in step 1, political orientation in step 2, and the interaction between dummy coded issue and political orientation in step 3. A significant interaction between issue and political orientation was expected showing that liberals (1 *SD* below the midpoint) were more morally convicted than conservatives (1 *SD* above the midpoint) on climate change and health care reform, conservatives were more morally convicted than liberals on gun control and immigration, and both liberals and conservatives were equally morally convicted on same-sex marriage and nuclear power.

As can be seen in Table II, the expectation that conservatives and liberals moralized issues in the predicted pattern was not supported. There was a significant main effect of issue on moral conviction. Not surprisingly, people felt stronger moral convictions about all of the issues compared to the control issue (skin rash treatment). As can also be seen in Table II, political orientation interacted with issue to predict moral conviction. The simple interactions between each dummy coded issue vector (i.e., the comparison between the moral conviction for each specific issue versus the moral conviction for the control issue) and political orientation was non-significant for all issues except carbon emissions and nuclear power. Liberals were more morally convicted about carbon emissions than the control issue ($B = 1.00$, $SE = .27$, $t(524) = 3.77$, $p < .001$), whereas conservatives were equally morally convicted about carbon emissions and the control issue ($B = .15$, $SE = .31$, $t(524) = .47$, $p = .64$, see Figure 2). Liberals were also more morally convicted about nuclear power than the control issue ($B = 1.21$, $SE = .25$, $t(524) = 4.91$, $p < .001$), whereas conservatives were also equally morally convicted about nuclear power and the control issue ($B = -.33$, $SE = .30$, $t(524) = -1.12$, $p = .26$, see Figure 2). In summary, levels of moral conviction about the issues did not conform to the expected ideological patterns, and both

liberals and conservatives moralized each of the issues more or less equally (except for nuclear power where liberals were more morally convicted than conservatives, $t(536) = 3.91, p < .001$).

Because the expected ideological moral conviction patterns for the issues were not found, type of issue was left as dummy coded for all further analyses, rather than breaking issues into the assumed types.

TABLE II
REGRESSION RESULTS FOR DUMMY CODED ISSUE, POLITICAL ORIENTATION,
AND THEIR INTERACTION PREDICTING MORAL CONVICTION

Predictors	Model 1		Model 2		Model 3	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Gun control	1.28***	.19	1.30***	.19	1.21***	.19
Carbon emissions	.65**	.20	.67**	.20	.57**	.20
Nuclear power	.55**	.19	.57**	.19	.44*	.19
Same-sex marriage	1.77***	.19	1.78***	.19	1.70***	.19
Health care	1.37***	.19	1.38***	.19	1.29***	.19
Immigration	1.16***	.19	1.19***	.19	1.09***	.19
Political orientation			-.05*	.02	.10	.06
Gun control X Political orientation					-.13	.08
Carbon emissions X Political orientation					-.18*	.09
Nuclear power X Political orientation					-.32***	.08
Same-sex marriage X Political orientation					-.12	.08
Health care X Political orientation					-.15	.08
Immigration X Political orientation					-.11	.08
ΔR^2	.18***		.01*		.03**	

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

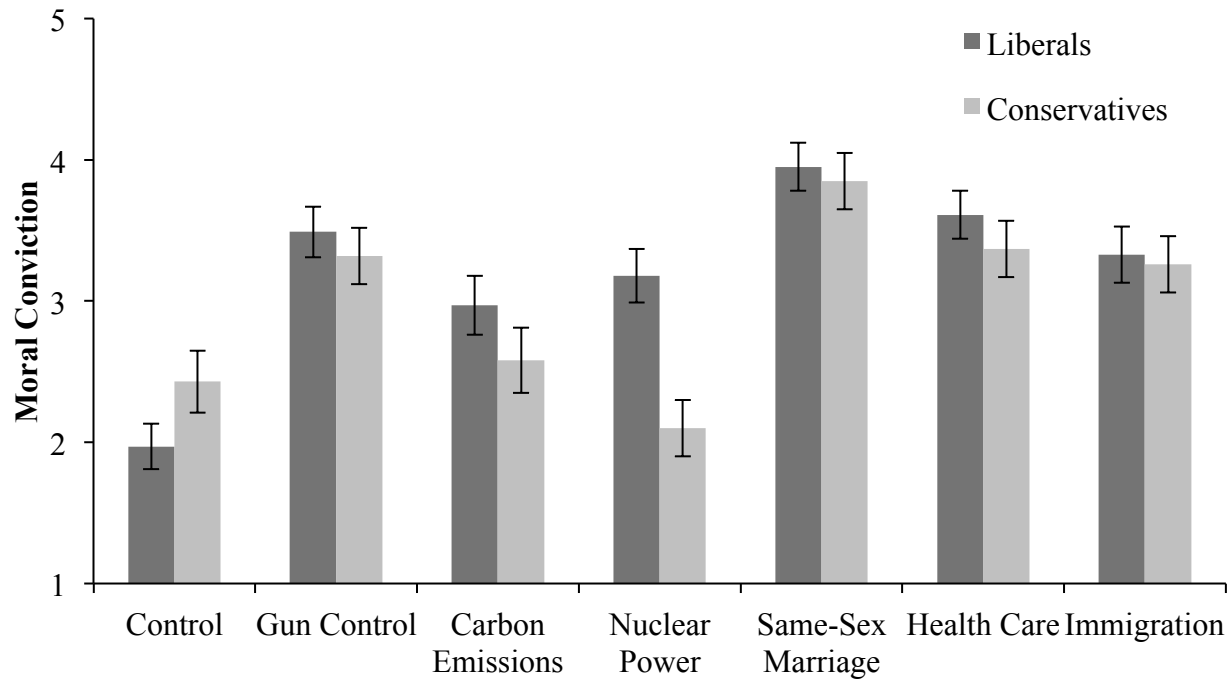


Figure 2. Moral conviction as a function of issue and political orientation. Liberals are 1 SD below the midpoint and conservatives are 1 SD above the midpoint of political orientation. Error bars represent standard error of the mean.

3.2 Dispositional and Motivated Reasoning Hypotheses

According to the *dispositional hypothesis*, conservatives are dispositionally inclined to deny attitude inconsistent science more than liberals across all contexts. In contrast, the *motivated reasoning hypothesis* is that morally motivated liberals and conservatives are equally likely to deny scientific evidence at odds with their preferred ideological conclusions. To test these hypotheses, a series of hierarchical regression models for both the binary interpretation of results “motivated reasoning” dependent variable and the continuous “science denial” dependent variable were conducted. Results were inconsistent with the *dispositional hypothesis* and were instead consistent with a soft version of the *motivated reasoning hypothesis*.

3.2.1 **Motivated Reasoning**

If the *dispositional hypothesis* is true, we should have observed a significant interaction between political orientation and results condition. According to this view, conservatives should have been more motivated than liberals to interpret results in a way that supported their preferred conclusions, including, if necessary, engaging in greater cognitive effort to reach their preferred conclusions. In contrast, if the *motivated reasoning hypothesis* is true, we should have observed a four-way interaction between issue, results condition, political orientation, and moral conviction because the effect of attitude consistency on the interpretation of the results for liberals and conservatives should depend the type of issue under consideration and how morally convicted liberals or conservatives are about that issue. More specifically, both liberal and conservative participants should have been motivated to interpret the results in attitudinally consistent ways for the issues they are strongly morally convicted about.

To test these competing hypotheses, a hierarchical logistic regression was conducted predicting interpretation of the scientific results (dummy coded: 1 = *correct interpretation*, 0 = *incorrect interpretation*) with dummy coded issue, results condition (dummy coded: 1 = *inconsistent*, 0 = *consistent*), political orientation, and moral conviction entered in step 1, all two-way interactions in step 2, all three-way interactions in step 3, and the four-way interaction in step 4.

As stated earlier, the *dispositional hypothesis* and *motivated reasoning hypothesis*, strictly defined, were not supported. There was a main effect of results condition, that is, whether the deliberative interpretation of the results was consistent or inconsistent with the participants' attitudes. Participants assigned to the inconsistent results conditions were about half as likely to engage in the deliberative strategy and correctly interpret the results than those in the consistent

results conditions, $B = -.56$, $SE = .18$, Wald $\chi^2(1) = 9.75$, $p = .002$, $\text{Exp}(B) = .57$ (see Table III and Figure 3). Adding the two-way, three-way, and four-way interactions did not improve model fit, $\chi^2(21) = 15.44$, $p = .80$, $\chi^2(19) = 22.62$, $p = .25$, and $\chi^2(6) = 7.76$, $p = .26$, respectively. Therefore, the effect of results consistency on interpretation of the scientific data did not depend on the type of issue, political orientation, level of moral conviction, or any combination of the three. Instead, participants were more likely to engage in a cognitively effortful deliberative strategy to correctly interpret the results of the study only when the first pass heuristic interpretation of the results was inconsistent with their preferred conclusion. These results most closely fit a softer version of the motivated reasoning hypothesis—people are motivated to interpret science as supporting their preferred conclusions and will engage in cognitively effortful strategies to do so. However, this motivation is not necessarily moral.

TABLE III

LOGISTIC REGRESSION RESULTS FOR DUMMY CODED ISSUE, RESULTS CONDITION, POLITICAL ORIENTATION, MORAL CONVICTION, AND ALL INTERACTIONS PREDICTING INTERPRETATION OF RESULTS

Predictors	Model 1			Model 2			Model 3			Model 4		
	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)
Gun control	.50	.34	1.66	.37	.51	1.45	.50	.53	1.65	.50	.53	1.65
Carbon emissions	.81*	.35	2.25	1.05*	.51	2.87	1.13*	.52	3.09	1.20*	.54	3.32
Nuclear power	.39	.33	1.47	.55	.52	1.73	.93	.57	2.55	.68	.57	1.97
Same-sex marriage	.02	.36	1.02	-.02	.50	.98	-.26	.57	.77	-.21	.55	.81
Health care	.18	.34	1.19	-.07	.49	.94	-.02	.51	.98	-.03	.51	.97
Immigration	.54	.34	1.72	.68	.50	1.97	.84	.53	2.33	.80	.54	2.23
Results condition	-.56**	.18	.57	-1.24*	.55	.29	-1.08	.76	.34	-1.05	.72	.35
Political orientation	-.02	.04	.99	-.21	.13	.81	-.05	.17	.95	-.07	.18	.93
Moral conviction	-.03	.07	.97	.03	.22	1.03	-.02	.27	.98	-.02	.27	.98
Gun control X Results				1.01	.73	2.73	.68	.90	1.97	.63	.87	1.88
Carbon emissions X Results				.14	.76	1.14	.11	.95	1.12	-.17	.96	.84
Nuclear power X Results				.34	.73	1.41	-.16	.94	.86	.26	.94	1.29
Same-sex marriage X Results				.94	.79	2.57	1.32	1.02	3.75	1.39	.97	4.01
Health care X Results				1.08	.74	2.95	.96	.92	2.61	.83	.90	2.30
Immigration X Results				.57	.74	1.76	.14	.94	1.15	.09	.91	1.10
Gun control X Political orientation				.29	.16	1.33	.15	.23	1.16	.16	.24	1.17
Carbon emissions X Political orientation				.25	.17	1.28	.03	.23	1.03	.03	.24	1.03
Nuclear power X Political orientation				.31	.17	1.36	.19	.24	1.21	.21	.24	1.24
Same-sex marriage X Political orientation				.29	.17	1.34	-.10	.24	.91	-.01	.24	.99
Health care X Political orientation				.24	.16	1.28	.05	.25	1.06	-.05	.27	.95
Immigration X Political orientation				.33*	.17	1.39	.40	.25	1.49	.41	.25	1.50
Gun control X Moral conviction				.19	.30	1.21	-.01	.46	.99	-.02	.45	.99
Carbon emissions X Moral conviction				.10	.30	1.11	-.06	.41	.95	-.06	.43	.95
Nuclear power X Moral conviction				.07	.29	1.07	.18	.42	1.20	.23	.41	1.26
Same-sex marriage X Moral conviction				.08	.29	1.08	.40	.40	1.49	.37	.39	1.45
Health care X Moral conviction				.22	.29	1.25	.30	.38	1.34	.34	.38	1.41
Immigration X Moral conviction				.05	.30	1.05	.09	.42	1.09	.11	.42	1.12

Results X Political orientation	-.13	.08	.88	-.33	.26	.72	-.25	.29	.78
Results X Moral conviction	-.32*	.16	.73	-.11	.46	.90	-.05	.46	.95
Political orientation X Moral conviction	-.01	.03	.99	.17	.10	1.18	.13	.12	1.14
Gun control X Results X Political orientation				.27	.34	1.31	.22	.36	1.24
Carbon emissions X Results X Political orientation				.32	.37	1.37	.12	.42	1.13
Nuclear power X Results X Political orientation				.14	.35	1.15	.14	.38	1.15
Same-sex marriage X Results X Political orientation				.60	.36	1.83	.29	.42	1.34
Health care X Results X Political orientation				.41	.37	1.50	.49	.41	1.64
Immigration X Results X Political orientation				-.20	.37	.82	-.25	.39	.78
Gun control X Results X Moral conviction				.15	.65	1.16	.09	.65	1.09
Carbon emissions X Results X Moral conviction				.24	.62	1.27	.11	.66	1.12
Nuclear power X Results X Moral conviction				-.32	.63	.72	-.32	.63	.73
Same-sex marriage X Results X Moral conviction				-.69	.66	.50	-.83	.65	.44
Health care X Results X Moral conviction				-.24	.62	.78	-.36	.63	.70
Immigration X Results X Moral conviction				-.28	.66	.75	-.33	.67	.72
Gun control X Political orientation X Moral conviction				-.21	.14	.81	-.13	.21	.88
Carbon emissions X Political orientation X Moral conviction				-.05	.14	.96	.13	.19	1.14
Nuclear power X Political orientation X Moral conviction				.01	.13	1.01	-.11	.18	.90
Same-sex marriage X Political orientation X Moral conviction				-.06	.13	.94	-.08	.16	.93
Health care X Political orientation X Moral conviction				-.21	.15	.82	-.06	.19	.94
Immigration X Political orientation X Moral conviction				-.19	.16	.82	-.10	.24	.91
Results X Political orientation X Moral conviction				-.15*	.08	.86	-.06	.19	.94
Gun control X Results X Political orientation X Moral conviction							-.16	.28	.85
Carbon emissions X Results X Political orientation X Moral conviction							-.41	.29	.67
Nuclear power X Results X Political orientation X Moral conviction							.17	.26	1.19
Same-sex marriage X Results X Political orientation X Moral conviction							.11	.28	1.11
Health care X Results X Political orientation X Moral conviction							-.37	.31	.69
Immigration X Results X Political orientation X Moral conviction							-.20	.33	.82
Δ-2 Log likelihood	720.97*	-15.44			-22.62			-7.76	

Note. * $p < .05$. ** $p < .01$.

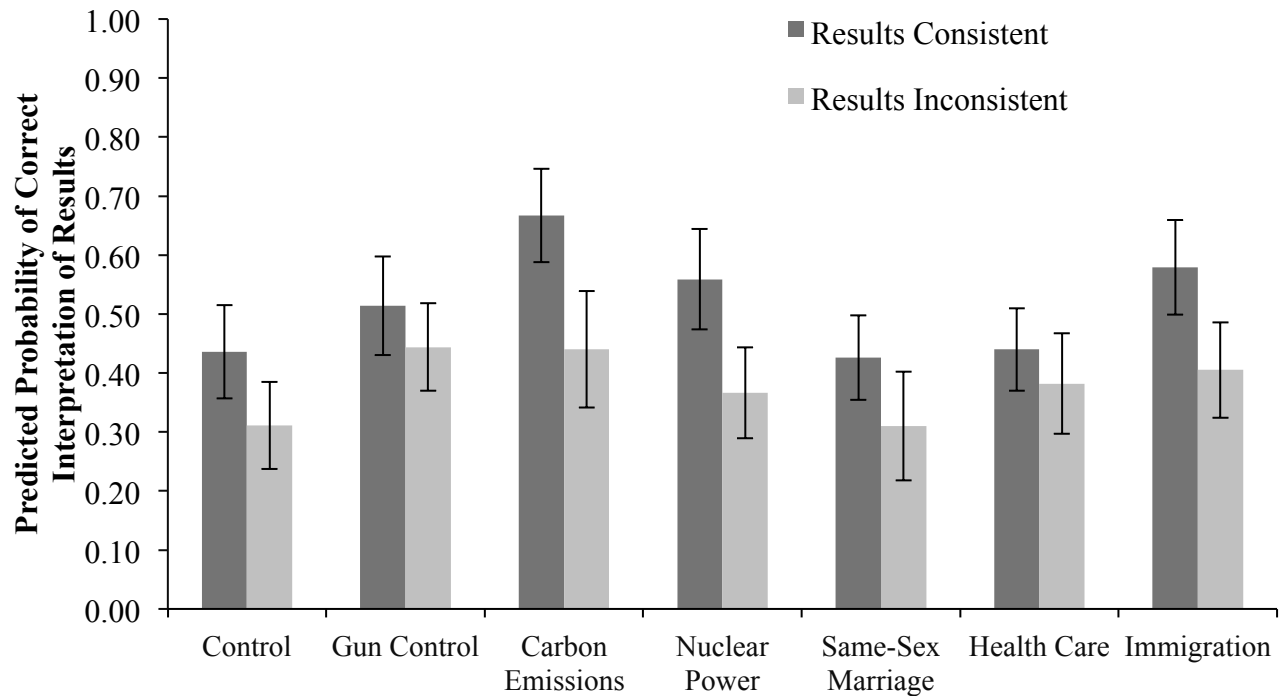


Figure 3. Predicted probability of correct interpretation of results as a function of issue and attitude consistency. Error bars represent standard error of the mean.

3.2.2 Science Denial

If the *dispositional hypothesis* is true, we should have observed a significant interaction between political orientation and results condition. More specifically, conservatives, but not liberals, should have been more likely to exhibit science denial when study results conflicted with their preferred conclusion. If the *motivated reasoning hypothesis* is true, however, we should have observed a four-way interaction between issue, results condition, political orientation, and moral conviction because the effect of attitude consistency on science denial for liberals and conservatives should depend the type of issue under consideration and how morally convicted liberals or conservatives are about that issue. More specifically, both liberal and

conservative participants who were presented with attitude inconsistent data should have denied the science for the issues they were strongly morally convicted about.

To test these competing hypotheses regarding science denial, the same analyses for the science denial dependent variable were conducted as were for the motivated reasoning variable. Because the science denial dependent variable was continuous, a hierarchical linear regression, rather than logistic regression, was used to predict science denial with dummy coded issue, results condition (dummy coded: 1 = *inconsistent*, 0 = *consistent*), and political orientation entered in step 1, all two-way interactions in step 2, and the three-way interaction between issue, results, and political orientation in step 3.⁶

The results indicated some support for the *motivated reasoning hypothesis* and no support for the *dispositional hypothesis*. There was a main effect for results condition where people engaged in greater science denial when the deliberative interpretation of the results of the study was inconsistent rather than consistent with their attitude, $B = .35$, $SE = .12$, $t(529) = 3.06$, $p = .002$ (see Table IV, Model 1). However, political orientation and issue slightly moderated this attitude consistency effect. Even though the three-way interaction between issue, results condition, and political orientation was significant ($\Delta R^2 = .03$, $p = .03$, see Table IV, Model 3), none of the simple two-way interactions between results condition and political orientation were significant except for the issues of same-sex marriage ($B = -.31$, $SE = .17$, $t(510) = -1.83$, $p = .07$) and immigration ($B = .30$, $SE = .18$, $t(510) = 1.63$, $p = .10$), which were both marginally significant. Liberals reported more science denial when the correct interpretation of the results

⁶ The four-way interaction between issue, results condition, political orientation, and moral conviction was significant ($\Delta R^2 = .02$, $p = .04$). Because it only explained an additional 2% of the variance in the model and none of the individual predictors (the simple three-way interactions between results condition, political orientation, and moral conviction for each issue) were significant, it was treated as not being meaningful.

for same-sex marriage (compared to control condition) was inconsistent than consistent with their attitude, $B = 1.61$, $SE = .52$, $t(510) = 3.10$, $p = .002$, but there was no effect for consistency for conservatives in this condition, $B = .12$, $SE = .66$, $t(510) = .18$, $p = .86$ (see Figure 4).

However, conservatives exhibited greater science denial when the correct interpretation of the results for immigration (compared to control condition) was inconsistent than consistent with their attitude, $B = 1.45$, $SE = .64$, $t(510) = 2.25$, $p = .03$, but there was no effect for consistency for liberals in this condition, $B = .02$, $SE = .57$, $t(510) = .04$, $p = .97$ (see Figure 4).

These results suggest that political orientation played a small role in moderating the influence of attitude consistency on science denial for the issues of same-sex marriage and immigration. Liberals were more motivated to deny science for same-sex marriage when that science conflicted with their preferred conclusion. Conservatives, however, were more motivated to deny science for immigration for the same reason. Despite these findings, most of the issues were unaffected by political stance and the majority of the science denial appears to be a result of attitude inconsistency—people were primarily motivated to deny scientific claims that conflicted with their attitudes, regardless of the issue under consideration or their political orientation.

TABLE IV
 REGRESSION RESULTS FOR DUMMY CODED ISSUE, RESULTS CONDITION,
 POLITICAL ORIENTATION, AND ALL INTERACTIONS PREDICTING SCIENCE
 DENIAL

Predictors	Model 1		Model 2		Model 3	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Gun control	-.02	.21	-.27	.31	-.32	.31
Carbon emissions	-.13	.22	-.67*	.30	-.66*	.30
Nuclear power	.16	.21	-.19	.31	-.20	.31
Same-sex marriage	.48*	.21	-.07	.29	-.02	.28
Health care	.07	.20	-.16	.28	-.15	.28
Immigration	.15	.21	-.28	.30	-.31	.30
Results condition	.35**	.12	-.23	.29	-.22	.29
Political orientation	.004	.02	.07	.07	.05	.10
Gun control X Results			.44	.41	.49	.42
Carbon emissions X Results			1.06*	.44	1.02*	.45
Nuclear power X Results			.53	.43	.50	.43
Same-sex marriage X Results			1.04*	.42	.86*	.43
Health care X Results			.30	.41	.28	.42
Immigration X Results			.74†	.42	.74†	.42
Gun control X Political orientation			-.002	.09	-.08	.14
Carbon emissions X Political orientation			-.07	.10	-.02	.13
Nuclear power X Political orientation			-.20*	.09	-.14	.13
Same-sex marriage X Political orientation			-.10	.09	.02	.12
Health care X Political orientation			-.04	.09	-.02	.12
Immigration X Political orientation			-.05	.09	-.20	.13
Results X Political orientation			.001	.05	.03	.13
Gun control X Results X Political orientation					.13	.18
Carbon emissions X Results X Political orientation					-.11	.20
Nuclear power X Results X Political orientation					-.10	.18
Same-sex marriage X Results X Political orientation					-.31†	.17
Health care X Results X Political orientation					-.04	.18
Immigration X Results X Political orientation					.30†	.18
ΔR^2		.03*		.03		.03*

Note. † $p < .11$. * $p < .05$. ** $p < .01$.

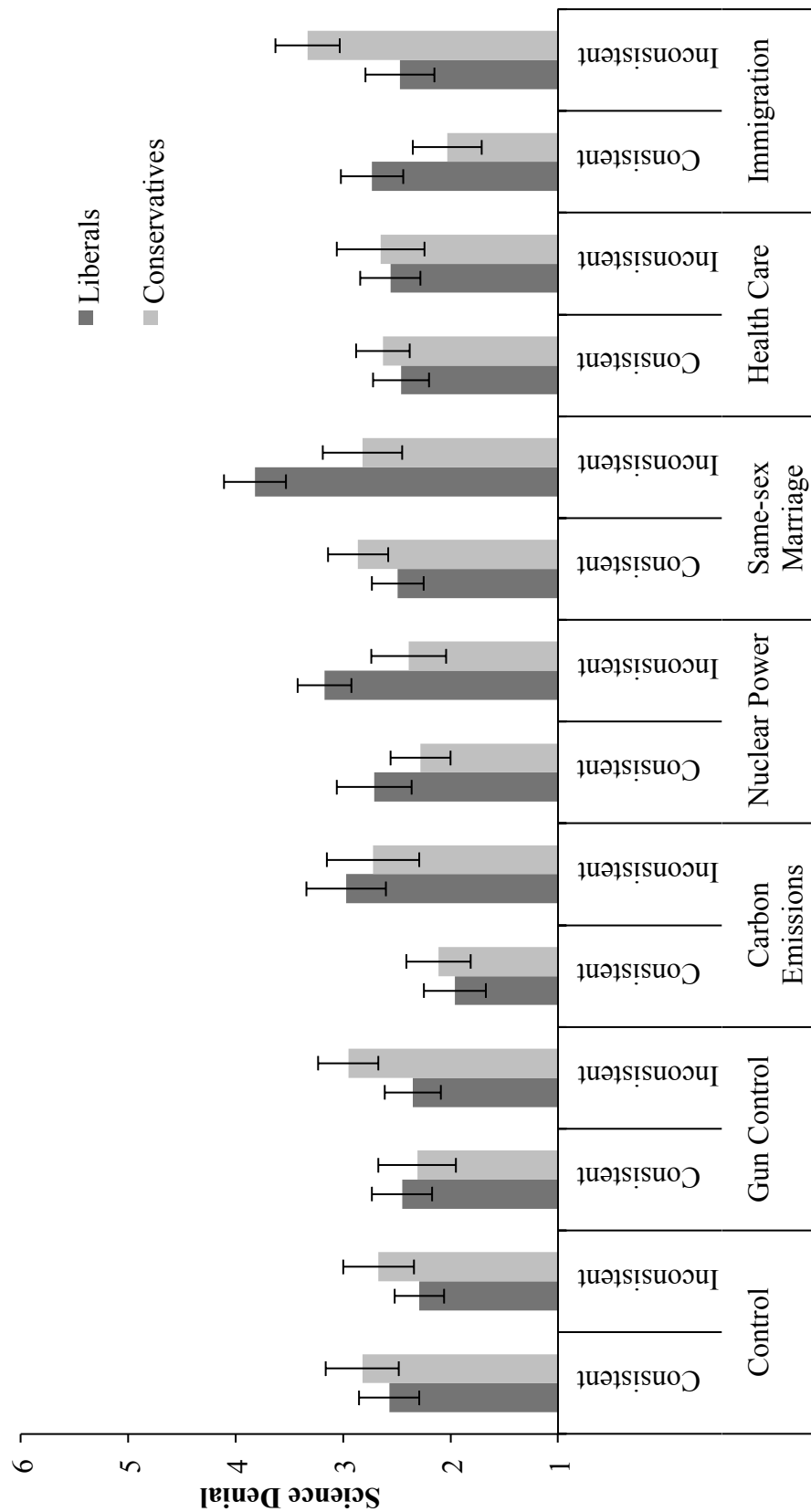


Figure 4. Science denial as a function of issue, attitude consistency, and political orientation. Liberals are 1 SD below the midpoint and conservatives are 1 SD above the midpoint of political orientation. Error bars represent standard error of the mean.

3.3 Motivated Reasoning and Science Denial

The results of the current study have so far indicated that both motivated reasoning (motivated interpretation of scientific data) and science denial (discrediting the correct interpretation of scientific data) were mostly a result of attitude inconsistency. People were motivated to either take the easy first pass (heuristic strategy) interpretation or engage in effortful processing (deliberative strategy) to reach a conclusion about the study that fit with their preferred conclusions. When scientific conclusions were inconsistent with one's position on a given issue, people were less likely to correctly interpret the results because the heuristically derived conclusion fit with their attitude stance. The motivation to rely on the heuristic strategy, and therefore incorrect interpretation, could have in turn led to greater science denial for the correct interpretation. I therefore tested whether the effect of attitude inconsistency on science denial was explained by motivated use of the heuristic reasoning strategy—the *motivated denial hypothesis*. If science denial is explained by motivated reasoning, then the incorrect interpretation of the results (use of heuristic strategy compared to deliberative strategy) should have mediated the relationship between results condition and science denial. In other words, people should have denied attitude inconsistent science because they were motivated to incorrectly interpret the information in a way that fit with their attitudes. The results indicated strong support for the *motivated denial hypothesis*.

To test this mediation hypothesis, science denial was first regressed on results condition. Whether the deliberative interpretation was consistent versus inconsistent with the participants' attitudes significantly predicted science denial. Participants in the inconsistent condition exhibited greater science denial than those in the consistent condition, $B = .33$, $SE = .11$, $t(536) = 2.93$, $p = .003$, $\Delta R^2 = .02$. The dichotomous interpretation variable was then regressed on results

condition. Whether the deliberative interpretation was consistent or inconsistent with the participants' attitudes also significantly predicted interpretation of the data. Participants in the inconsistent condition were less likely to correctly interpret the data (more likely to use the heuristic interpretation strategy) when the deliberative interpretation of the results was inconsistent versus consistent with their attitude, $B = -.54$, $SE = .18$, Wald $\chi^2(1) = 9.36$, $p = .002$, $\text{Exp}(B) = .59$. Science denial was then regressed on the dichotomous interpretation variable and results condition simultaneously. Correctly interpreting the data (relying on the deliberative interpretation strategy) significantly predicted science denial, $B = -1.04$, $SE = .11$, $t(535) = -9.85$, $p < .001$, $\Delta R^2 = .16$. When participants relied on the heuristic interpretation strategy, they were more likely to engage in science denial for the correct interpretation of the results. When controlling for whether the data was correctly interpreted, participants in the inconsistent condition did not exhibit greater science denial than those in the consistent condition, $B = .20$, $SE = .11$, $t(535) = 1.86$, $p = .06$, $\Delta R^2 = .01$ (see Figure 5). The drop in significance of the direct effect of results condition on science denial when controlling for interpretation of the data was significant via the Sobel test, $z = 2.86$, $p = .004$. Therefore, motivated interpretation of results fully mediated the relationship between attitude inconsistency and science denial. Science denial in this context was fully explained by the fact that people who were motivated to use the heuristic interpretation strategy and therefore incorrectly interpret the study results were then also motivated to engage in science denial for the correctly interpreted results.

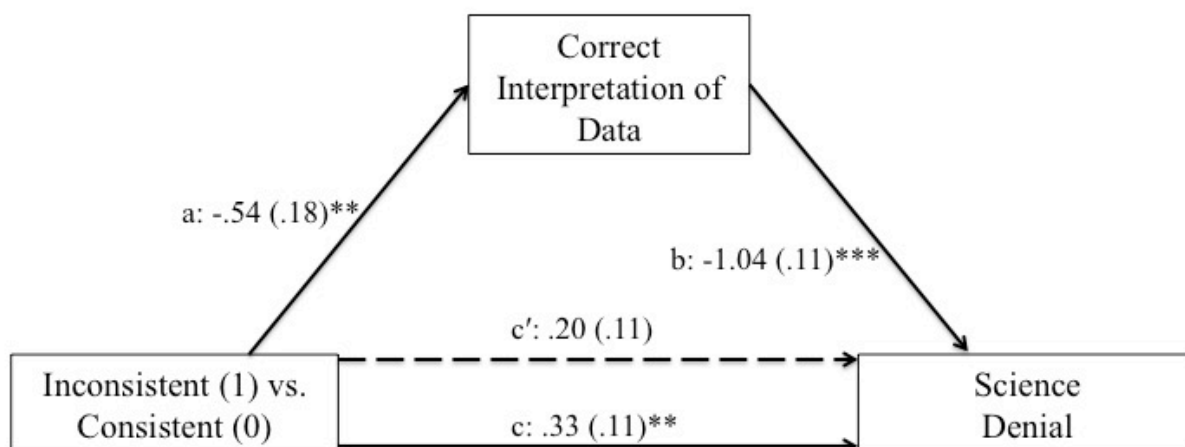


Figure 5. Mediation analysis of the effect of results consistency on science denial through motivated reasoning (interpretation of data). Numbers represent unstandardized regression coefficients (*SE*). Path *c* represents the total effect of the independent variable on science denial; Path *c'* represents the direct effect of results consistency on science denial controlling for motivated reasoning.

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

4. DISCUSSION

The original goal of the current study was to experimentally test whether moral conviction about a given issue serves as a motivator of science denial when it conflicts with one's preferred conclusions, and whether motivated denial of science is equally or differentially likely for both liberals and conservatives. The current study tested whether people who feel more morally convicted about an issue (e.g., climate change) were more likely than those low in moral conviction to interpret scientific evidence in ideologically consistent ways both when the evidence countered their ideologically preferred conclusions (e.g., for liberals—climate change regulations increase instead of decrease CO₂ emissions) and when it affirmed their preferred conclusions (the converse). I tested two hypotheses: 1) the *dispositional hypothesis*, which is that conservatives are dispositionally inclined to deny attitude inconsistent science more than liberals across all contexts, and 2) the *motivated reasoning hypothesis*, which is that morally motivated liberals and conservatives are equally likely to deny scientific evidence at odds with their preferred ideological conclusions.

The results from the current study supported a qualified version of the motivated reasoning hypothesis. Across almost all of the issues, people on both the left and the right of the political spectrum were more likely to misinterpret the results of a target study (i.e., rely on a heuristic strategy rather than a deliberative strategy) when the correct interpretation of those results conflicted with their attitude stance on the issue. At the same time, participants were motivated to engage in a more effortful deliberative interpretation process when the heuristic interpretation of the data provided attitude inconsistent conclusions (i.e., those in the “results consistent” conditions). Taken together, these results suggest that participants were motivated to interpret scientific information in ways consistent with their preferred conclusions and were

willing to use either heuristic or deliberative cognitive strategies to do so. Additionally, both liberals and conservatives were also more likely to deny the scientific credibility of the results when the correct interpretation of the data conflicted with their attitudes. The likelihood of interpreting the data in an attitude consistent way mediated the effect of attitude inconsistency on science denial. When provided with scientific results that conflicted with their attitudes for any given issue, participants were more likely to engage in a heuristic processing strategy leading to the incorrect interpretation, and those who incorrectly interpreted the results were in turn, more willing to deny the scientific credibility of the researchers involved with the target study (support for the *motivated denial hypothesis*). However, unexpectedly, the motivated interpretation of results and rejection of attitude inconsistent science were not motivated by participants' level of moral conviction on the issue—people who felt both high and low moral conviction about a given issue were equally likely to interpret results in attitudinally consistent ways, even when it required additional cognitive effort, and this kind of motivated reasoning was also associated with science denial when results were at odds with both liberals' and conservatives' preferred conclusions. These results point to some interesting conclusions about the role of moral conviction and political ideology in motivated rejection of science and suggest some fruitful avenues for further exploration, subjects I turn to next.

4.1 **Moral Conviction and Motivated Rejection of Science**

One surprising result of the current study is that moral conviction associated with social issues did not play a role in the motivated interpretation of results or in science denial. I expected motivated reasoning and science denial to be particularly strong for those who were highly morally convicted about the issue at hand because moral convictions serve as inherent motivational guides for behavior and reasoning (see Skitka, 2013 for a review). However, the

likelihood of correctly interpreting the results and rejecting the science were both mostly driven by whether the results were consistent or inconsistent with one's attitude stance on the issue. Participants interpreted the data correctly and engaged in the deliberative interpretation strategy when the heuristic interpretation strategy provided an answer that was at odds with their preferred conclusion. However, when the heuristic strategy fit with their preferred conclusion, participants were willing to stick with that (incorrect) answer instead of engage in further cognitive processing to reach the correct conclusion. As a result, participants motivated to endorse the heuristically derived conclusions were also willing to reject the science behind the researchers' correct interpretation of the results.

Although one must always be careful when interpreting null effects, the current study was adequately powered (observed power was .88) to detect even a small moderating effect (explaining at least 3% of the variance) of moral conviction, if one was present. Therefore, I can be more confident that moral conviction did not play a meaningful role in motivated rejection of science. The lack of an effect of moral conviction may have occurred because the issues used in this study were already "hot-button" political issues (e.g., same-sex marriage and gun control). Political attitudes are sometimes viewed as possessions that need to be protected (e.g., Abelson & Prentice, 1989) and because people often invest a lot of effort into forming their attitudes, they are extra vigilant of conflicting information and tend to trust their own attitudes more than new evidence, especially when that evidence supports one's political opponent. Therefore, being morally convicted about political attitudes may not provide enough further motivation noticeable beyond the motivation to seek out attitude consistent information and be skeptical of attitude inconsistent information.

Similarly, people may have been more motivated to engage in science denial because of self or group interests, rather than challenges to their moral beliefs. Most of the issues used in this study all have clear partisan stances (e.g., conservatives opposed to and liberals supportive of gun control). Therefore, participants who identify as liberal or conservative know which stance they are “supposed” to take on each issue and may be motivated to interpret scientific information in ways that are in line with the party’s stance to maintain positive status within the group. Additionally, making an incorrect interpretation of the scientific results in service of the groups’ beliefs or goals has almost no negative consequence in terms of that person’s standing within the group. However, if one were to correctly interpret scientific information in a way that conflicted with their groups’ beliefs, the consequences could be quite detrimental (e.g., loss of trust within the group, Kahan, 2012). Therefore, because partisans were likely to be aware of their political groups’ stances on the issues in question, they may have been sufficiently motivated to seek ideologically congruent scientific information regardless of whether they had strong or weak moral convictions about these issues.

In sum, people seem to rely on their ideologically preferred conclusions as guides for interpretation of scientific information. However, knowing whether political attitudes are moral does not add any explanatory power for the motivated reasoning or science denial phenomena over and above knowing whether scientific information is attitudinally consistent or inconsistent. Both the low and high morally convicted appear to be sufficiently motivated to interpret scientific evidence in a matter consistent with their preferred conclusions and to engage in science denial for attitude inconsistent scientific findings. Additionally, adhering to one’s preferred conclusions in the face of objective scientific truth appears to not only be insensitive to one’s moral beliefs but also insensitive to one’s political orientation, a point I turn to next.

4.2 **Ideological Symmetry in Motivated Rejection of Science**

The most interesting and informative results from the current research is the finding that there is overwhelming symmetry between liberals and conservatives when it comes to motivated interpretation and rejection of science. Despite having adequate power to detect a small moderating effect (observed power was .88) of political orientation on science denial, no meaningful simple interactions between issue, attitude consistency, and political orientation were observed. In recent years, conservatives have been pegged as the anti-science constituency mainly because of their unwillingness to agree with the scientific consensus regarding climate change and global warming (e.g., Dunlap, 2008). However, as the current research and other recent research (e.g., Lewandowsky et al., 2013; Kahan et al., 2013) suggest, motivated rejection of scientific information appears to be a strategy employed by people on both sides of the political spectrum. For example, Nyhan and Reifler (2010) found that when people are faced with factual contradictions to their prior beliefs, they become even more committed to their preferred conclusions and engage in motivated dismissal of the attitudinally inconsistent evidence. Similarly, Kahan and colleagues (2013) found convincing evidence of ideological symmetry in motivated interpretation of fabricated study results in the domain of gun control, but did not test whether motivated reasoning was related to evaluations of the science itself. In the current research I posited motivated reasoning as an explanation for why people may engage in science denial. People seek out attitudinally consistent information and will even engage in biased cognitive strategies to fit inconsistent information to their beliefs and as a result are motivated to deny the credibility of those providing the contrary evidence. Moreover, the current research established that motivated reasoning is in fact the motivational underpinning of explicit science denial.

The current research replicated the motivated reasoning findings across several more political issues (not just gun control) and extends prior research by exhibiting that people are not only motivated to interpret scientific data as consistent with their prior beliefs, they are also motivated to deny the scientific rigor of research when informed that the data is in fact at odds with their preferred conclusions. For almost all issues, liberals and conservatives were equally likely to interpret data in an attitudinally consistent way, whether that meant taking the cognitively easy way out (and getting the interpretation wrong) because the heuristic strategy result fit with their attitudes or engaging in effortful processing (and getting the interpretation right) because the heuristic strategy result conflicted with their attitudes. Additionally, liberals and conservatives were also equally likely to engage in science denial for the correct interpretation of the results when told that their heuristic interpretation was incorrect. Therefore, although the influence of political orientation on science denial cannot be completely ruled out, the burden of proof shifts to those who would characterize conservatives as being more anti-science than liberals (see Greenwald, 1975, on the power of null hypothesis results to shift burdens of proof). Instead of making dispositional claims that conservatives are always anti-science or that liberals are always pro-science, it may be more advantageous to consider the motivational forces at work when people evaluate the credibility and/or utility of specific scientific claims.

Similar to research on ideological differences and similarities in attributions for others' behavior (e.g., Morgan et al., 2010), the current research suggests that it may not necessarily be the science per se that is rejected but the implications of what that scientific evidence means and how those implications fit with one's preferred conclusions. For example, science denial may not stem from actual rejection of the science itself, but from an aversion to the solutions the science

seems to imply instead (Campbell & Kay, 2014). Conservatives may be perfectly willing to believe the scientific evidence regarding climate change, but are ideologically opposed to the proposed solutions to combat global warming—proposals that usually involve governmental restriction of free enterprise (Jacques, 2006). Therefore, conservatives may appear to be more anti-science at times because the issues that are commonly discussed in the media are the ones that conservatives are motivated to reject (e.g., climate change) and because they may be especially motivated to avoid the solutions that are logically tied to accepting the problems that the science identifies (Campbell & Kay, 2014).

My results suggest that liberals are just as skeptical of scientific information that conflicts with their preferred conclusions, and may also be motivated to avoid the solutions that accepting non-preferred scientific conclusions would imply. As mentioned earlier, liberals question the environmental safety of hydraulic fracturing or “fracking” more than conservatives, despite evidence that fracking does not have any detrimental consequences on the surrounding natural environment (e.g., drinking water) (Mooney, 2012; Pew Research Center, 2012a).⁷ All people appear to be susceptible to motivated reasoning, especially when important social identities (political or otherwise) are particularly salient. For example, strongly identified group members (i.e., people highly identified as being a video “gamer”) were more likely than weakly identified members to discredit identity-threatening scientific findings (i.e., a study suggesting playing violent video games leads to aggression) via engaging in online collective denigration of the scientific results (Nauroth, Gollwitzer, Bender, & Rothmund, 2015). If highly identified video game enthusiasts can be motivated to engage in science denial for identity threatening science,

⁷ Again, there is more recent evidence that fracking is responsible for seismic activity in certain areas of the country (Ellsworth, 2013; Keranen et al., 2014). However, it is still the case that liberals, prior to the earthquake evidence, were denying the science behind fracking more so than conservatives.

then it stands to reason that strongly identified political liberals and conservatives can also be motivated to deny scientific information that is viewed as threatening their group's values.

In fact, science denial in response to identity threat could be a fruitful area for future research. People might be more willing to deny scientific evidence if that evidence counters a core tenet of their political identity. For example, if a conservative bases his conservative identity around strongly supporting second amendment rights, then scientific evidence which suggests that gun bans effectively reduce crime could be perceived as more threatening to his identity than to another conservative who centers his political identity around his stance on immigration issues. Therefore, if science denial is a strategy for alleviating identity threat (e.g., Nauroth et al., 2015), it may be even stronger in domains where partisans attach their issue stance to their political identity. Additionally, the initial evidence of science denial in response to identity threat implies that affirming one's identity might attenuate people's need to engage in denial of identity-threatening science. Future research that manipulates how threatening or affirming scientific conclusions are to one's core political identity would be an interesting and potentially informative area of investigation to follow up the insights gained from the current research.

4.3 **Strengths and Limitations**

The current research advances understanding in the areas of science denial and political ideology. Although much research has examined science denial within a narrow range of contexts (e.g., climate change and evolution—notably issues where conservative values are particularly threatened by the science), until now relatively little was known about scientific acceptance and denial for other important issues, including those that could challenge liberal values. The current research widens the scope of targets of science denial and provides insight that science denial can occur in new settings that have not previously been explored (i.e., pros

and cons of immigration and same-sex marriage). A major strength of the current research is that it adds to the growing literature that suggests that liberals and conservatives are actually psychologically more alike than they are different (e.g., Skitka & Washburn, in press). Highlighting that liberals as well as conservatives are likely to engage in motivated denial of scientific evidence—and for similar reasons—demonstrates that the same motivational processes underlie differences in the political priorities of those on the left and the right and provide an avenue for greater understanding between political foes.

Another major strength of the current research is that we were able to experimentally control the motivation to interpret the results of the target studies. By giving participants the exact same numbers to interpret, and only changing the labeling of the columns associated with an increase or decrease in the particular consequences associated with the issue (e.g., gun ban results in increase in crime vs. decrease in crime), we were able to see how people interpret the actual data behind the scientific claims rather than simply asking people to provide their opinion about the study. Because people can easily come up with reasons to discredit a study when the interpretation of the results is already given, asking people to provide their own interpretation of objective data provides a clean and clear measure of motivated reasoning. The participants were allowed to interpret the raw data however they saw fit. After being shown the correct way to interpret the results of the study, participants in the inconsistent conditions were still more likely than those in the inconsistent conditions to find the researchers involved with the study less knowledgeable and trustworthy despite having all of the information and the correct way to interpret it in front of them.

Another strength of the current research is that we were able to recruit an equal number of conservatives and liberals to participate in this study. Therefore, our operationalization of

political orientation more accurately reflected actual liberal and conservative stances due to the normal distribution of political orientation scores. Oftentimes research on political ideology is plagued with a liberal sampling bias where comparing liberals and conservatives actually looks more like comparing strong liberals and weak liberals or moderates (see Berinsky et al., 2012 for discussion). Additionally, as discussed earlier, because we had a normal distribution of political orientation scores, we were able maintain adequate power in our analyses to detect any possible effects moderated by political orientation. In sum, the current research revealed a number of insights into motivated reasoning and motivated rejection of attitude inconsistent science. However, there are also further areas of inquiry worth exploring that the current research was not able to explicitly address.

4.4 **Future Directions**

The current research suggests that both liberals and conservative are equally likely to engage in science denial when the scientific evidence conflicts with their preferred conclusions. However, there are many additional areas of exploration that could fruitful avenues for further research. For example, liberals and conservatives may be differentially attuned to different types of consensus information when making decisions (Sanders, 2014). Liberals tend to focus on making decisions that are more objective and able to be reconciled with scientific evidence and facts. In contrast, conservatives tend to focus on normative standards in their decision making processes, relying more on social or group consensus to inform their decisions (Sanders, 2014). This liberal preference for using scientific consensus information when making decisions could possibly account for the perceived asymmetry in science denial and acceptance where liberals are perceived as being more accepting of scientific information than conservatives, especially for issues like global warming and evolution (Braman et al., 2007). However, most information

regarding consensus about issues like climate change frame the consensus in terms of objective consensus. For example, global warming consensus is commonly reported in the media as having near unanimous scientific consensus. What would happen if the same findings were framed in terms of social or normative consensus? Because conservatives are more attuned to social consensus, it may be the case that they would be more willing to accept scientific findings that are supported by their peers (e.g., the American public).

Another area for future research could include examining more closely the cognitive process of evaluating attitude consistent and inconsistent scientific information. When it comes to evaluating scientific information, are people searching for the first answer that fits with their preferred conclusion or do they evaluate all of the possible options and then decide which one fits with their preferred conclusion? One possible way to examine this question would be to use the same methodological paradigm as the current research and manipulate motivation to reach a preferred outcome and cognitive load. If people search for the best fitting conclusion out of all of the options, then one would expect people under cognitive load to more often select interpretations via less cognitively effortful heuristic strategies. One could then manipulate whether the interpretation based on the heuristic strategy fit with one's preferred conclusion. If motivated interpretation of evidence requires cognitive effort then those under cognitive load should be just as likely to pick ideologically consistent and inconsistent heuristic interpretations. However, people not under cognitive load should be more likely to engage in the more effortful deliberate reasoning process when the heuristic interpretation conflicts with their preferred conclusion (similar to the results observed in the current research). There is some evidence to suggest that people will switch their interpretation of nearly identical data based on whether the correct interpretation fits with their preferred conclusion, even within subjects (Mata, Ferreira, &

Sherman, 2013). Using this within subjects paradigm, one could examine whether people who were motivated to engage in the cognitively effortful deliberative interpretation process in one scenario (because the effortful interpretation fit with their preferred conclusion) could also be motivated to engage in the less effortful heuristic interpretation strategy in a different scenario (because the heuristic strategy fit with their preferred conclusion) using nearly identical raw data. In sum, based on the results of the current research, there exist many potentially productive areas for future research to gain a deeper understanding of the motivational processes involved with science denial.

4.5 **Conclusion**

Liberals and conservatives are similarly motivated to accept or deny scientific information in ways that fit with their preferred conclusions. Regardless of issue, people were motivated to engage in different cognitive strategies to interpret the results of a study in attitudinally consistent ways. When given results that, at first glance, could be interpreted to fit with a person's preferred conclusions, perceivers were willing to take the easy way out and incorrectly interpret the results. However, when the first glance heuristic interpretation of the results did not fit with a person's preferred conclusion, perceivers were willing to engage in further effortful processing to reach the correct interpretation of the results. Additionally, people given attitude inconsistent results were also more likely to disagree with the researchers' correct interpretation and find them less trustworthy and knowledgeable. Importantly, these effects were not meaningfully moderated by political orientation. Both liberals and conservatives were equally likely to engage in motivated interpretation of the results and to deny the correct interpretation of those results when that interpretation conflicted with their attitudes. This study

suggests that the same motivational processes may underlie differences in the political priorities of those on the left and the right.

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APPENDICES

APPENDIX A

MANIPULATIONS (Participants were randomly assigned to 1 of the 14 following conditions)

Rash decreases condition (adapted from Kahan et al., 2013)

Medical researchers have developed a new cream for treating skin rashes. New treatments often work but sometimes make rashes worse. Even when treatment don't work, skin rashes sometimes get better and sometimes get worse on their own. As a result, it is necessary to test any new treatment in an experiment to see whether it makes the skin condition of those who use it better or worse than if they had not used it.

Researchers have conducted an experiment on patients with skin rashes. In the experiment, one group of patients used the new cream for two weeks, and a second group did not use the new cream.

In each group, the number of people whose skin condition got better and the number whose condition got worse are recorded in the table below. Because patients do not always complete studies, the total number of patients in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether the experiment shows that using the new cream is likely to make the skin condition better or worse.

	Result	
	Rash Got Worse	Rash Got Better
Patients who <u>did</u> use the new skin cream	223	75
Patients who did <u>not</u> use the new skin cream	107	21

What result does the study support?

☐ People who used the skin cream were more likely to get better than those who didn't.

☐ People who used the skin cream were more likely to get worse than those who didn't.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

Result		TOTAL
<u>Rash Got Worse</u>	<u>Rash Got Better</u>	

Patients who <u>did</u> use the new skin cream	223	75	298
Patients who did <u>not</u> use the new skin cream	107	21	128

--The researchers compared the percentage of people whose rash got better in each condition (**those who used the new skin cream** and **those who did not**). Of the people who used the skin cream, **approximately 25% (75 out of 298 people total) got better**. Of the people who did not use the new skin cream, **approximately 16% (21 out of 128 people total) got better**. Therefore, a greater percentage of people's rashes got better when they used the skin cream. The researchers concluded that:

People who used the skin cream were more likely to get better than those who didn't.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
1-slightly correct 2-moderately correct 3-completely correct

How trustworthy or untrustworthy are the researchers?

-3-completely untrustworthy -2-moderately untrustworthy -1-slightly untrustworthy
1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

Rash increases condition (adapted from Kahan et al., 2013)

Medical researchers have developed a new cream for treating skin rashes. New treatments often work but sometimes make rashes worse. Even when treatment don't work, skin rashes sometimes get better and sometimes get worse on their own. As a result, it is necessary to test any new treatment in an experiment to see whether it makes the skin condition of those who use it better or worse than if they had not used it.

Researchers have conducted an experiment on patients with skin rashes. In the experiment, one group of patients used the new cream for two weeks, and a second group did not use the new cream.

In each group, the number of people whose skin condition got better and the number whose condition got worse are recorded in the table below. Because patients do not always complete studies, the total number of patients in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether the experiment shows that using the new cream is likely to make the skin condition better or worse.

	Result	
	Rash Got Better	Rash Got Worse
Patients who <u>did</u> use the new skin cream	223	75
Patients who did <u>not</u> use the new skin cream	107	21

What result does the study support?

☐ People who used the skin cream were more likely to get better than those who didn't.

☐ People who used the skin cream were more likely to get worse than those who didn't.

How confident are you in your answer?

1-not at all

2-slightly

3-moderately

4-much

5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Rash Got Better	Rash Got Worse	
Patients who <u>did</u> use the new skin cream	223	75	298
Patients who did <u>not</u> use the new skin cream	107	21	128

--The researchers compared the percentage of people whose rash got better in each condition (**those who used the new skin cream** and **those who did not**). Of the people who used the skin cream, **approximately 75% (223 out of 298 people total) got better**. Of the people who did not use the new skin cream, **approximately 84% (107 out of 128 people total) got better**. Therefore, a greater percentage of people's rashes got better when they did not use the skin cream. The researchers concluded that:

People who used the skin cream were more likely to get worse than those who didn't.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
1-slightly correct 2-moderately correct 3-completely correct

How trustworthy or untrustworthy are the researchers?

-3-completely untrustworthy -2-moderately untrustworthy -1-slightly untrustworthy
1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly
unknowledgeable 1-slightly knowledgeable 2-moderately knowledgeable 3-
completely knowledgeable

Crime decreases condition (Gun control) (adapted from Kahan et al., 2013)

A city government was trying to decide whether to pass a law banning private citizens from carrying concealed handguns in public. Government officials were unsure whether the law would be more likely to decrease crime by reducing the number of people carrying weapons or increase crime by making it harder for law-abiding citizens to defend themselves from violent criminals.

To address this question, researchers divided cities into two groups: one consisting of cities that had recently enacted bans on concealed weapons and another that had cities with no such bans. They then observed the number of cities that experienced decreases in crime and those that experienced increases in crime in the next year.

In each group, the number of cities that experienced decreases in crime and the number of cities that experienced increases in crime are recorded in the table below. Because they could not choose which cities enacted concealed carry bans, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities that enacted a ban on carrying concealed handguns were more likely to have a decrease in crime or instead more likely to have an increase in crime than cities without bans.

	Result	
	Increase in Crime	Decrease in Crime
Cities that <u>did</u> ban carrying concealed handguns in public	223	75
Cities that did <u>not</u> ban carrying concealed handguns in public	107	21

What result does the study support?

_____ Cities that enacted a ban on carrying concealed handguns were more likely to have a decrease in crime than cities without bans.

_____ Cities that enacted a ban on carrying concealed handguns were more likely to have an increase in crime than cities without bans.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Increase in Crime	Decrease in Crime	
Cities that <u>did</u> ban carrying concealed handguns in public	223	75	298
Cities that did <u>not</u> ban carrying concealed handguns in public	107	21	128

--The researchers compared the percentage of cities whose crime decreased in each condition (**cities that enacted a gun ban** and **cities that did not**). Of the cities that enacted gun bans, **approximately 25% (75 out of 298 cities total) experienced a decrease in crime**. Of the cities that did not enact gun bans, **approximately 16% (21 out of 128 cities total) experienced a decrease in crime**. Therefore, a greater percentage of cities' crime decreased when they enacted gun bans. The researchers concluded that:

Cities that enacted a ban on carrying concealed handguns were more likely to have a decrease in crime than cities without bans.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
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How knowledgeable or unknowledgeable are the researchers?

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Crime increases condition (Gun control) (adapted from Kahan et al., 2013)

A city government was trying to decide whether to pass a law banning private citizens from carrying concealed handguns in public. Government officials were unsure whether the law would be more likely to decrease crime by reducing the number of people carrying weapons or increase crime by making it harder for law-abiding citizens to defend themselves from violent criminals.

To address this question, researchers divided cities into two groups: one consisting of cities that had recently enacted bans on concealed weapons and another that had cities with no such bans. They then observed the number of cities that experienced decreases in crime and those that experienced increases in crime in the next year.

In each group, the number of cities that experienced decreases in crime and the number of cities that experienced increases in crime are recorded in the table below. Because they could not choose which cities enacted concealed carry bans, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities that enacted a ban on carrying concealed handguns were more likely to have a decrease in crime or instead more likely to have an increase in crime than cities without bans.

	Result	
	Decrease in Crime	Increase in Crime
Cities that <u>did</u> ban carrying concealed handguns in public	223	75
Cities that did <u>not</u> ban carrying concealed handguns in public	107	21

What result does the study support?

____ Cities that enacted a ban on carrying concealed handguns were more likely to have a decrease in crime than cities without bans.

____ Cities that enacted a ban on carrying concealed handguns were more likely to have an increase in crime than cities without bans.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Decrease in Crime	Increase in Crime	
Cities that <u>did</u> ban carrying concealed handguns in public	223	75	298
Cities that did <u>not</u> ban carrying concealed handguns in public	107	21	128

--The researchers compared the percentage of cities whose crime decreased in each condition (**cities that enacted a gun ban** and **cities that did not**). Of the cities that enacted gun bans, **approximately 75% (223 out of 298 cities total) experienced a decrease in crime**. Of the cities that did not enact gun bans, **approximately 84% (107 out of 128 cities total) experienced a decrease in crime**. Therefore, a greater percentage of cities' crime decreased when they did not enact gun bans. The researchers concluded that:

Cities that enacted a ban on carrying concealed handguns were more likely to have an increase in crime than cities without bans.

How much do you agree or disagree with the researchers' interpretation?

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1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

CO₂ emissions decrease condition (Climate change)

A city government was trying to decide whether to pass a law requiring stricter motor vehicle emissions standards. Government officials were unsure whether the law would be more likely to decrease CO₂ emissions by reducing the number of cars with poor emissions or increase CO₂ emissions because of increased use of public transportation.

To address this question, researchers divided cities into two groups: one consisting of cities that had recently enacted strict emissions standards and another that had cities with no such

standards. They then observed the number of cities that experienced decreases in CO₂ levels and those that experienced increases in CO₂ levels in the next year.

In each group, the number of cities that experienced decreases in CO₂ levels and the number of cities that experienced increases in CO₂ levels are recorded in the table below. Because they could not choose which cities enacted strict emissions standards, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities that enacted stricter vehicle emissions standards were more likely to have a decrease in CO₂ levels or instead more likely to have an increase in CO₂ levels than cities without strict emissions standards.

	Result	
	Increase in CO ₂ Emissions	Decrease in CO ₂ Emissions
Cities that <u>did</u> enact strict CO ₂ emissions standards	223	75
Cities that did <u>not</u> enact strict CO ₂ emissions standards	107	21

What result does the study support?

____ Cities that enacted strict CO₂ vehicle emissions standards were more likely to have a decrease in CO₂ emissions than cities without such standards.

____ Cities that enacted strict CO₂ vehicle emissions standards were more likely to have an increase in CO₂ emissions than cities without such standards.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Increase in CO ₂ Emissions	Decrease in CO ₂ Emissions	
Cities that <u>did</u> enact strict CO ₂ emissions standards	223	75	298
Cities that did <u>not</u> enact strict CO ₂ emissions standards	107	21	128

--The researchers compared the percentage of cities whose CO₂ emissions decreased in each condition (**cities that enacted strict emissions standards** and **cities that did not**). Of the cities

that enacted strict emissions standards, **approximately 25% (75 out of 298 cities total) experienced a decrease in CO₂ emissions**. Of the cities that did not enact strict emissions standards, **approximately 16% (21 out of 128 cities total) experienced a decrease in CO₂ emissions**. Therefore, a greater percentage of cities' CO₂ emissions decreased when they enacted strict emissions standards. The researchers concluded that:

Cities that enacted strict CO₂ vehicle emissions standards were more likely to have a decrease in CO₂ emissions than cities without such standards.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
1-slightly correct 2-moderately correct 3-completely correct

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1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

CO₂ emissions increase condition (Climate change)

A city government was trying to decide whether to pass a law requiring stricter motor vehicle emissions standards. Government officials were unsure whether the law would be more likely to decrease CO₂ emissions by reducing the number of cars with poor emissions or increase CO₂ emissions because of increased use of public transportation.

To address this question, researchers divided cities into two groups: one consisting of cities that had recently enacted strict emissions standards and another that had cities with no such standards. They then observed the number of cities that experienced decreases in CO₂ levels and those that experienced increases in CO₂ levels in the next year.

In each group, the number of cities that experienced decreases in CO₂ levels and the number of cities that experienced increases in CO₂ levels are recorded in the table below. Because they could not choose which cities enacted strict emissions standards, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities that enacted stricter vehicle emissions standards were more likely to have a decrease in CO₂ levels or instead more likely to have an increase in CO₂ levels than cities without strict emissions standards.

	Result	
	Decrease in CO ₂ Emissions	Increase in CO ₂ Emissions
Cities that <u>did</u> enact strict CO ₂ emissions standards	223	75
Cities that did <u>not</u> enact strict CO ₂ emissions standards	107	21

What result does the study support?

____ Cities that enacted strict CO₂ vehicle emissions standards were more likely to have a decrease in CO₂ emissions than cities without such standards.

____ Cities that enacted strict CO₂ vehicle emissions standards were more likely to have an increase in CO₂ emissions than cities without such standards.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Decrease in CO ₂ Emissions	Increase in CO ₂ Emissions	
Cities that <u>did</u> enact strict CO ₂ emissions standards	223	75	298
Cities that did <u>not</u> enact strict CO ₂ emissions standards	107	21	128

--The researchers compared the percentage of cities whose CO₂ emissions decreased in each condition (**cities that enacted strict emissions standards** and **cities that did not**). Of the cities that enacted strict emissions standards, **approximately 75% (223 out of 298 cities total) experienced a decrease in CO₂ emissions**. Of the cities that did not enact strict emissions standards, **approximately 84% (107 out of 128 cities total) experienced a decrease in CO₂ emissions**. Therefore, a greater percentage of cities' CO₂ emissions decreased when they did not enact strict emissions standards. The researchers concluded that:

Cities that enacted strict CO₂ vehicle emissions standards were more likely to have an increase in CO₂ emissions than cities without such standards.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
 1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
 1-slightly correct 2-moderately correct 3-completely correct

How trustworthy or untrustworthy are the researchers?

-3-completely untrustworthy -2-moderately untrustworthy -1-slightly untrustworthy
 1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly
 unknowledgeable 1-slightly knowledgeable 2-moderately knowledgeable 3-
 completely knowledgeable

Illnesses decrease condition (Nuclear power)

A city government was trying to decide whether to allow an energy company to build a nuclear power plant in their city. Government officials were unsure whether the new nuclear plant would be more likely to decrease illnesses in the community by reducing pollution from relying on coal plants or increase illnesses in the community because of increased radiation contamination.

To address this question, researchers divided cities into two groups: one consisting of cities that built nuclear power plants and another consisting of cities that did not have nuclear power plants. They then observed the number of cities that experienced decreases in illnesses in the community and those that experienced increases in illnesses in the community in the year after the nuclear power plants were built.

In each group, the number of cities that experienced decreases in illnesses in the community and the number of cities that experienced increases in illnesses in the community are recorded in the table below. Because they could not choose which cities built nuclear power plants, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities that built nuclear power plants were more likely to have a decrease in illnesses in the community or instead more likely to have an increase in illnesses in the community than cities without nuclear power plants.

	Result	
	Increase in Illnesses	Decrease in Illnesses
Cities that <u>did</u> build nuclear power plants	223	75
Cities that did <u>not</u> build nuclear power plants	107	21

What result does the study support?

____ Cities that built nuclear power plants were more likely to have a decrease in illnesses in the community than cities without nuclear power plants.

____ Cities that built nuclear power plants were more likely to have an increase in illnesses in the community than cities without nuclear power plants.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Increase in Illnesses	Decrease in Illnesses	
Cities that <u>did</u> build nuclear power plants	223	75	298
Cities that did <u>not</u> build nuclear power plants	107	21	128

--The researchers compared the percentage of cities whose illnesses decreased in each condition (**cities that built nuclear power plants** and **cities that did not**). Of the cities that built nuclear power plants, **approximately 25% (75 out of 298 cities total) experienced a decrease in illnesses**. Of the cities that did not build nuclear power plants, **approximately 16% (21 out of 128 cities total) experienced a decrease in illnesses**. Therefore, a greater percentage of cities' illnesses decreased when they built nuclear power plants. The researchers concluded that:

Cities that built nuclear power plants were more likely to have a decrease in illnesses in the community than cities without nuclear power plants.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
1-slightly correct 2-moderately correct 3-completely correct

How trustworthy or untrustworthy are the researchers?

-3-completely untrustworthy -2-moderately untrustworthy -1-slightly untrustworthy
1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
 1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

Illnesses increase condition (Nuclear power)

A city government was trying to decide whether to allow an energy company to build a nuclear power plant in their city. Government officials were unsure whether the new nuclear plant would be more likely to decrease illnesses in the community by reducing pollution from relying on coal plants or increase illnesses in the community because of increased radiation contamination.

To address this question, researchers divided cities into two groups: one consisting of cities that built nuclear power plants and another consisting of cities that did not have nuclear power plants. They then observed the number of cities that experienced decreases in illnesses in the community and those that experienced increases in illnesses in the community in the year after the nuclear power plants were built.

In each group, the number of cities that experienced decreases in illnesses in the community and the number of cities that experienced increases in illnesses in the community are recorded in the table below. Because they could not choose which cities built nuclear power plants, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities that built nuclear power plants were more likely to have a decrease in illnesses in the community or instead more likely to have an increase in illnesses in the community than cities without nuclear power plants.

	Result	
	Decrease in Illnesses	Increase in Illnesses
Cities that <u>did</u> build nuclear power plants	223	75
Cities that did <u>not</u> build nuclear power plants	107	21

What result does the study support?

____ Cities that built nuclear power plants were more likely to have a decrease in illnesses in the community than cities without nuclear power plants.

____ Cities that built nuclear power plants were more likely to have an increase in illnesses in the community than cities without nuclear power plants.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Decrease in Illnesses	Increase in Illnesses	
Cities that <u>did</u> build nuclear power plants	223	75	298
Cities that did <u>not</u> build nuclear power plants	107	21	128

--The researchers compared the percentage of cities whose illnesses decreased in each condition (**cities that built nuclear power plants** and **cities that did not**). Of the cities that built nuclear power plants, **approximately 75% (223 out of 298 cities total) experienced a decrease in illnesses**. Of the cities that did not build nuclear power plants, **approximately 84% (107 out of 128 cities total) experienced a decrease in illnesses**. Therefore, a greater percentage of cities' illnesses decreased when they did not build nuclear power plants. The researchers concluded that:

Cities that built nuclear power plants were more likely to have an increase in illnesses in the community than cities without nuclear power plants.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
1-slightly correct 2-moderately correct 3-completely correct

How trustworthy or untrustworthy are the researchers?

-3-completely untrustworthy -2-moderately untrustworthy -1-slightly untrustworthy
1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

Health decreases condition (Same-sex marriage)

A state government was trying to decide whether to pass a law allowing same-sex marriages in their state. Government officials were unsure whether the law would be more likely to decrease physical and mental health by increasing the prevalence of non-traditional families or increase

physical and mental health by providing more security (e.g., legal protections) for same-sex couples.

To address this question, researchers divided cities into two groups: one consisting of cities that were in states that had recently passed laws allowing same-sex marriage and another that had cities in states that banned same-sex marriage. They then observed the number of cities that experienced decreases in physical and mental health and those that experienced increases in physical and mental health in the next year.

In each group, the number of cities that experienced decreases in physical and mental health and the number of cities that experienced increases in physical and mental health are recorded in the table below. Because they could not choose which states passed laws allowing same-sex marriage, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities in states that passed laws allowing same-sex marriage were more likely to have a decrease in physical and mental health or instead more likely to have an increase in physical and mental health than cities in states with bans on same-sex marriage.

	Result	
	Increase in Health	Decrease in Health
Cities in states that <u>did</u> pass laws allowing same-sex marriage	223	75
Cities in states that <u>not</u> pass laws allowing same-sex marriage	107	21

What result does the study support?

- ____ Cities in states that passed laws allowing same-sex marriage were more likely to have a decrease in physical and mental health than cities in states that banned same-sex marriage.
- ____ Cities in states that passed laws allowing same-sex marriage were more likely to have an increase in physical and mental health than cities in states that banned same-sex marriage.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Increase in Health	Decrease in Health	
Cities in states that <u>did</u> pass laws allowing same-sex marriage	223	75	298

Cities in states that did <u>not</u> pass laws allowing same-sex marriage	107	21	128
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--The researchers compared the percentage of cities whose health decreased in each condition (**cities in states that passed laws allowing same-sex marriage** and **cities in states that did not**). Of the cities in states that passed laws allowing same-sex marriage, **approximately 25% (75 out of 298 cities total) experienced a decrease in health**. Of the cities in states that did not pass laws allowing same-sex marriage, **approximately 16% (21 out of 128 cities total) experienced a decrease in health**. Therefore, a greater percentage of cities' health decreased when they were in states that passed laws allowing same-sex marriage. The researchers concluded that:

Cities in states that passed laws allowing same-sex marriage were more likely to have a decrease in physical and mental health than cities in states that banned same-sex marriage.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
1-slightly correct 2-moderately correct 3-completely correct

How trustworthy or untrustworthy are the researchers?

-3-completely untrustworthy -2-moderately untrustworthy -1-slightly untrustworthy
1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

Health increases condition (Same-sex marriage)

A state government was trying to decide whether to pass a law allowing same-sex marriages in their state. Government officials were unsure whether the law would be more likely to decrease physical and mental health by increasing the prevalence of non-traditional families or increase physical and mental health by providing more security (e.g., legal protections) for same-sex couples.

To address this question, researchers divided cities into two groups: one consisting of cities that were in states that had recently passed laws allowing same-sex marriage and another that had cities in states that banned same-sex marriage. They then observed the number of cities that experienced decreases in physical and mental health and those that experienced increases in physical and mental health in the next year.

In each group, the number of cities that experienced decreases in physical and mental health and the number of cities that experienced increases in physical and mental health are recorded in the table below. Because they could not choose which states passed laws allowing same-sex marriage, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities in states that passed laws allowing same-sex marriage were more likely to have a decrease in physical and mental health or instead more likely to have an increase in physical and mental health than cities in states with bans on same-sex marriage.

	Result	
	Decrease in Health	Increase in Health
Cities in states that <u>did</u> pass laws allowing same-sex marriage	223	75
Cities in states that <u>not</u> pass laws allowing same-sex marriage	107	21

What result does the study support?

- ____ Cities in states that passed laws allowing same-sex marriage were more likely to have a decrease in physical and mental health than cities in states that banned same-sex marriage.
- ____ Cities in states that passed laws allowing same-sex marriage were more likely to have an increase in physical and mental health than cities in states that banned same-sex marriage.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Decrease in Health	Increase in Health	
Cities in states that <u>did</u> pass laws allowing same-sex marriage	223	75	298
Cities in states that <u>not</u> pass laws allowing same-sex marriage	107	21	128

--The researchers compared the percentage of cities whose health decreased in each condition (**cities in states that passed laws allowing same-sex marriage** and **cities in states that did not**). Of the cities in states that passed laws allowing same-sex marriage, **approximately 75% (223 out of 298 cities total) experienced a decrease in health**. Of the cities in states that did not

pass laws allowing same-sex marriage, **approximately 84% (107 out of 128 cities total) experienced a decrease in health**. Therefore, a greater percentage of cities' health decreased when they were in states that did not pass laws allowing same-sex marriage. The researchers concluded that:

Cities in states that passed laws allowing same-sex marriage were more likely to have an increase in physical and mental health than cities in states that banned same-sex marriage.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
1-slightly correct 2-moderately correct 3-completely correct

How trustworthy or untrustworthy are the researchers?

-3-completely untrustworthy -2-moderately untrustworthy -1-slightly untrustworthy
1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

Inpatient hospital admission decreases condition (Health care reform)

A state government was trying to decide whether to pass a law mandating universal health care coverage for its residents. Government officials were unsure whether the law would be more likely to decrease inpatient hospital admissions because people will get more preventative care or increase inpatient hospital admissions because people will no longer worry about having to pay the bill.

To address this question, researchers divided cities into two groups: one consisting of cities in states that had recently passed universal health care reform and another that had cities in states with no such laws. They then observed the number of cities that experienced decreases in inpatient hospital admissions and those that experienced increases in inpatient hospital admissions in the next year.

In each group, the number of cities that experienced decreases in inpatient hospital admissions and the number of cities that experienced increases in inpatient hospital admissions are recorded in the table below. Because they could not choose which states enacted universal health care reform, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities in states that passed universal health care reform were more likely to have a decrease in inpatient hospital admissions or instead more likely to have an increase in inpatient hospital admissions than cities in states without universal health care.

	Result	
	Increase in Hospitalizations	Decrease in Hospitalizations
Cities in states that <u>did</u> pass universal health care reform	223	75
Cities in states that <u>did not</u> pass universal health care reform	107	21

What result does the study support?

____ Cities in states that passed universal health care reform were more likely to have a decrease in inpatient hospital admissions than cities in states without universal health care.

____ Cities in states that passed universal health care reform were more likely to have an increase in inpatient hospital admissions than cities in states without universal health care.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Increase in Hospitalization	Decrease in Hospitalization	
Cities in states that <u>did</u> pass universal health care reform	223	75	298
Cities in states that <u>did not</u> pass universal health care reform	107	21	128

--The researchers compared the percentage of cities whose hospitalizations decreased in each condition (**cities in states that passed universal health care reform** and **cities in states that did not**). Of the cities in states that passed universal health care reform, **approximately 25% (75 out of 298 cities total) experienced a decrease in hospitalizations**. Of the cities in states that did not pass universal health care reform, **approximately 16% (21 out of 128 cities total) experienced a decrease in hospitalizations**. Therefore, a greater percentage of cities' hospitalizations decreased when they were in states that passed universal health care reform. The researchers concluded that:

Cities in states that passed universal health care reform were more likely to have a decrease in inpatient hospital admissions than cities in states without universal health care.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

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How trustworthy or untrustworthy are the researchers?

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1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly
unknowledgeable 1-slightly knowledgeable 2-moderately knowledgeable 3-
completely knowledgeable

Inpatient hospital admission increases condition (Health care reform)

A state government was trying to decide whether to pass a law mandating universal health care coverage for its residents. Government officials were unsure whether the law would be more likely to decrease inpatient hospital admissions because people will get more preventative care or increase inpatient hospital admissions because people will no longer worry about having to pay the bill.

To address this question, researchers divided cities into two groups: one consisting of cities in states that had recently passed universal health care reform and another that had cities in states with no such laws. They then observed the number of cities that experienced decreases in inpatient hospital admissions and those that experienced increases in inpatient hospital admissions in the next year.

In each group, the number of cities that experienced decreases in inpatient hospital admissions and the number of cities that experienced increases in inpatient hospital admissions are recorded in the table below. Because they could not choose which states enacted universal health care reform, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities in states that passed universal health care reform were more likely to have a decrease in inpatient hospital admissions or instead more likely to have an increase in inpatient hospital admissions than cities in states without universal health care.

Result

Decrease in Hospitalizations	Increase in Hospitalizations
------------------------------	------------------------------

Cities in states that <u>did</u> pass universal health care reform	223	75
Cities in states that did <u>not</u> pass universal health care reform	107	21

What result does the study support?

____ Cities in states that passed universal health care reform were more likely to have a decrease in inpatient hospital admissions than cities in states without universal health care.

____ Cities in states that passed universal health care reform were more likely to have an increase in inpatient hospital admissions than cities in states without universal health care.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Decrease in Hospitalization	Increase in Hospitalization	
Cities in states that <u>did</u> pass universal health care reform	223	75	298
Cities in states that did <u>not</u> pass universal health care reform	107	21	128

--The researchers compared the percentage of cities whose hospitalizations decreased in each condition (**cities in states that passed universal health care reform** and **cities in states that did not**). Of the cities in states that passed universal health care reform, **approximately 75% (223 out of 298 cities total) experienced a decrease in hospitalizations**. Of the cities in states that did not pass universal health care reform, **approximately 84% (107 out of 128 cities total) experienced a decrease in hospitalizations**. Therefore, a greater percentage of cities' hospitalizations decreased when they were in states that did not pass universal health care reform. The researchers concluded that:

Cities in states that passed universal health care reform were more likely to have an increase in inpatient hospital admissions than cities in states without universal health care.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

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1-slightly correct 2-moderately correct 3-completely correct

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1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly
unknowledgeable 1-slightly knowledgeable 2-moderately knowledgeable 3-
completely knowledgeable

Economic prosperity decreases condition (Immigration)

A national government was trying to decide whether to pass a law making it easier for illegal immigrants to attain citizenship. Government officials were unsure whether the law would be more likely to decrease economic prosperity by overcrowding the job pool or increase economic prosperity by increasing tax revenues from newly legalized workers.

To address this question, researchers divided cities into two groups: one consisting of cities in countries that had recently passed lenient immigration reform and another that had cities in countries with no such laws. They then observed the number of cities that experienced decreases in economic prosperity and those that experienced increases in economic prosperity in the next year.

In each group, the number of cities that experienced decreases in economic prosperity and the number of cities that experienced increases in economic prosperity are recorded in the table below. Because they could not choose which countries enacted lenient immigration reform, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities in countries that passed lenient immigration reform were more likely to have a decrease in economic prosperity or instead more likely to have an increase in economic prosperity than cities in countries without lenient immigration reform.

	Result	
	Increase in Prosperity	Decrease in Prosperity
Cities in countries that <u>did</u> pass lenient immigration reform	223	75
Cities in countries that did <u>not</u> pass lenient immigration reform	107	21

What result does the study support?

- _____ Cities in countries that passed lenient immigration reform were more likely to have a decrease in economic prosperity than cities in countries without lenient immigration reform.
- _____ Cities in countries that passed lenient immigration reform were more likely to have an increase in economic prosperity than cities in countries without lenient immigration reform.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Increase in Prosperity	Decrease in Prosperity	
Cities in countries that <u>did</u> pass lenient immigration reform	223	75	298
Cities in countries that <u>did not</u> pass lenient immigration reform	107	21	128

--The researchers compared the percentage of cities whose prosperity decreased in each condition (**cities in countries that passed lenient immigration reform** and **cities in countries that did not**). Of the cities in countries that passed lenient immigration reform, **approximately 25% (75 out of 298 cities total) experienced a decrease in prosperity**. Of the cities in countries that did not pass lenient immigration reform, **approximately 16% (21 out of 128 cities total) experienced a decrease in prosperity**. Therefore, a greater percentage of cities' prosperity decreased when they were in countries that passed lenient immigration reform. The researchers concluded that:

Cities in countries that passed lenient immigration reform were more likely to have a decrease in economic prosperity than cities in countries without lenient immigration reform.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
1-slightly agree 2-moderately agree 3-completely agree

How correct or incorrect is the researchers' interpretation of the data?

-3-completely incorrect -2-moderately incorrect -1-slightly incorrect
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1-slightly trustworthy 2-moderately trustworthy 3-completely trustworthy

How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
 1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

Economic prosperity increases condition (Immigration)

A national government was trying to decide whether to pass a law making it easier for illegal immigrants to attain citizenship. Government officials were unsure whether the law would be more likely to decrease economic prosperity by overcrowding the job pool or increase economic prosperity by increasing tax revenues from newly legalized workers.

To address this question, researchers divided cities into two groups: one consisting of cities in countries that had recently passed lenient immigration reform and another that had cities in countries with no such laws. They then observed the number of cities that experienced decreases in economic prosperity and those that experienced increases in economic prosperity in the next year.

In each group, the number of cities that experienced decreases in economic prosperity and the number of cities that experienced increases in economic prosperity are recorded in the table below. Because they could not choose which countries enacted lenient immigration reform, the total number of cities in the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether cities in countries that passed lenient immigration reform were more likely to have a decrease in economic prosperity or instead more likely to have an increase in economic prosperity than cities in countries without lenient immigration reform.

	Result	
	Decrease in Prosperity	Increase in Prosperity
Cities in countries that <u>did</u> pass lenient immigration reform	223	75
Cities in countries that did <u>not</u> pass lenient immigration reform	107	21

What result does the study support?

- ____ Cities in countries that passed lenient immigration reform were more likely to have a decrease in economic prosperity than cities in countries without lenient immigration reform.
- ____ Cities in countries that passed lenient immigration reform were more likely to have an increase in economic prosperity than cities in countries without lenient immigration reform.

How confident are you in your answer?

1-not at all 2-slightly 3-moderately 4-much 5-very much

Here is how the researchers involved with the project interpreted the results:

	Result		TOTAL
	Decrease in Prosperity	Increase in Prosperity	
Cities in countries that <u>did</u> pass lenient immigration reform	223	75	298
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Cities in countries that passed lenient immigration reform were more likely to have an increase in economic prosperity than cities in countries without lenient immigration reform.

How much do you agree or disagree with the researchers' interpretation?

-3-completely disagree -2-moderately disagree -1-slightly disagree
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How correct or incorrect is the researchers' interpretation of the data?

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How knowledgeable or unknowledgeable are the researchers?

-3-completely unknowledgeable -2-moderately unknowledgeable -1-slightly unknowledgeable
1-slightly knowledgeable 2-moderately knowledgeable 3-completely knowledgeable

ATTITUDE / MORAL CONVICTION (Depending on the condition assigned to, participants only answered items for one of the issues)

Immigration

Do you support or oppose immigration reform making it easier for undocumented immigrants to attain citizenship in the U.S.?

1-Oppose 2-Neutral/Uncertain 3-Support

How strongly do you support/oppose immigration reform making it easier for undocumented immigrants to attain citizenship in the U.S.?

1-slightly 2-moderately 3-much 4-very much

(If uncertain) Do you lean towards supporting or opposing immigration reform making it easier for undocumented immigrants to attain citizenship in the U.S.?

1-lean towards supporting 2-neutral/uncertain 3-lean towards opposing

To what extent is your position on immigration reform:

1-not at all 2-slightly 3-moderately 4-much 5-very much

Something you are certain about? (Certainty)

Connected to your beliefs about fundamental right and wrong? (MC)

Personally important to you? (Importance)

A reflection of your core moral beliefs and convictions? (MC)

A reflection of your religious beliefs? (RC)

Gun control

Do you support or oppose additional gun control laws?

1-Oppose 2-Neutral/Uncertain 3-Support

How strongly do you support/oppose additional gun control laws?

1-slightly 2-moderately 3-much 4-very much

(If uncertain) Do you lean towards supporting or opposing additional gun control laws?

1-lean towards supporting 2-neutral/uncertain 3-lean towards opposing

To what extent is your position on gun control laws:

1-not at all 2-slightly 3-moderately 4-much 5-very much

Something you are certain about? (Certainty)

Connected to your beliefs about fundamental right and wrong? (MC)

Personally important to you? (Importance)

A reflection of your core moral beliefs and convictions? (MC)

A reflection of your religious beliefs? (RC)

Climate change

Do you support or oppose laws designed to place restrictions on carbon emissions?

1-Oppose 2-Neutral/Uncertain 3-Support

How strongly do you support/oppose laws designed to place restrictions on carbon emissions?

1-slightly 2-moderately 3-much 4-very much

(If uncertain) Do you lean towards supporting or opposing laws designed to place restrictions on carbon emissions?

1-lean towards supporting 2-neutral/uncertain 3-lean towards opposing

To what extent is your position on laws designed to place restrictions on carbon emissions:

1-not at all 2-slightly 3-moderately 4-much 5-very much

Something you are certain about? (Certainty)

Connected to your beliefs about fundamental right and wrong? (MC)

Personally important to you? (Importance)

A reflection of your core moral beliefs and convictions? (MC)

A reflection of your religious beliefs? (RC)

Health care reform

Do you support or oppose health care reform mandating that every U.S. citizen have health insurance?

1-Oppose 2-Neutral/Uncertain 3-Support

How strongly do you support/oppose health care reform mandating that every U.S. citizen have health insurance?

1-slightly 2-moderately 3-much 4-very much

(If uncertain) Do you lean towards supporting or opposing health care reform mandating that every U.S. citizen have health insurance?

1-lean towards supporting 2-neutral/uncertain 3-lean towards opposing

To what extent is your position on health care reform mandating that every U.S. citizen have health insurance:

1-not at all 2-slightly 3-moderately 4-much 5-very much

Something you are certain about? (Certainty)

Connected to your beliefs about fundamental right and wrong? (MC)

Personally important to you? (Importance)

A reflection of your core moral beliefs and convictions? (MC)

A reflection of your religious beliefs? (RC)

Nuclear power

Do you support or oppose government investment in nuclear energy?

1-Oppose 2-Neutral/Uncertain 3-Support

How strongly do you support/oppose government investment in nuclear energy?

1-slightly 2-moderately 3-much 4-very much

(If uncertain) Do you lean towards supporting or opposing government investment in nuclear energy?

1-lean towards supporting 2-neutral/uncertain 3-lean towards opposing

To what extent is your position on government investment in nuclear energy:

1-not at all 2-slightly 3-moderately 4-much 5-very much

Something you are certain about? (Certainty)

Connected to your beliefs about fundamental right and wrong? (MC)

Personally important to you? (Importance)

A reflection of your core moral beliefs and convictions? (MC)

A reflection of your religious beliefs? (RC)

Same-sex marriage

Do you support or oppose federal regulation allowing same-sex marriage?

1-Oppose 2-Neutral/Uncertain 3-Support

How strongly do you support/oppose federal regulation allowing same-sex marriage?

1-slightly 2-moderately 3-much 4-very much

(If uncertain) Do you lean towards supporting or opposing federal regulation allowing same-sex marriage?

1-lean towards supporting 2-neutral/uncertain 3-lean towards opposing

To what extent is your position on federal regulation allowing same-sex marriage:

1-not at all 2-slightly 3-moderately 4-much 5-very much

Something you are certain about? (Certainty)

Connected to your beliefs about fundamental right and wrong? (MC)

Personally important to you? (Importance)

A reflection of your core moral beliefs and convictions? (MC)

A reflection of your religious beliefs? (RC)

Control (Skin rash treatment)

Do you support or oppose medical researchers developing new treatments for skin rashes?

1-Oppose 2-Neutral/Uncertain 3-Support

How strongly do you support/oppose medical researchers developing new treatments for skin rashes?

1-slightly 2-moderately 3-much 4-very much

(If uncertain) Do you lean towards supporting or opposing medical researchers developing new treatments for skin rashes?

1-lean towards supporting 2-neutral/uncertain 3-lean towards opposing

To what extent is your position on medical researchers developing new treatments for skin rashes:

1-not at all 2-slightly 3-moderately 4-much 5-very much

Something you are certain about? (Certainty)

Connected to your beliefs about fundamental right and wrong? (MC)

Personally important to you? (Importance)

A reflection of your core moral beliefs and convictions? (MC)

A reflection of your religious beliefs? (RC)

MORAL RATIONALITY SCALE

Please indicate how much you endorse the following items (1 = Not at all, 7 = Very much).

Political decisions should be based on rational arguments.

Political decisions should be based on the best available scientific evidence.

Ignoring scientific evidence when forming public policy is morally wrong.

Forming public policy based on religious beliefs is morally wrong.

Evaluating alternative public policies objectively, based on the quality of arguments and scientific evidence, is a moral virtue.

Being intellectually honest when evaluating the strength of one's own arguments is a moral virtue.

BELIEF IN SCIENCE SCALE (Farias et al., 2013)

Please indicate your level of agreement or disagreement with the following statements (1 = *Strongly disagree*, 6 = *Strongly agree*).

Science provides us with a better understanding of the universe than does religion.

“In a demon-haunted world, science is a candle in the dark.” (Carl Sagan)

We can only rationally believe in what is scientifically provable.

Science tells us everything there is to know about what reality consists of.

All the tasks human beings face are soluble by science.

The scientific method is the only reliable path to knowledge.

The only real kind of knowledge we can have is scientific knowledge.

Science is the most valuable part of human culture.

Science is the most efficient means of attaining truth.

Scientists and science should be given more respect in modern society.

DEMOGRAPHICS

What is your age? _____

What is your gender?

1-Male 2-Female 3-Other/rather not say

What is your race/ethnicity? (check all that apply)

1-White 2-Black or African American 3-Native American 4-Latino/a
5-Asian 6-Pacific Islander 7-Other _____

What is the highest level of education you have achieved?

1-less than high school 2-high school/GED 3-some college, no degree
4-associate's degree 5-bachelor's degree 6-master's/professional degree 7-doctoral degree

Are you a U.S. citizen?

1-yes 2-no

In which state do you currently reside? _____

What is your religious preference?

1-Christian 2-Jewish 3-Muslim 4-Hindu 5-Buddhist 6-Unitarian
7-Atheist 8-Other _____

What is your political orientation?

1-conservative 2-liberal 3-neither/neutral

To what extent are you liberal/conservative?

1-slightly 2-moderately 3-much 4-very much

(If neutral) Do you lean towards liberal or conservative?

1-lean towards liberal 2-neutral/uncertain 3-lean towards conservative

What is your political party identification?

1-Republican 2-Democrat 3-Independent 4-Other/Neutral

To what extent do you identify as a Democrat/Republican?

1-slightly 2-moderately 3-much 4-very much

(If neutral) Do you lean towards identifying as a Democrat or Republican?

1-lean towards Democrat 2-neutral/uncertain 3-lean towards Republican

Do you support or oppose the Tea Party movement?

1-support 2-oppose 3-neither or uncertain

To what extent do you support or oppose the Tea Party movement?

1-slightly 2-moderately 3-much 4-very much

Do you think of yourself as a member of the Tea Party movement, or not?

1-Yes, I think of myself as a member of the Tea Party movement

2-No, I do not think of myself as a member

How much attention overall do you pay to...

International news? / state or national news? / local news? / political news? / news on the internet?

1-none at all 2-slightly 3-moderately 4-much 5-very much

APPENDIX B

Supplemental Analyses

Moral rationality and science denial. According to the *moral rationality hypothesis*, people high in moral rationality (people who place high value on objective scientific information) are less likely than those low in moral rationality to interpret scientific results in a motivated way or exhibit science denial for attitude inconsistent information. Therefore I expected a significant interaction between results condition and moral rationality where those low in moral rationality should have been less likely to correctly interpret the results and more likely to engage in science denial for attitude inconsistent information. However, this pattern should not have existed for those high in moral rationality. Results indicated at least partial support for the *moral rationality hypothesis*.

To test this hypothesis, a hierarchical logistic regression was conducted predicting interpretation of the scientific results with results condition (dummy coded: 1 = *inconsistent*, 0 = *consistent*) and moral rationality entered in step 1, and the two-way interaction between results condition and moral rationality in step 2. Adding the interaction between results condition and moral rationality marginally significantly improved model fit, $\chi^2(1) = 2.85, p = .09$ (see Table V). There was a main effect of results condition on interpretation of results. People, overall, were less likely to correctly interpret the results when the correct interpretation was inconsistent rather than consistent with their attitude, $B = -.53, SE = .18, \text{Wald } \chi^2(1) = 9.15, p = .002, \text{Exp}(B) = .59$. However, this main effect was qualified by a marginally significant interaction between results condition and moral rationality. People low in moral rationality (1 *SD* below the mean) were more than half as likely to correctly interpret the results when they were inconsistent compared to consistent with their attitude, regardless of issue, $B = -.84, SE = .26, \text{Wald } \chi^2(1) = 10.66, p =$

.001, $\text{Exp}(B) = .43$. However, those high in moral rationality (1 *SD* above the mean) were no less likely to correctly interpret the results when they were inconsistent compared to consistent with their attitude, $B = -.23$, $SE = .25$, Wald $\chi^2(1) = .88$, $p = .35$, $\text{Exp}(B) = .79$ (see Figure 6).

Therefore, participants high in moral rationality were not as susceptible as those low in moral rationality to the trappings of motivated reasoning and did not change their interpretation of the data because of attitude inconsistency.

TABLE V
LOGISTIC REGRESSION RESULTS FOR RESULTS CONDITION, MORAL RATIONALITY, AND THEIR INTERACTION PREDICTING INTERPRETATION OF RESULTS

Predictors	Model 1			Model 2		
	<i>B</i>	<i>SE</i>	$\text{Exp}(B)$	<i>B</i>	<i>SE</i>	$\text{Exp}(B)$
Results condition	-.53**	.18	.59	-.53**	.18	.59
Moral rationality	.10	.07	1.10	-.02	.10	.98
Results X Moral Rationality				.25 [†]	.15	1.29
Δ -2 Log likelihood		728.80*			-2.85 [†]	

Note. [†] $p < .10$. * $p < .05$. ** $p < .01$.

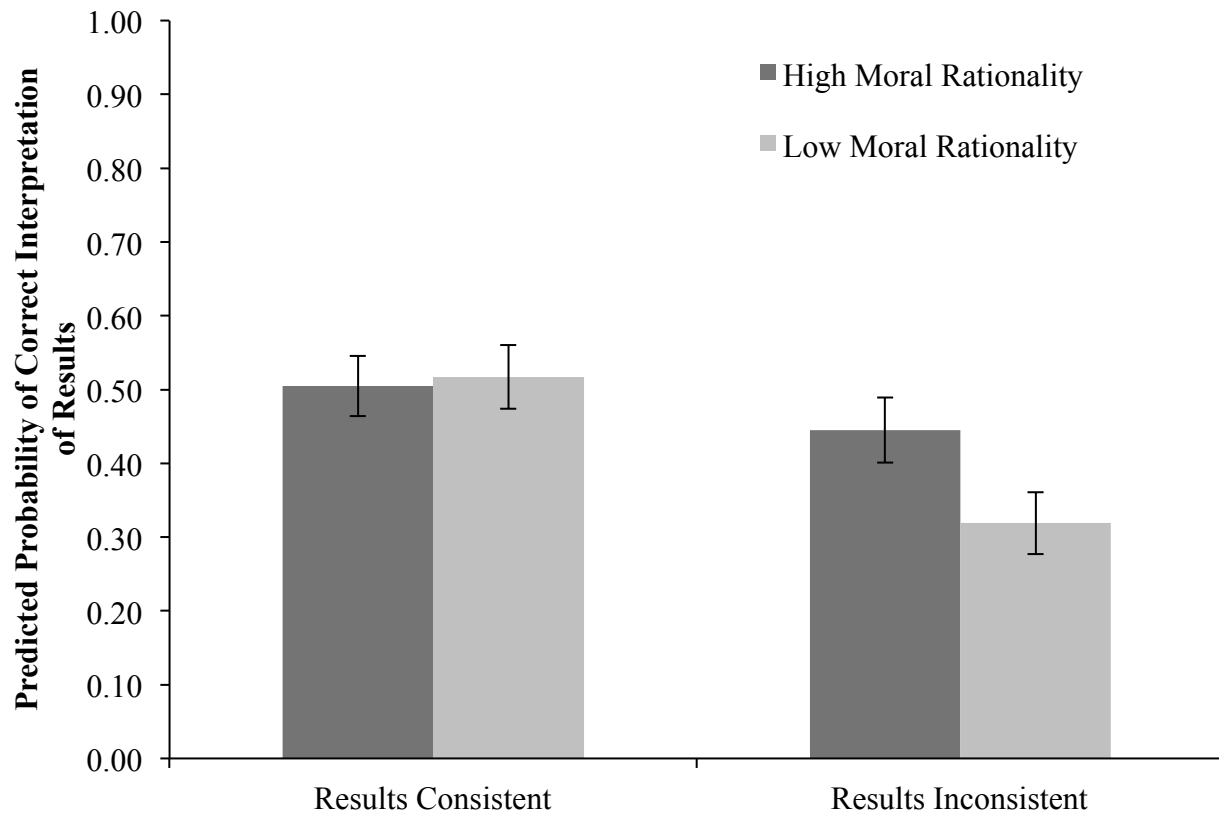


Figure 6. Predicted probability of correct interpretation of results as a function of attitude consistency and moral rationality. Low moral rationality is 1 SD below the mean and high moral rationality is 1 SD above the mean of the moral rationality measure. Error bars represent standard error of the mean.

The same analyses were conducted with the continuous measure of science denial instead of the binary measure of interpretation of data. There was a similar main effect for results condition where people engaged in more science denial when the correct interpretation of the data was inconsistent rather than consistent with their attitude, $B = .33$, $SE = .11$, $t(534) = 2.88$, $p = .004$ (see Table VI). However, there was no significant interaction between results condition and moral rationality, $B = -.12$, $SE = .10$, $t(534) = -1.27$, $p = .20$ (see Figure 7). These results suggest that moralizing rational thinking may inoculate people from motivated reasoning, but that this inoculation may not translate into having any actual effect on science denial.

TABLE VI
REGRESSION RESULTS FOR RESULTS CONDITION, MORAL RATIONALITY, AND
THEIR INTERACTION PREDICTING SCIENCE DENIAL

Predictors	Model 1		Model 2	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Results condition	.33**	.11	.33**	.11
Moral rationality	-.05	.05	.01	.07
Results X Moral rationality			-.12	.10
ΔR^2	.018**		.003	

Note. ** $p < .01$.

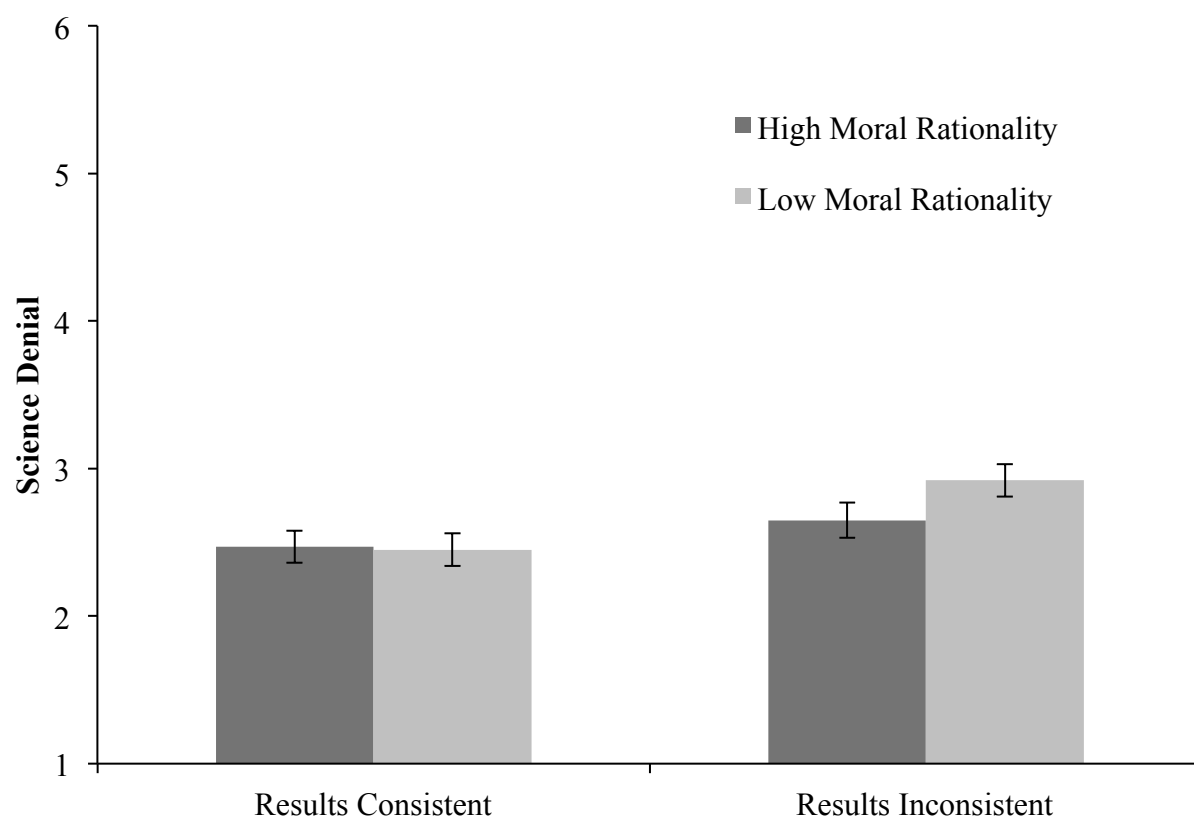


Figure 7. Science denial as a function of attitude consistency and moral rationality. Low moral rationality is 1 SD below the mean and high moral rationality is 1 SD above the mean of the moral rationality measure.

VITA

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Curriculum Vitae

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EDUCATION

- 2015 – present University of Illinois at Chicago, Chicago, IL
 Ph.D. Social Psychology
 Minor: Statistics, Methods, and Measurement
- 2013 – 2015 University of Illinois at Chicago, Chicago, IL
 M.A. Social Psychology
- 2011 – 2013 DePaul University, Chicago, IL
 M.S. Psychology, *with distinction*
- 2004 – 2008 Greenville College, Greenville, IL
 B.A. Psychology/Religion, *magna cum laude*
 Minor: Business

RESEARCH INTERESTS

My research examines the psychological and moral underpinnings of the liberal-conservative divide in American politics. In particular, I am interested in understanding how ideologically motivated reasoning influences people's judgments and decisions, especially in the realms of attributions for behavior and denial of scientific claims. I am also interested in understanding the causes and consequences of holding attitudes with moral conviction. Specifically, my research examines factors that cause individuals to adjust how morally convicted they feel about certain social issues, persons, or situations.

SCHOLARSHIPS/GRANTS/AWARDS

- 2014 – 2015 Chancellor's Graduate Research Fellowship (\$8,000 over two summers), Graduate College, University of Illinois at Chicago
- 2014 – 2015 Ph.D. Student Travel Award (\$1,000 over two years), College of Liberal Arts and Sciences, University of Illinois at Chicago
- 2014 – 2015 Travel Grant (\$600 over two years), Department of Psychology, University of Illinois at Chicago

- 2014 M.A. Research Grant (\$300), Department of Psychology, University of Illinois at Chicago
- 2013 Graduate Research Funding Grant (\$500), College of Science and Health, DePaul University
- 2012 Avery-Barat Scholarship (\$505), Department of Psychology, DePaul University
- 2004 – 2008 Presidential Honors Scholarship (\$20,000 over four years), Greenville College

PUBLICATIONS

- Skitka, L. J., **Washburn, A. N.**, & Carsel, T. S. (in press). The psychological foundations and consequences of moral conviction. *Current Opinion in Psychology*.
- Washburn, A. N.**, Morgan, G. S., & Skitka, L. J. (in press). A checklist to facilitate objective hypothesis testing. *Behavioral and Brain Sciences*.
- Skitka, L. J., & **Washburn, A. N.** (in press). Are conservatives from Mars and liberals from Venus? Maybe not so much. In P. Valdesolo & J. Graham (Eds.), *Bridging ideological divides (the Claremont Symposium on Applied Psychology)*.
- Washburn, A. N.**, & Skitka, L. J. (2014). Motivated and displaced revenge: Remembering 9/11 suppresses opposition to military intervention in Syria (for some). *Analyses of Social Issues and Public Policy*. doi: 10.1111/asap.12062

MANUSCRIPTS UNDER REVIEW AND IN PREPARATION

- Skitka, L. J., **Washburn, A. N.**, Hanson, B., Mueller, A., Wisneski, D. C., & Carsel, T. S. (in preparation). Are conservatives from Mars and liberals from Venus? A critical review.
- Washburn, A. N.**, & Skitka, L. J. (in preparation). Moral conviction as an equal opportunity motivator of science denial across the political divide.
- Washburn, A. N.**, & Skitka, L. J. (in preparation). Consensus information, political orientation, and science denial.

SYMPOSIA PRESENTATIONS

- Washburn, A. N.**, & Skitka, L. J. (2015, July). Science denial across the political divide. In L. J. Skitka (Chair), *Motivated denial: How group identities motivate rejection of science*. Symposium conducted at the annual meeting of the International Society of Political Psychology, San Diego, CA.

POSTER PRESENTATIONS

Washburn, A. N., & Skitka, L. J. (2015, May). *Science denial across the political divide*. Poster presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL.

Washburn, A. N., & Skitka, L. J. (2015, February). *Motivated and displaced revenge: Remembering 9/11 influences support for military intervention in Syria*. Poster presented at the annual meeting of the Society for Personality and Social Psychology, Long Beach, CA.

Washburn, A. N., & Skitka, L. J. (2014, May). *Displaced international punishment and support for military intervention in Syria*. Poster presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL.

Steiger, R. L., Benson, O., Omair, A., Van Damme, C., **Washburn, A. N.**, Wetherell, G. A., & Reyna, C. (2014, May). *Intent as a necessary and sufficient precursor to moral judgment*. Poster presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL.

Washburn, A. N., Reyna, C., Steiger, R., Wetherell, G. A., Benson, O., & Omair, A. (2014, February). *Sex, pranks, and videotapes: What are the precursors of moral judgment?* Poster presented at the annual meeting of the Society for Personality and Social Psychology, Austin, TX.

Washburn, A. N., Wetherell G. A., Yantis, C., & Reyna, C. (2013, May). *Moral conviction and value violation in response to situational constraint*. Poster presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL.

Washburn, A. N., Wetherell G. A., Yantis, C., & Reyna, C. (2013, January). *Forcing the issue: Moral conviction and perceptions of value violation in response to situational constraint*. Poster presented at the annual meeting of the Society for Personality and Social Psychology, New Orleans, LA.

Washburn, A. N., Wetherell G. A., Yantis, C., & Reyna, C. (2012, May). *Effects of social distance and situational constraint on attitudes and moral conviction*. Poster presented at the annual meeting of the Association for Psychological Science, Chicago, IL.

Washburn, A. N., Wetherell G. A., Yantis, C., & Reyna, C. (2012, April). *Moral conviction, social distance, and situational constraint*. Paper presented at the 2nd meeting of Chicagoland Morality Researchers (C-MORE), Chicago, IL.

ACADEMIC APPOINTMENTS

2013 – present	University of Illinois at Chicago, Chicago, IL Teaching Associate, Department of Psychology
2013	DePaul University, Chicago, IL Teaching Associate, Department of Psychology
2012 – 2013	University of Illinois at Chicago, Chicago, IL Visiting Teaching Associate, Department of Psychology

TEACHING EXPERIENCE

Teaching Associate

Laboratory in Social Psychology (Department of Psychology, University of Illinois at Chicago,
Fall 2012, Spring 2013, Fall 2013, Spring 2014, Fall 2014, Spring 2015)

Research Methods II (Department of Psychology, DePaul University, Winter 2013, Spring 2013)

Guest Lecturer

Laboratory in Social Psychology (*Measurement Construction, Reliability, and Validity*, University of
Illinois at Chicago, Spring 2015)

Laboratory in Social Psychology (*Using Qualtrics for Psychological Research*, University of Illinois at
Chicago, Spring 2013, Fall 2013, Spring 2014, Fall 2014, Spring 2015)

PROFESSIONAL EXPERIENCE

Preparing Future Faculty Program, DePaul University

PROFESSIONAL MEMBERSHIPS

American Psychological Association
Association for Psychological Science
Midwestern Psychological Association
Society for Personality and Social Psychology
International Society of Political Psychology
Psi Chi, National Honor Society in Psychology

OTHER EXPERIENCE

Member of C-MORE (Chicagoland Morality Researchers)