

*****PAPER IN PRESS AT POLITICAL PSYCHOLOGY*****

Political Attitudes and the Processing of Misinformation Corrections

Ullrich K. H. Ecker & Li Chang Ang

School of Psychological Science

University of Western Australia

Word count: 8,282 (main text only)

Address correspondence to: Ullrich Ecker, School of Psychological Science (M304),
University of Western Australia, 35 Stirling Hwy, Perth 6009, Australia. Telephone: +618
6488 3257; e-mail: ullrich.ecker@uwa.edu.au.

Acknowledgement: The research was supported by the Australian Research Council under
grant DP160103596, awarded to the first author. We thank Charles Hanich and Toni Doan
for research assistance, and Stephan Lewandowsky for his comments.

Abstract: Misinformation often continues to influence people's memory and inferential reasoning after it has been retracted; this is known as the continued influence effect (CIE). Previous research investigating the role of attitude-based motivated reasoning in this context has found conflicting results: Some studies have found that worldview can have a strong impact on the magnitude of the CIE, such that retractions are less effective if the misinformation is congruent with a person's relevant attitudes, in which case the retractions can even backfire. Other studies have failed to find evidence for an effect of attitudes on the processing of misinformation corrections. The present study used political misinformation—specifically fictional scenarios involving misconduct by politicians from left-wing and right-wing parties—and tested participants identifying with those political parties. Results showed that in this type of scenario, partisan attitudes have an impact on the processing of retractions, in particular (1) if the misinformation relates to a general assertion rather than just a specific singular event, and (2) if the misinformation is congruent with a conservative partisanship.

Keywords: Misinformation; Continued influence effect; Worldview backfire effect; Political attitudes; Motivated reasoning

Political Attitudes and the Processing of Misinformation Corrections

An information landscape that is marked by social media, citizen journalism, and fast-paced information flow places specific cognitive demands on information consumers. One such demand is that actualizations and corrections of outdated, no longer relevant, or invalidated information require continuous memory updating and knowledge revision. This is a difficult task, and it is well-known from the existing literature that invalid information continues to influence people's memory and inferential reasoning after the information has been corrected, even if people demonstrably remember the correction. This is known as the continued influence effect of misinformation (CIE; Johnson & Seifert, 1994; for reviews, see Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012; Seifert, 2002; Swire & Ecker, 2018).

The CIE has been documented in real-world settings (Lewandowsky, Stritzke, Oberauer, & Morales, 2005) as well as laboratory studies using fictional materials (e.g., Ecker, Lewandowsky, Cheung, & Maybery, 2015; Ecker, Lewandowsky, & Tang, 2010; Ecker, Hogan, & Lewandowsky, 2017; Johnson & Seifert, 1994; Thorson, 2016). As the CIE reliably occurs with neutral, fictitious materials, one could assume it results purely from failures of memory and memory updating (e.g., Ecker, Lewandowsky, Swire, & D. Chang, 2011; Ecker, Lewandowsky, E. P. Chang, & Pillai, 2014; Johnson & Seifert, 1994; Wilkes & Leatherbarrow, 1988). However, various authors have demonstrated that the CIE is particularly pronounced if corrected misinformation is congruent with a person's worldview. It follows that in real-world settings, the CIE may at least partially be an effect of motivated reasoning.

To illustrate, consider the mythical yet persistent claims that former US President Obama was born outside the United States. Even after the provision of his birth certificate, a sizeable proportion of the US populace continued to believe the myth. Prevalence of this misconception was not evenly distributed, but much greater among Republicans (as

compared to Democrats), who apparently remained unconvinced by the counter-evidence presented (Travis, 2010). Similarly, Prasad et al. (2009) found that when people were presented with retractions of attitude-congruent misconceptions, they defended their beliefs by engaging in attitude bolstering—a mental strategy that aims to reduce conflicting thoughts by reinforcing initial beliefs. Specifically, Republican participants who believed that Saddam Hussein was involved in the 9/11 attacks were presented with evidence that there was no such link. Despite the fact that this evidence was endorsed by the Republican Party and was the official bipartisan US position, the overwhelming majority of participants counter-argued or ignored the worldview-dissonant correction while bringing supportive evidence to mind (also see Jacks & Cameron, 2003; Zollo et al., 2017). Finally, Lewandowsky et al.'s (2005) study investigated belief in retracted news items during the 2003 Iraq war. It was found that people who were more supportive of the war (i.e., less skeptical about the official reason for the invasion) were less sensitive to retractions of pro-war misinformation.

In light of this, it may not be surprising that retractions of worldview-congruent misinformation can even backfire and ironically strengthen the very misconception they are meant to correct, a phenomenon coined the worldview backfire effect (Lewandowsky et al., 2012). For instance, Nyhan and Reifler (2010) presented participants with a series of misperceptions (e.g., the notion that tax cuts of the Republican George W. Bush administration had increased government revenues) and later retracted them (e.g., explaining how revenues actually decreased after the tax cuts). Nyhan and Reifler found that retractions tended to be inefficient or even backfire when they were aimed at misinformation that was worldview-congruent—for example, Republican participants believed *more strongly* in increased revenues after reading the factual retraction that revenues had decreased. Similarly, Nyhan, Reifler, and Ubel (2013) found that correcting Sarah Palin's "death panel" claims backfired in (politically knowledgeable) Palin supporters. Nyhan, Reifler, Richey, and Freed

(2014) found that while corrections of vaccine-related misperceptions reduced those misperceptions, they ironically also reduced the willingness to vaccinate in vaccine-skeptical parents. The present paper seeks to clarify under what conditions worldview affects the processing of misinformation corrections, and whether such worldview effects occur on both ends of the political left/right spectrum, or predominantly on the right.

The ineffectiveness of worldview-incongruent retractions is in line with general tendencies to seek out, favorably evaluate, and preferentially remember information that is congruent with one's attitudes and beliefs, while being distrustful of evidence that runs counter to one's attitudes and beliefs (i.e., motivated reasoning, cf. Bartels, 2002; Edwards & Smith, 1996; W. Hart et al., 2009; Kruglanski & Webster, 1996; Kunda, 1990; Lord, Ross, & Lepper, 1979; Redlawsk, 2002; Sharot, Korn, & Dolan, 2011; Taber & Lodge, 2006; Zollo et al., 2017). To use climate change as a topical example: Lorenzoni and Hulme (2009) found that prior beliefs about climate change determined people's evaluations of information regarding anthropogenic global warming. Lewandowsky and colleagues showed that attitudes regarding the free market predicted the rejection of climate science (Lewandowsky, Gignac, & Oberauer, 2013) and that, in US participants, information on the scientific consensus on climate change reduced acceptance of climate change in strong supporters of the free market (Cook & Lewandowsky, 2016). P. S. Hart and Nisbet (2011) observed that information regarding the health effects of climate change led Democrats to increase their support for mitigation policies, while ironically reducing support in Republicans. Likewise, Zhou (2016) found that despite various framing manipulations designed to make climate-change action more palatable to Republicans (e.g., presenting climate change as a threat to national security or economic development), arguments in favor of mitigation were consistently ineffective or backfired in Republican participants.

Thus, taken together, there seems to be good evidence that attitudes can influence the processing of evidence in general, and misinformation retractions in particular. However, beliefs are not always tainted by attitudes or partisanship (e.g., Blais et al., 2010; Gerber & Green, 1999). It seems sometimes attitudes only affect fact interpretations as opposed to beliefs (Gaines, Kuklinski, Quirk, Peyton, & Verkuilen, 2007), and that with sufficient accuracy motivation or focus on the explanatory power of arguments, attitude effects on reasoning are small, even in the climate domain (W. Hart et al., 2009; D. Johnson, 2017; Prior, Sood, & Khanna, 2015; Ranney & Clark, 2016).

Regarding the processing of corrections more specifically, some recent studies have also failed to find support for worldview effects: Garrett, Nisbet, and Lynch (2013) reported that a misconception that a local imam was a terrorist sympathizer was reduced by rebuttals irrespective of participants' ideology or relevant attitudes. Weeks (2015) found that emotions can affect susceptibility to attitude-congruent political misinformation, but that corrections effected belief updating independent of partisanship. Likewise, Nyhan and Reifler (2015) found that fact-checking improved political knowledge with only a non-significant impact of partisanship (note that factual affirmations and myth debunkings were not separately reported). Similarly, Swire, Berinsky, Lewandowsky, and Ecker (2017) found that corrections of misleading statements made by Donald Trump on the presidential campaign trail led to belief updating even in Trump supporters—although those belief changes did not translate into changes in affection or voting intentions. In a recent study correcting a wide variety of real-world statements, T. Wood and Porter (2018) found no evidence of a worldview backfire effect across five experiments. One potential issue with this study is that many of the presented statements were not technically false, and were thus not directly addressed by the associated corrections (e.g., the fact that in the U.S. “the number of gun homicides has fallen since the mid 1990s” does not technically make Hillary Clinton’s

statement that there is an “epidemic of gun violence” incorrect). Therefore, the experimental design was arguably not ideally suited to detect worldview backfire effects. That being said, the authors also failed to elicit a worldview backfire effect when using some of the exact materials that did elicit worldview backfire in the study by Nyhan and Reifler (2010).

In a traditional CIE paradigm, Ecker, Lewandowsky, and Apai (2011) presented participants with a fictitious plane crash scenario and attributed the cause to a terrorist bomb. Later on, in one condition the cause was retracted and a faulty fuel tank was stated as the cause of the crash; in another condition there was no retraction. A post-hoc analysis showed that people with higher islamophobia scores referred to terrorism as the cause of the crash more often than participants who scored lower in islamophobia, but this was true both in the retraction and the no-retraction condition, and thus the retraction was equally effective in both groups of participants. Ecker, Lewandowsky, Fenton, and Martin (2014) replicated this pattern in an investigation into the effects of racial attitudes on the processing of race-related misinformation. They presented participants who scored high versus low on a racial prejudice scale with a fictional robbery report. In this report, one of the protagonists—either the culprit or a hero preventing the robbery—was initially introduced as an Aboriginal person, and this was or was not retracted later on (i.e., it was or was not stated that police no longer believed the culprit/hero was an Aboriginal person). Results showed that participants’ racial attitudes determined how much they used race-related information in their inferential reasoning overall, but that attitude did not influence the effectiveness of the retraction (i.e., there was a main effect of racial prejudice but no interaction with retraction condition). In other words, both high and low-prejudice groups were able to discount race-related misinformation to a similar extent after a retraction.

It is unclear why there is a discrepancy between the work conducted in particular by Nyhan and colleagues (Nyhan & Reifler, 2010; Nyhan et al., 2013, 2014) and the findings of

Ecker, Lewandowsky, Fenton, et al. (2014). One proposal that Ecker et al. made is that the centrality of the misinformation to the attitude might be an important factor. Specifically, they argued that a retraction of an attitude-congruent one-off event might be easily accommodated with a person's worldview because it may not require attitude change. For example, a racially-prejudiced person could easily accept that a *particular* robbery was not committed by an Aboriginal person, but could continue to believe that most robberies are committed by Aboriginal people, or that most Aboriginal people are criminals. This suggestion is in-line with the findings of Blais et al. (2010), who found no effects of partisanship on specific beliefs such as whether or not a particular politician knew about a particular scandal before taking office, and Garrett et al. (2013), who found no effect of ideology in a study where the retracted misinformation regarded a specific imam and whether or not they were a terrorism sympathizer.

Support for this view comes from the stereotype subtyping literature (e.g., Kunda & Oleson, 1995; Richards & Hewstone, 2001). Subtyping occurs during exemplar classification when people accommodate an exemplar (e.g., an object or individual) that violates their stereotype by viewing it as an exception and placing it in a separate distinct subcategory of their stereotype. For example, a racially-prejudiced person could maintain their belief that Aboriginal people are generally cowardly by placing a brave Aboriginal preventing a robbery into a newly created stereotype subcategory of "fearless, valiant Aboriginals" (see Haslam & Loughnan, 2012; Pedersen, Beven, Walker, & Griffiths, 2004).

By contrast, accepting a retraction of attitude-congruent misinformation that is more general is more likely to require attitude change: misinformation that is general is more likely to be relevant to the associated attitude, and no subtyping will be possible. For instance, having received and accepted misinformation that Aboriginal people are *generally* more likely to commit robberies than Caucasians, a racially-prejudiced person might be unwilling

to accept a retraction of that misinformation because this would necessitate a certain amount of attitude change.

Thus, in a first experiment, we tested the hypothesis put forward by Ecker, Lewandowsky, Fenton, et al. (2014) that attitude effects on the processing of retractions may arise only with generic assertions and not specific one-off episodic events. As prior research found ineffective retractions mainly when correcting politically conservative misinformation (e.g., Nyhan & Reifler, 2010), Experiment 1 used scenarios involving misconduct of left-leaning politicians, and we tested pre-screened participants supporting either a left-leaning or a right-leaning party. To foreshadow, the results confirmed our hypothesis—partisan attitudes affected the processing of a retraction when the misinformation was of a general nature but not when it related to a specific episodic event. However, because Experiment 1 used misinformation that was congruent with a conservative partisan attitude, it only allowed us to test for motivated rejection of a retraction in participants supporting the conservative party. Thus, in a second experiment, we explored whether effects of partisanship on corrections of political misconceptions are stronger on the political right than the political left.

This was motivated by the fact that while previous studies reported evidence for motivated reasoning and backfire effects predominantly in conservative participants, often—as in Experiment 1 of the present study—these studies only used corrections that opposed conservative attitudes (e.g., P. S. Hart & Nisbet, 2011; Nyhan et al., 2013; Lewandowsky et al., 2005; Prasad et al., 2009; Swire et al., 2017; Zhou 2016). Thus, no strong conclusions can be drawn from this research that conservatives are more susceptible to attitudinal bias in the processing of misinformation corrections. Hitherto, only few studies have actively sought evidence for attitude/backfire effects in left-leaning participants. For example, Nyhan and Reifler (2010) included correction of a real-world misconception they assumed to be more widely held by Democrats, namely that then President G. W. Bush had banned stem cell

research. They indeed found that the correction of that misperception worked in Republicans but was ineffective in Democrats (without, however, backfiring). This suggests that attitude effects may indeed be symmetrical in the sense that people will dismiss corrective evidence if it threatens their political worldview, regardless of their political persuasion. The question of whether the effects of partisan attitudes on correction processing should be expected to be symmetrical or to occur predominantly on the right will be discussed in more detail in the Introduction of Experiment 2.

Experiment 1

Experiment 1 tested the hypothesis that worldviews affect retraction processing when the misinformation is a general assertion but not when it relates to a specific singular episodic event. Given that partisanship and political worldviews are commonly studied and people tend to display bias in evaluating political evidence (e.g., Edwards & Smith, 1996; Lord et al., 1979; Taber & Lodge, 2006), and in particular in processing of corrections of political misinformation (Nyhan & Reifler, 2010; Prasad et al., 2009), Experiment 1 used (fictional) political scenarios and tested participants scoring on the extreme ends of a bipolar political party-preference scale (the study was conducted in Australia, where the two major political parties are the left-leaning Labor party and the right-leaning Liberal party). Of course, party affiliation—the grouping variable in the present study—is not equivalent to political or ideological worldview, despite the strong relationship that exists between the two (e.g., Fielding, Head, Laffan, Western, & Hoegh-Guldberg, 2012). We thus acknowledge that effects of partisan attitudes in the present study can serve merely as a proxy to worldview effects in a more general sense.

The scenarios contained a critical piece of information that was subsequently retracted or not retracted, depending on condition. The critical information either related to a singular event (a Labor politician embezzling public funds) or a general assertion (Labor politicians

being more likely to embezzle in general). Misinformation scenarios congruent with a conservative partisan attitude were chosen as previous studies have found attitude effects mainly in conservatives (e.g., Nyhan & Reifler, 2010; Prasad et al., 2009). Following precedent (e.g., Ecker, Lewandowsky, Fenton, et al., 2014), the test involved an open-ended questionnaire; this contained fact-recall questions—serving mainly to ensure adequate encoding of materials—as well as inferential reasoning questions designed to measure participants' belief in the critical information.

Method

Experiment 1 used a $2 \times 2 \times 2$ between-subjects design with factors political party preference (Labor, Liberal), scenario (singular, general), and retraction condition (no-retraction, retraction). The main dependent variable was the mean number of references to the critical information participants made in response to the questionnaire (following ample precedent, e.g., Ecker et al., 2015, 2017; Johnson & Seifert, 1994). The statistical hypothesis was that the number of references would show a significant interaction of party preference and retraction in the general but not the singular scenario condition. It follows that we also expected an interaction of scenario and retraction condition in Liberal but not Labor supporters. If a worldview backfire effect was to occur, we hypothesized it would be observed in Liberal supporters in the general-scenario condition.

Participants. Approximately 2,000 first-year undergraduate students were pre-screened with a party-preference scale (see below for details on the scale). A priori power analysis (using G*Power 3; Faul, Erdfelder, Lang, & Buchner, 2007) suggested that in order to find a medium-size effect of $f = .25$ at $\alpha = .05$ and $1 - \beta = .80$, the minimum sample size was 128. A total of $N = 162$ undergraduates ($n = 19-21$ per cell) were recruited from the lower and upper quartiles of the party-preference scale distribution. The sample consisted of 100 females and 62 males, with age ranging from 17 to 71 years ($M = 20.87$ years, $SD = 7.89$).

Participants were pseudo-randomly assigned to one of the four experimental conditions. All participants provided informed consent and received course credit.

Materials.

Party-preference scale. The party-preference scale was a modified version of Mehrabian's (1996) conservatism-liberalism scale, using Labor and Liberal terms (see Appendix). It comprised five statements rated on 5-point Likert scales ranging from *strongly disagree* (0) to *strongly agree* (4). Higher scores indicated a stronger inclination towards the Labor Party. A representative statement is "I am politically more in line with the Labor party than the Liberal party."

Scenarios. Two fictitious scenarios, one involving a singular event and one involving a general assertion, were constructed (see Online Supplement). The singular scenario involved a specific Labor politician suspected of embezzlement. The general scenario regarded a study claiming that Labor politicians were in general three times more likely to be involved in embezzlement than Liberal politicians. Each scenario consisted of a series of 10 messages. Across both scenarios, the critical piece of information was given in message 4, and was either retracted or not retracted in message 9. Specifically, in the singular scenario, message 4 stated that "*It was announced today that Labor MP Tom Bradley, member for Newtown, is the politician who misappropriated the funds.*" In the retraction condition, message 9 then stated that "*Later today, a spokesperson for the prosecution, Dr Simon Cameron, clarified on ABC radio that the case had been misrepresented and that Labor MP Tom Bradley was not, in fact, suspected of having misappropriated the public funds.*" In the general scenario, message 4 stated that "*The study found that Labor politicians over the last three decades were more than three times as likely to misappropriate public funds compared to Liberals.*" In the retraction condition, message 9 then stated "*Later today, the lead author of the study, Dr Simon Cameron, clarified on ABC radio that the study results had been*

misrepresented and that Labor politicians were not, in fact, more likely than Liberals to misappropriate public funds.” In the no-retraction condition, message 9 of both scenarios just provided neutral, arbitrary information.

Test questionnaire. The test questionnaire consisted of 10 inference questions, 10 fact-recall questions, and 2 retraction-awareness questions (see Online Supplement). Questions across the two scenarios were kept as similar as possible but differed somewhat because of the differences inherent in the scenarios. Nine of the inference questions were open-ended questions designed to elicit responses relating to the critical information. For example, the inference question “*What would be a good headline for a report about the events/study?*” could be answered by referring to the critical information (e.g., “*Fraud in Labor party*”) or it could be answered without referring to the critical information (e.g., “*Taxpayers exploited*”). The final inference question was a 0-10 rating scale measuring belief in the critical information more directly (e.g., “*Do you think MP Bradley is guilty?*”).

The open-ended fact-recall questions assessed participants’ recollection of factual details (e.g., “*What was the total amount of embezzled public funds reported?*”) and were included to ensure sufficient encoding of the materials. Finally, the retraction-awareness questions examined encoding of and memory for a potential retraction (e.g., “*Was any of the information in the story subsequently corrected or altered? And if so, what was it?*”). This was to ensure that any reliance on retracted misinformation is not simply a result of not encoding the retraction in the first place.

Analyses were concerned with condition differences in (i) the accuracy of recall, (ii) memory for the retraction, and, most importantly, (iii) the number of references to the critical information in response to the inference questions.

Procedure. Participants were tested individually; the experimenter was not aware of any participant’s group (i.e., their party-preference score). Participants first read the fictitious

political article as a series of messages on a computer screen via a Microsoft PowerPoint presentation. Each message was shown separately and displayed for a set amount of time (message display time was set at 400 ms per word, following Rayner & Clifton, 2009).

Participants were informed that there would be a questionnaire relating to the article. The test questionnaire was given after an unrelated 10-minute distractor task, and participants were instructed to respond to all questions in the order they were presented. Lastly, participants were debriefed on the objectives of the study and the condition they had been assigned to. The entire experiment took approximately 30 minutes.

Results

Party-preference scores. Mean party preference scores were $M = 16.18$ ($SE = 0.22$; range 13-20) for Labor supporters ($n = 80$) and $M = 4.38$ ($SE = 0.21$; range 0-7) for Liberal supporters ($n = 82$).

Coding of test questionnaire. Open-ended questionnaires were scored using a standardized guide by a scorer blind to experimental conditions. Responses to fact-recall questions were given a score of 0 or 1, with .5 awarded for partially correct responses; scores were summed and the maximum total fact-recall score was thus 10. Responses to retraction-awareness questions were given a score of 0 or 1; the maximum retraction-awareness score was thus 2. Responses to open-ended inference questions were given a score of 0 or 1. Any uncontroverted mention of the Labor politician(s) embezzling funds, or any other statement that clearly related to the Labor politician(s)' actions and reflected the belief that they had embezzled funds was given an inference score of 1. Controverted mentions such as "*Labor politicians were initially under suspicion but this was later corrected*" were given a score of 0. The response to the direct 0-10 rating-scale question was transformed onto a 0-1 scale. Scores were summed and thus the maximum inference score was 10. To assess inter-rater agreement, a second scorer scored five questionnaires from each condition; a high inter-rater

reliability was found ($r > .95$ for inference, fact-recall, and retraction-awareness questions, respectively).

Fact recall. Mean fact-recall accuracy rates across conditions ranged from 3.55 to 5.16 (out of a maximum of 10). A 2 (party preference: Labor, Liberal) \times 2 (scenario: singular, general) \times 2 (retraction condition: no-retraction, retraction) factorial ANOVA on fact-recall scores revealed only a main effect of scenario, $F(1,154) = 5.43$, $MSE = 4.12$, $p = .02$, $\eta_p^2 = .03$, indicating slightly better recall of the general scenario. All other effects were non-significant, $F_s < 2.11$, $p_s > .14$.

Retraction awareness. Retraction-awareness scores were analyzed only for the retraction conditions. Mean scores ranged from 0.79 to 1.29 (out of a maximum of 2) across conditions. Mirroring the fact-recall analysis, a 2 (party preference: Labor, Liberal) \times 2 (scenario: singular, general) ANOVA revealed only a main effect of scenario, $F(1,78) = 6.32$, $MSE = 0.49$, $p = .01$, $\eta_p^2 = .07$, indicating slightly better retraction awareness in the general scenario. All other effects were non-significant, $F_s < 1$.

Reliance on critical (mis)information. Mean inference scores across conditions are presented in Figure 1. A 2 (party preference: Labor, Liberal) \times 2 (scenario: singular, general) \times 2 (retraction condition: no-retraction, retraction) factorial ANOVA found significant main effects of party preference, $F(1,154) = 11.12$, $MSE = 4.79$, $p = .001$, $\eta_p^2 = .07$, scenario, $F(1,154) = 34.34$, $p < .001$, $\eta_p^2 = .18$, and retraction condition, $F(1,154) = 10.70$, $p = .001$, $\eta_p^2 = .06$, as well as a significant interaction of party preference and retraction condition, $F(1,154) = 12.67$, $p < .001$, $\eta_p^2 = .08$, and a marginal interaction of scenario and retraction condition, $F(1,154) = 3.10$, $p = .08$, $\eta_p^2 = .02$.¹

¹ An analysis using the party-preference score as a continuous predictor confirmed the main effects and also yielded a significant three-way interaction between party preference, scenario, and retraction, $F(1,154) = 4.10$, $p = .04$, $\eta_p^2 = .03$, demonstrating that the effect of a retraction depends on party preference, especially in the general as compared to the specific scenario.

Planned interaction contrasts were used to directly test our hypothesis of a significant party preference by retraction condition interaction in the general but not the singular scenario. In the general scenario, the interaction was significant, $F(1,154) = 11.51, p < .001$. In the singular scenario, it was not, $F(1,154) = 2.66, p = .11$. Likewise, planned interaction contrasts were run to directly test our hypothesis of a significant scenario by retraction condition interaction in Liberal but not Labor supporters. In Liberal supporters, the interaction was significant, $F(1,154) = 4.65, p = .03$; in Labor supporters, it was not, $F < 1$. The apparent backfire effect in Liberal supporters in the general scenario condition was not significant, $F(1,154) = 2.79, p = .10$ (the retraction effect in Liberal supporters in the singular scenario was also non-significant, $F(1,154) = 1.90, p = .17$, while the retraction effects in Labor supporters were both significant, $F_s > 9.67, p_s \leq .002$).²

Discussion

At first glance, the main effects found in Experiment 1 confirm previous findings. Retractions were generally effective in reducing (but not eliminating) the number of references made to the critical misinformation, in line with much previous research (e.g., Ecker et al., 2011; Thorson, 2016; Wilkes & Leatherbarrow, 1988). Moreover, in line with Ecker, Lewandowsky, Fenton, et al. (2014), partisan attitudes had a general impact on the number of references made to the critical information: Liberal supporters tended to refer more often to the Labor misconduct than Labor supporters. This is also consistent with the motivated reasoning literature (e.g., Kunda, 1990). However, as can be seen in Figure 1,

² Following precedent (e.g., Ecker et al., 2014), inference-score analyses were repeated excluding participants with poor recall of materials. Excluding participants in the retraction condition with retraction-awareness scores of zero ($n = 20$) did not substantially affect the outcome. However, when excluding participants with fact-recall scores < 2 ($n = 13$), the omnibus analysis yielded a significant scenario by retraction condition interaction, $F(1,141) = 4.32, MSE = 4.40, p = .04, \eta_p^2 = .03$, and additionally yielded a marginally significant three-way interaction, $F(1,141) = 3.90, p = .05, \eta_p^2 = .03$. Moreover, in this sample, the backfire effect in Liberal supporters in the general scenario condition was significant, $F(1,141) = 6.34, p = .01$.

retractions were generally more effective in Labor supporters, and partisan attitudes selectively affected inference scores in the retraction conditions.

Thus, regarding the influence of partisan attitudes on retraction processing, Experiment 1 largely confirmed our hypotheses. The outcome of the singular scenario condition mirrors the findings of Ecker, Lewandowsky, Fenton, et al. (2014) and Garrett et al. (2013): with a singular episodic event, partisan attitudes did not have a strong impact on the processing of a retraction. This provides corroborative evidence for the notion that retraction processing is not much influenced by attitudes if accepting the retraction does not require attitudinal change. It seems plausible that the ensuing conflict between attitude maintenance and belief updating is achieved at least partially through stereotype subtyping (Kunda & Oleson, 1995; Richards & Hewstone, 2001). Liberal participants could have maintained a negative view of Labor politicians by placing the Labor politician who was cleared of any wrongdoing into an isolated subcategory of “virtuous Labor politician” that differentiates that individual from the representation of the “typical” Labor politician.

By contrast, partisan attitudes strongly influenced the effectiveness of a misinformation retraction when the misinformation was of a general nature and thus more directly attitude-relevant. In this case, if the misinformation was attitude-incongruent, the retraction was clearly effective, and if the misinformation was attitude-congruent, the retraction was clearly ineffective (and backfired in participants with reasonable memory for the report). This pattern is broadly consistent with previous work by Nyhan and colleagues (Nyhan & Reifler, 2010; Nyhan et al., 2013, 2014; also see Lewandowsky et al., 2005; Prasad et al., 2009). Thus, results supported our hypothesis that retractions are ineffective if they require attitude change (we acknowledge that the proposed underlying mechanism must necessarily remain somewhat speculative because we did not directly measure attitude change).

As the misinformation used in this experiment revolved around misconduct of Labor politicians, the retraction was ineffective in Liberal participants. To establish whether this finding was merely a trivial consequence of the one-sided materials used in Experiment 1, or whether effects of partisan attitudes on retraction processing are genuinely stronger in conservatives, we ran Experiment 2. Experiment 2 was an exact replication of the general scenario condition of Experiment 1, only that we used two parallel versions of the scenario involving misconduct by either Labor or Liberal politicians.

Experiment 2

Experiment 2 focused on the question of whether effects of partisan attitudes on correction processing occur on both sides of the political spectrum or predominantly in conservatives. The symmetry of worldview effects across the political dimension is a hotly debated topic. The notion of symmetry—namely, that worldview effects occur on the political left and the political right—is a central aspect of Kahan’s (2010, 2013) “cultural cognition” thesis, a variant of motivated reasoning theory that explicitly takes into account the insight that humans operate in a socio-cultural context. Kahan argues that group values are a strong determinant of an individual’s attitudes and beliefs, and that biased information processing serves primarily to defend one’s socio-cultural worldview and “tribal” identity. In a community with culturally shared values and attitudes, expressing dissenting beliefs bears the risk of social exclusion. Thus, people are motivated to resist oppositional persuasion to protect their group and preserve their social standing, together with the psychological and material benefits that come with it. Importantly, this biased information processing is argued to occur in all people, irrespective of political partisanship or ideological worldview.

Support for the symmetry argument comes from Kahan, Peters, Dawson, and Slovic (2017), who asked participants to interpret data presented in contingency tables. The data allegedly reflected either the outcome of a clinical trial regarding a skin-care product, or the

outcome of a study on the effects of gun control on crime. Kahan et al. found political polarization in the gun control condition, such that participants became more accurate in their interpretations of the data if the data aligned with their worldview (i.e., liberal Democrats were more accurate if the data suggested gun control had reduced crime, and conservative Republicans became more accurate if the data suggested gun control had increased crime). Thus, polarization was found to be symmetrical along the political dimension.

Moreover, Nisbet, Cooper, and Garrett (2015) found that when presented with worldview-dissonant scientific information, participants responded with counter-arguing, reactance, and negative affect irrespective of their political persuasion (also see Washburn & Skitka, in press). Similarly, Frimer, Skitka, and Motyl (2017) reported equivalent selective exposure tendencies in left-leaning and right-leaning participants, who as groups were equally inclined to “remain in their respective ideological bubbles” (p.1; also see Crawford, 2014; Crawford, Kay, & Duke, 2015). In summary, it follows from this line of research that effects of partisan attitudes on retraction processing should occur on both sides of the political spectrum, depending on the nature of the retracted content.

An alternative position has highlighted individual differences in personality traits between left-leaning progressives and right-leaning conservatives, and has claimed that these differences underlie biases in information processing (Feather, 1979; Jost, 2017; Jost, Glaser, Kruglanski, & Sulloway, 2003; Mooney, 2012; Thórisdóttir & Jost, 2011). There is ample evidence that conservatives exhibit greater levels of negativity bias and perceived threat (e.g., Carraro, Castelli, & Macchiella, 2011; Fessler, Pisor, & Holbrook, 2017; Hibbing, Smith, & Alford, 2014) as well as greater need for certainty and ambiguity intolerance (e.g., Fibert & Ressler, 1998; Jost et al., 2007), and lower open-mindedness (e.g., Carney, Jost, Gosling, & Potter, 2008; Price, Ottati, Wilson, & Kim, 2015). Jost and colleagues (Jost et al., 2003; Jost, 2017) argue that attitudes and beliefs are not, as suggested by the cultural cognition thesis,

passively absorbed from one's sociocultural context, but that an individual tends to actively adopt attitudes that resonate with their personality. In other words, the traits associated with political conservatism may motivate the development and maintenance of key conservative values. For example, greater negativity bias and perceived threat may foster the affinity for system justification and strict policies (e.g., with respect to crime prevention and immigration regulation), while ambiguity intolerance and closed-mindedness may promote traditional values and preference for clear societal structures and hierarchies.

Likewise, conservative personality traits may foster a particular style of information processing. For example, negativity bias and perceived threat may foster defensive reasoning strategies in response to oppositional challenges, while ambiguity intolerance and closed-mindedness may foster resistance to worldview-dissonant retractions. Indeed, motivated reasoning has been linked to closed-mindedness (W. Hart et al., 2009; Levitan & Visser, 2008), and conservatives have been shown to be less likely to seek out information regarding non-preferred candidates during election campaigns (Iyengar, Hahn, Krosnick, & Walker, 2008), and to be generally more averse to worldview-dissonant information (Barberá, Jost, Nagler, Tucker, & Bonneau, 2015; Nam, Jost, & Bavel, 2013; Vraga, 2015, 2016). Moreover, Trevors, Muis, Pekrun, Sinatra, and Winne (2016) explicitly associated worldview backfire effects with the negative emotional fallout of a correction that threatens one's identity and self-concept. Thus, greater susceptibility to threat should be associated with stronger worldview effects on retraction processing. It follows from this literature that effects of partisan attitudes on retraction processing should occur predominantly on the political right because conservatives may be intrinsically motivated to dismiss attitude-dissonant retractions in accord with the unique personality traits found in this group.

To test whether the effects of partisan attitudes on retraction processing occur on both sides of the political spectrum, Experiment 2 replicated the general-scenario condition of

Experiment 1, using two parallel versions with misconduct associated mainly with politicians on the left or the right. Experiment 2 focused on the general scenario based not only on the stronger partisan-attitude effect observed in Experiment 1, but also because general assertions will arguably carry greater importance than one-off events in most real-world contexts. We expected that there would be an effect of partisan attitudes on retraction processing only in Liberal supporters. In other words, we hypothesized a significant party preference by retraction condition interaction would emerge with a scenario that suggested misconduct in the Labor party but not with a scenario suggesting misconduct in the Liberal party.

Method

Experiment 2 employed a $2 \times 2 \times 2$ between-subjects design with factors party preference (Labor, Liberal), misconduct party (Labor, Liberal), and retraction condition (no-retraction, retraction).

Participants. Approximately 1,500 undergraduate students at the University of Western Australia were pre-screened with the party-preference scale. These students had not participated in Experiment 1. A total of $N = 165$ ($n = 20-21$ per cell) undergraduates were recruited from the upper and lower quartiles of the resulting distribution. The sample comprised 59 males and 106 females, with ages ranging from 15 to 69 years ($M = 21.59$ years; $SD = 8.41$). Participants were pseudo-randomly assigned to one of the four experimental conditions. All participants provided informed consent and received course credit.

Materials and Procedure. Materials and procedure were identical to the general-scenario condition of Experiment 1, with the exception that an additional parallel version of the scenario was created, which suggested that Liberal politicians were generally more likely to embezzle public funds.

Results

Party-preference scores. Mean party preference scores were $M = 16.53$ ($SE = 0.23$; range 13-20) for Labor supporters ($n = 83$) and $M = 4.52$ ($SE = 0.23$; range 0-8) for Liberal supporters ($n = 82$).

Coding of test questionnaire. Coding procedures were identical to Experiment 1. Inter-rater reliability was high ($r > .95$ for inference, fact-recall, and retraction-awareness questions, respectively).

Fact recall. Mean fact-recall accuracy rates across conditions ranged from 4.12 to 5.29 (out of 10). A 2 (party preference: Labor, Liberal) \times 2 (misconduct party: Labor, Liberal) \times 2 (retraction condition: no-retraction, retraction) factorial ANOVA on fact-recall scores revealed no significant effects, $F_s < 2.56$, $p_s > .11$.

Retraction awareness. Mean retraction-awareness scores ranged from 0.80 to 1.10 (out of 2) across conditions. Mirroring the fact-recall analysis, a 2 (party preference) \times 2 (misconduct party) analysis revealed no significant effects, $F_s < 1.49$, $p_s > .22$.

Reliance on critical (mis)information. Mean inference scores across conditions are presented in Figure 2. A 2 (party preference: Labor, Liberal) \times 2 (misconduct party: Labor, Liberal) \times 2 (retraction condition: no-retraction, retraction) factorial ANOVA found significant main effects of misconduct party, $F(1,157) = 9.23$, $MSE = 4.57$, $p = .003$, $\eta_p^2 = .06$, and retraction condition, $F(1,157) = 27.57$, $p < .001$, $\eta_p^2 = .15$, as well as significant interactions between party preference and retraction condition, $F(1,157) = 4.03$, $p = .05$, $\eta_p^2 = .03$, and between party preference and misconduct party, $F(1,157) = 18.54$, $p < .001$, $\eta_p^2 = .11$. Moreover, there was a marginal three-way interaction, $F(1,157) = 3.19$, $p = .08$, $\eta_p^2 = .02$.³

³ As in Experiment 1, an analysis using the party-preference score as a continuous predictor was performed, which confirmed the main effects of misconduct party and retraction

Planned interaction contrasts were used to directly test our hypothesis of a significant party preference by retraction condition interaction in the Labor misconduct but not the Liberal misconduct scenario. In the Labor misconduct scenario, the interaction was significant, $F(1,157) = 7.24, p = .008$. In the Liberal misconduct scenario, it was not, $F < 1$. Planned contrasts testing the misconduct party by retraction condition interaction were non-significant in both groups, $F_s < 1.81, p_s > .18$. There was no backfire effect in Liberal participants in the scenario involving misconduct in the Labor party, but the retraction in this condition was clearly ineffective, $F < 1$ (the three other retraction effects were all significant with $F_s > 6.01, p_s \leq .15$).⁴

Discussion

The results from Experiment 2 were clear-cut. In line with Experiment 1 and much previous research, retractions were generally effective at reducing (but not eliminating) references to the critical information (Ecker et al., 2011; Thorson, 2016; Wilkes & Leatherbarrow, 1988). In general, there were slightly more references to misconduct when it was suggested to take place mainly in the Labor party, but this was entirely due to the scores of Liberal participants. Partisan attitudes had a general impact on the number of references made to the critical information: Labor supporters tended to refer more often to the Liberal misconduct than Liberal supporters and vice versa. However, as can be seen in Figure 2 and corroborated by the interaction between party preference and misconduct party, while Labor supporters referred to misconduct to roughly the same extent whether it had occurred in the

condition, and the interactions of party preference \times retraction and party preference \times misconduct party.

⁴ As in Experiment 1, inference-score analyses were repeated excluding participants with poor recall of materials. Excluding participants in the retraction condition with retraction-awareness scores of zero ($n = 25$) did not substantially affect the outcome. When excluding participants with fact-recall scores < 2 ($n = 11$), the party preference by retraction condition interaction was no longer significant, $F(1,146) = 2.86, MSE = 4.64, p = .09, \eta_p^2 = .02$, but the three-way interaction was significant, $F(1,146) = 4.37, p = .04, \eta_p^2 = .04$.

Labor or Liberal party, Liberal supporters referred much more often to misconduct when it was associated with the opposition party. In other words, the effect of attitude-congruence was much more pronounced in Liberal participants: numerically, the attitude-congruence effect—the difference between attitude-congruent and attitude-incongruent references across retraction conditions—was 0.42 in Labor participants and at 2.44 almost six times that number in Liberal participants (to see attitude-congruence effects in Figure 2, compare the two light-gray bars in the left panel with the two light-gray bars in the right panel, and likewise for the dark-gray bars).

Regarding the influence of partisan attitudes on retraction processing more specifically, retractions tended to be more effective if attitude-dissonant information was retracted. This was true for both left-wing and right-wing participants. However, retractions were clearly effective in all conditions except the condition involving the retraction of information congruent with the partisan attitudes of Liberal participants, where the retraction was entirely ineffective.

General Discussion

In two experiments, we investigated the conditions under which partisan attitudes affect the processing of misinformation retractions. In general, across all conditions in both experiments, retractions tended to be more effective if they retracted attitude-dissonant misinformation. This is in line with theoretical accounts of motivated reasoning and the cultural cognition thesis (W. Hart et al., 2009; Kahan, 2010, 2013; Kruglanski & Webster, 1996; Kunda, 1990; Taber & Lodge, 2006). Confirming a hypothesis specified by Ecker, Lewandowsky, Fenton, et al. (2014), Experiment 1 found that partisan attitudes affected retraction processing predominantly if the misinformation was of a general nature, such that accepting the retraction would require a certain amount of attitudinal change. In this case (i.e., in the context of Experiment 1, in Liberal participants), an attitude-dissonant retraction

was ineffective (the apparent backfire effect was significant only when excluding participants with poor memory for the materials) in line with Nyhan and Reifler (2010). Experiment 2 replicated the pattern found in the general-scenario condition of Experiment 1 closely; while the backfire effect was now clearly absent, an attitude-dissonant retraction was still found to be entirely ineffective in Liberal participants. By contrast, retractions across both experiments were consistently effective in Labor participants. In sum, one can conclude that partisan attitudes generally affect the processing of misinformation retractions, but the partisan attitude effects seem somewhat stronger on the political right, where attitude-dissonant retractions were found consistently ineffective. This supports the view that conservative minds are particularly prone to worldview effects when processing contentious information (Jost et al., 2003; Jost, 2017; Nam et al., 2013; Prasad et al., 2009). This might best be explained by the notion that worldview effects are mediated by the negative emotional impact of self-concept threatening corrections, combined with the assumption that conservatives are (i) particularly susceptible to such threats (Trevors et al., 2016; Carraro et al., 2011; Fessler et al., 2017; Hibbing et al., 2014), and (ii) generally less likely to engage with worldview-dissonant information based on their greater need for certainty, ambiguity intolerance, and closed-mindedness (Carney et al., 2008; Fibert & Ressler, 1998; Jost et al., 2007; Price et al., 2015).

To the best of our knowledge, this is the first study to test for partisan-attitude effects on information processing using entirely parallel materials for participants supporting left-leaning and right-leaning parties. However, an obvious limitation of this study is that only one particular topic—misconduct in politicians—was used. Thus, it is possible that the observed variation in retraction effectiveness across partisan groups may relate to the specific topic used in this study. For example, an alternative explanation of the result pattern could be derived from Crawford's (2012) ideologically objectionable premise model. This model

assumes that judgments can be biased by political attitudes across the spectrum, but that the judgment context determines whether biased judgment actually occurs. Specifically, if an individual categorically rejects the premise of a judgment, then attitudes do not lead to bias. For example, if a person thinks that in general torture can be a legitimate interrogation tool, they may be biased in their assessment of who might be justifiably tortured (e.g., a foreign terror suspect vs. a domestic crime suspect). If, however, a person rejects torture outright, they will show no bias and will be equally concerned about torture of any person. In the present context, if Liberal supporters in general found embezzlement somewhat more acceptable than Labor supporters, this may explain the observed stronger bias. This notion is of course highly speculative, in particular as it seems improbable that Liberal supporters would find embezzlement any more acceptable than Labor supporters, despite the existing partisan differences in what is morally acceptable behavior (e.g., Gallup, 2016). However, this speculation produces the testable hypothesis that in a scenario involving a behavior that right-leaning participants find categorically unacceptable but left-leaning participants find generally more acceptable, the opposite result pattern should emerge.

A second factor could be the general salience of the misinformation. There are some claims in the literature that misinformation that is more salient is more easily retracted (e.g., Ecker et al., 2017; Kendeou, Butterfuss, van Boekel, & O'Brien, 2017; Kendeou, Walsh, Smith, & O'Brien, 2014; Putnam, Wahlheim, & Jacoby, 2014; Stadtler, Scharrer, Brummernhenrich, & Bromme, 2013). However, to explain the observed data, this account would have to assume that misconduct in Labor politicians was a particularly un-salient topic for Liberal participants, an assumption that seems fairly implausible. Nevertheless, before drawing stronger conclusions, future research should attempt to replicate the obtained data pattern with different materials, and perhaps also including more direct target measures (e.g.,

in the present paradigm, one could measure directly participants' evaluation of the politicians involved).

Third, it is known that motivated reasoning is particularly strong in cases where an attitude is central to a person's identity (Brannon, Tagler, & Eagly, 2007; W. Hart et al., 2009). Thus, to the extent that the Liberal participants in the present study may consider their support of their preferred party as a more central aspect of their identity than the Labor participants, they would be expected to show stronger resistance to retractions that run counter to their partisan attitudes. Even though our samples were well-matched in terms of party-preference scores, this is a plausible hypothesis that cannot be entirely ruled out by the present data; future research should thus aim to disentangle the potential effects of participants' political persuasion and their strength of identification with their preferred party. This is perhaps best done in a representative sample, as it is unclear to what extent young adults, such as the undergraduates tested in this study, have formed strong political loyalties. We also acknowledge that other potential mediators of the effect might exist.

Regarding the question of whether or not the worldview backfire effect observed in some studies but not others is a reliable phenomenon, the present research cannot provide a conclusive answer. A numerical backfire effect was obtained in Experiment 1, although it was statistically significant only when excluding participants with poor memory for the materials, and no evidence for backfire was found in Experiment 2. It thus seems that the worldview backfire effect is a "real" phenomenon that can sometimes occur, but that is not reliably evoked (see T. Wood & Porter, in press). The present research, together with previous reports of the effect (see Cook & Lewandowsky, 2016; Nyhan & Reifler, 2010; Nyhan et al., 2013), suggests that the effect is more likely to occur in conservative people, but future research should aim to further constrain the conditions under which the effect is most likely to arise.

Another important question for future studies will be to tease apart how much of the effect, when it occurs, represents true ironic belief change, and how much might reflect over-compensatory reactance. As discussed by Ecker, Lewandowsky, Fenton, et al. (2014), an effect that resembles a worldview backfire effect may occur if a person (1) changes their belief in line with the corrective evidence, but (2) does not want to express this changed belief, for example out of fear of social exclusion, and then (3) over-corrects for the belief change (see Batson, 1975; Gal & Rucker, 2010).

A similar interpretation of potential backfire effects stems from work on agent-based modeling of social norm impacts (Brown, Lewandowsky, & Huang, 2018; Epstein, 2001; Marsella, Pynadath, & Read, 2004; Smaldino & Epstein, 2015). Specifically, one might assume that expressed beliefs (e.g., beliefs expressed in an experiment) are always a compromise between a person's true belief and the perceived relevant social norm. This compromise is sought to concurrently meet the competing needs for authenticity (A. Wood, Linley, Maltby, Baliouis, & Joseph, 2008) and social inclusion (Hornsey & Jetten, 2004). If corrective evidence becomes available that is perceived to strongly shift the estimated social norm belief, then a compromise between a person's true belief and the norm belief may no longer be possible. If a person then decides post-correction to express their true belief—in order to satisfy their need for authenticity while foregoing their need for social inclusion—the correction's effect may resemble a worldview backfire effect even if no ironic belief change has actually occurred.

Conclusion

To conclude, the present findings demonstrate that partisan attitudes can affect the processing of retractions, at least in the type of paradigm used in the present study. This extends the study of motivated reasoning to the continued influence effect of misinformation (see also Ecker, Swire, & Lewandowsky, 2014). The fact that retractions were consistently

found to be particularly ineffective in Liberal supporters corroborates the notion that conservative traits such as perceived threat, ambiguity intolerance, and closed-mindedness may foster resistance to attitude-dissonant retractions (Barberá et al., 2015; Jost et al., 2003; Jost, 2017; Lewandowsky et al., 2005; Nam et al., 2013; Nyhan & Reifler, 2010; Prasad et al., 2009; Vraga, 2015, 2016).

References

- Barberá, P., Jost, J. T., Nagler, J., Tucker, J. A., & Bonneau, R. (2015). Tweeting from left to right: Is online political communication more than an echo chamber? *Psychological Science, 26*, 1531-1542. doi:10.1177/0956797615594620
- Bartels, L. M. (2002). Beyond the running tally: Partisan bias in political perceptions. *Political Behavior, 24*, 117-150.
- Batson, C. D. (1975). Rational processing or rationalization? Effect of disconfirming information on a stated religious belief. *Journal of Personality and Social Psychology, 32*, 176-184. doi:10.1037/h0076771
- Blais, A., Gindengil, E., Fournier, P., Nevitte, N., Everitt, J., & Kim, J. (2010). Political judgments, perception of facts, and partisan effects. *Electoral Studies, 29*, 1-12. doi:10.1016/j.electstud.2009.07.001
- Brannon, L. A., Tagler, M. J., & Eagley, A. H. (2007). The moderating role of attitude strength in selective exposure to information. *Journal of Experimental Social Psychology, 43*, 611-617. doi:10.1016/j.jesp.2006.05.001
- Brown, G. D. A., Lewandowsky, S., & Huang, Z. (2018). *Social sampling theory: Authenticity preference and social extremeness aversion lead to social norm effects and polarization*. Manuscript submitted for publication.
- Carney, D. R., Jost, J. T., Gosling, S. D., & Potter, J. (2008). The secret lives of liberals and conservatives: Personality profiles, interaction styles, and the things they leave behind. *Political Psychology, 29*, 807-840. doi:10.1111/j.1467-9221.2008.00668.x
- Carraro, L., Castelli, L., & Machiella, C. (2011). The automatic conservative: Ideology-based attentional asymmetries in the processing of valenced information. *PLOS ONE, 6*, e26456. doi:10.1371/journal.pone.0026456

- Cook, J., & Lewandowsky, S. (2016). Rational irrationality: Modeling climate change belief polarization using Bayesian Networks. *Topics in Cognitive Science*, 8, 160-179.
doi:10.1111/tops.12186
- Crawford, J. T. (2012). The ideologically objectionable premise model: Predicting biased political judgments on the left and right. *Journal of Experimental Social Psychology*, 48, 138-151. doi:10.1016/j.jesp.2011.10.004
- Crawford, J. T. (2014). Ideological symmetries and asymmetries in political intolerance and prejudice toward political activist groups. *Journal of Experimental Social Psychology*, 55, 284-298. doi:10.1016/j.jesp.2014.08.002
- Crawford, J. T., Kay, S. A., & Duke, K. E. (2015). Speaking out of both sides of their mouths: Biased political judgments within (and between) individuals. *Social Psychological and Personality Science*, 6, 422-430. doi:10.1177/1948550614566858
- Ecker, U. K. H., Hogan, J. L. & Lewandowsky, S. (2017). Reminders and repetition of misinformation: Helping or hindering its retraction? *Journal of Applied Research in Memory and Cognition*, 6, 185-192. doi:10.1016/j.jarmac.2017.01.014
- Ecker, U. K. H., Lewandowsky, S., & Apai, J. (2011). Terrorists brought down the plane!—No, actually it was a technical fault: Processing corrections of emotive information. *Quarterly Journal of Experimental Psychology*, 64, 283-310.
doi:10.1080/17470218.2010.497927
- Ecker, U. K. H., Lewandowsky, S., Chang, E. P., & Pillai, R. (2014). The effects of subtle misinformation in news headlines. *Journal of Experimental Psychology: Applied*, 20, 323-335. doi:10.1037/xap0000028
- Ecker, U. K. H., Lewandowsky, S., Cheung, C. S. C., & Maybery, M. T. (2015). He did it! She did it! No, she did not! Multiple causal explanations and the continued influence of misinformation. *Journal of Memory and Language*, 85, 101-115.

- Ecker, U. K. H., Lewandowsky, S., Fenton, O., & Martin, K. (2014). Do people keep believing because they want to? Preexisting attitudes and the continued influence of misinformation. *Memory & Cognition*, *42*, 292-304. doi:10.3758/s13421-013-0358-x
- Ecker, U. K. H., Lewandowsky, S., Swire, B., & Chang, D. (2011). Correcting false information in memory: Manipulating the strength of misinformation encoding and its retraction. *Psychonomic Bulletin & Review*, *18*, 570-578. doi:10.3758/s13423-011-0065-1
- Ecker, U. K. H., Lewandowsky, S., & Tang, D. T. W. (2010). Explicit warnings reduce but do not eliminate the continued influence of misinformation. *Memory & Cognition*, *38*, 1087-1100. doi:10.3758/MC.38.8.1087
- Edwards, K., & Smith, E. E. (1996). A disconfirmation bias in the evaluation of arguments. *Journal of Personality and Social Psychology*, *71*, 5-24. doi:10.1037/0022-3514.71.1.5
- Epstein, J. M. (2001). Learning to be thoughtless: Social norms and individual computation. *Computational Economics*, *18*, 9-24. doi:10.1023/a:1013810410243
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191. doi:10.3758/bf03193146
- Feather, N. T. (1979). Value correlates of conservatism. *Journal of Personality and Social Psychology*, *37*, 1617-1630. doi:10.1037/0022-3514.37.9.1617
- Fessler, D. M. T., Pisor, A. C., & Holbrook, C. (2017). Political orientation predicts credulity regarding putative hazards. *Psychological Science*, *28*, 651-660. doi:10.1177/0956797617692108

- Fibert Z., & Ressler, W. H. (1998). Intolerance of ambiguity and political orientation among Israeli university students. *The Journal of Social Psychology, 138*, 33-40.
doi:10.1080/00224549809600351
- Fielding, K. S., Head, B. W., Laffan, W., Western, M., & Hoegh-Guldberg, O. (2012). Australian politicians' beliefs about climate change: Political partisanship and political ideology. *Environmental Politics, 21*, 712-733.
doi:10.1080/09644016.2012.698887
- Frimer, J. A., Skitka, L. J., & Motyl, M. (2017). Liberals and conservatives are similarly motivated to avoid exposure to one another's opinions. *Journal of Experimental Social Psychology, 72*, 1-12. doi:10.1016/j.jesp.2017.04.003
- Gaines, B. J., Kuklinski, J. H., Quirk, P. J., Peyton, B., & Verkuilen, J. (2007). Same facts, different interpretations: Partisan motivation and opinion on Iraq. *The Journal of Politics, 69*, 957-974.
- Gal, D., & Rucker, D. D. (2010). When in doubt, shout! Paradoxical influences of doubt on proselytizing. *Psychological Science, 21*, 1701-1707.
doi:10.1177/0956797610385953
- Garrett, R. K., Nisbet, E. C., & Lynch, E. K. (2013). Undermining the corrective effects of media-based political fact checking? The role of contextual cues and naïve theory. *Journal of Communication, 63*, 617-637. doi:10.1111/jcom.12038
- Gallup News Service (2016). *Gallup poll social series: Values and beliefs*. Retrieved from www.gallup.com/file/poll/192407/Moral_Issues_II_160608.pdf
- Gerber, A., & Green, D. (1999). Misperceptions about perceptual bias. *Annual Review of Political Science, 2*, 189-210. doi:10.1146/annurev.polisci.2.1.189

Hart, W., Albarracín, D., Eagly, A. H., Brechan, I., Lindberg, M. J., & Merrill, L. (2009).

Feeling validated versus being correct: A meta-analysis of selective exposure to information. *Psychological Bulletin*, *135*, 555-588. doi: 10.1037/a0015701

Hart, P. S., & Nisbet, E. C. (2011). Boomerang effects in science communication: How motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Communication Research*, *39*, 701-723.

doi:10.1177/0093650211416646

Haslam, N., & Loughnan, S. (2012). Dehumanization and prejudice. In J. Dixon & M. Levine (Eds.), *Beyond Prejudice* (pp. 89-104). London: Psychology Press.

Hibbing, J. R., Smith, K. B., & Alford, J. R. (2014). Differences in negativity bias underlie variations in political ideology. *Behavioral and Brain Sciences*, *37*, 297-307.

doi:10.1017/S0140525X13001192

Hornsey, M. J., & Jetten, J. (2004). The individual within the group: Balancing the need to belong with the need to be different. *Personality and Social Psychology Review*, *8*, 248-254. doi:10.1207/s15327957pspr0803_2

Iyengar, S., Hahn, K. S., Krosnick, J. A., & Walker, J. (2008). Selective exposure to campaign communication: The role of anticipated agreement and issue public membership. *Journal of Politics*, *70*, 186-200. doi:10.1017/S0022381607080139

Jacks, Z. J., & Cameron, K. A. (2003). Strategies for resisting persuasion. *Basic and Applied Social Psychology*, *25*, 145-161. doi:10.1207/S15324834BASP2502_5

Johnson, D. R. (2017). Bridging the political divide: Highlighting explanatory power mitigates biased evaluation of climate arguments. *Journal of Environmental Psychology*, *51*, 248-255. doi:10.1016/j.jenvp.2017.04.008

Johnson, H. M., & Seifert, C. M. (1994). Sources of the continued influence effect: When misinformation in memory affects later inferences. *Journal of Experimental*

Psychology: Learning, Memory, and Cognition, 20, 1420-1436. doi:10.1037/0278-7393.20.6.1420

Jost, J. T. (2017). Ideological asymmetries and the essence of political psychology. *Political Psychology*, 38, 167-208. doi:10.1111/pops.12407

Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated cognition. *Psychological Bulletin*, 129, 339-375. doi: 10.1037/0033-2909.129.3.339

Kahan, D. (2010). Fixing the communications failure. *Nature*, 463, 296-297.

Kahan, D. (2013). Ideology, motivated reasoning, and cognitive reflection. *Judgment and Decision Making*, 8, 407-424.

Kahan, D. M., Peters, E., Dawson, E. C., & Slovic, P. (2017). Motivated numeracy and enlightened self-government. *Behavioural Public Policy*, 1, 54-86.
doi:10.1017/bpp.2016.2

Kendeou, P., Butterfuss, R., van Boekel, M., & O'Brien, E. J. (2017). Integrating relational reasoning and knowledge revision during reading. *Educational Psychology Review*, 29, 27-39. doi:10.1007/s10648-016-9381-3

Kendeou, P., Walsh, E. K., Smith, E. R., & O'Brien, E. J. (2014). Knowledge revision processes in refutation texts. *Discourse Processes*, 51, 374-397.
doi:10.1080/0163853X.2014.913961

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: "Seizing" and "freezing." *Psychological Review*, 103, 263-283.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, 108, 480-498.
doi:10.1037/0033-2909.108.3.480

- Kunda, Z., & Oleson, K. C. (1995). Maintaining stereotypes in the face of disconfirmation: Constructing grounds for subtyping deviants. *Journal of Personality and Social Psychology, 68*, 565-579. doi:10.1037/0022-3514.68.4.565
- Levitan, L. C., & Visser, P. S. (2008). The impact of the social context on resistance to persuasion: Effortful versus effortless responses to counter-attitudinal information. *Journal of Experimental Social Psychology, 44*, 640-649. doi:10.1016/j.jesp.2007.03.004
- Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N., & Cook, J. (2012). Misinformation and its correction: Continued influence and successful debiasing. *Psychological Science in the Public Interest, 13*, 106-131. doi:10.1177/1529100612451018
- Lewandowsky, S., Gignac, G. E., & Oberauer, K. (2013). The role of conspiracist ideation and worldviews in predicting rejection of science. *PLOS ONE, 10*, e0134773. doi:10.1371/journal.pone.0075637
- Lewandowsky, S., Stritzke, W. G. K., Oberauer, K., & Morales, M. (2005). Memory for fact, fiction, and misinformation. *Psychological Science, 16*, 190-195. doi:10.1111/j.0956-7976.2005.00802.x
- Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology, 37*, 2098-2109. doi:10.1037/0022-3514.37.11.2098
- Lorenzoni, I. & Hulme, M. (2009). Believing is seeing: Laypeople's views of future socio-economic and climate change in England and in Italy. *Public Understanding of Science, 18*, 383-400. doi:10.1177/0963662508089540

- Marsella, S. C., Pynadath, D. V., & Read, S. J. (2004). PsychSim: Agent-based modeling of social interactions and influence. *Proceedings of the International Conference on Cognitive Modeling*, 36, 243-248.
- Mehrabian, A. (1996). Relations among political attitudes, personality, and psychopathology assessed with new measures of libertarianism and conservatism. *Basic and Applied Social Psychology*, 18, 469-491. doi:10.1207/s15324834basp1804_7
- Mooney, C. (2012). *The Republican brain: The science of why they deny science—and reality*. Hoboken, NJ: John Wiley & Sons.
- Nam, H. H., Jost, J. T., & van Bavel, J. J. (2013). “Not for all the tea in China!” Political ideology and the avoidance of dissonance-arousing situations. *PLOS ONE*, 8, e59837. doi:10.1371/journal.pone.0059837
- Nisbet, E. C., Cooper, K. E., & Garrett, R. K. (2015). The partisan brain: How dissonant science messages lead conservatives and liberals to (dis)trust science. *Annals of the American Academy of Political and Social Science*, 658, 36-66. doi:10.1177/0002716214555474
- Nyhan, B., & Reifler, J. (2010). When corrections fail: The persistence of political misperceptions. *Political Behavior*, 32, 303-330. doi:10.1007/s11109-010-9112-2
- Nyhan, B. & Reifler, J. (2015). Estimating fact-checking’s effects: Evidence from a long-term experiment during campaign 2014. Retrieved from: <http://www.americanpressinstitute.org/wp-content/uploads/2015/04/Estimating-Fact-Checkings-Effect.pdf>
- Nyhan, B., Reifler, J., Richey, S., & Freed, G. L. (2014). Effective message in vaccine promotion: A randomized trial. *Pediatrics*, 133, E835–E842. doi:10.1542/peds.2013-2365

- Nyhan, B., Reifler, J., & Ubel, P. A. (2013). The hazards of correcting myths about health care reform. *Medical Care, 51*, 127-132. doi:10.1097/mlr.0b013e318279486b
- Pedersen, A., Beven, J., Walker, I., & Griffiths, B. (2004). Attitudes toward Indigenous Australians: The role of empathy and guilt. *Journal of Community & Applied Social Psychology, 14*, 233-249. doi: 10.1002/casp.771
- Prasad, M., Perrin, A. J., Bezila, K., Hoffman, S. G., Kindleberger, K., Manturuk, K., & Powers, A. S. (2009). "There must be a reason": Osama, Saddam, and inferred justification. *Sociological Inquiry, 79*, 142-162. doi:10.1111/j.1475-682x.2009.00280.x
- Price, E., Ottati, V., Wilson, C., & Kim, S. (2015). Open-minded cognition. *Personality and Social Psychology Bulletin, 4*, 1488-1504. doi:10.1177/0146167215600528
- Prior, M., Sood, G., & Khanna, K. (2015). You cannot be serious: The impact of accuracy incentives on partisan bias in reports of economic perceptions. *Quarterly Journal of Political Science, 10*, 489-518. doi:10.1561/100.00014127
- Putnam, A. L., Wahlheim, C. N., & Jacoby, L. L. (2014). Memory for flip-flopping: Detection and recollection of political contradictions. *Memory & Cognition, 42*, 1198-1210. doi:10.3758/s13421-014-0419-9
- Ranney, M. A., & Clark, D. (2016). Climate change conceptual change: Scientific information can transform attitudes. *Topics in Cognitive Science, 8*, 49-75. doi:10.1111/tops.12187
- Rayner, K., & Clifton, C. (2009). Language processing in reading and speech perception is fast and incremental: Implications for event-related potential research. *Biological Psychology, 80*, 4-9. doi:10.1016/j.biopsycho.2008.05.002

- Redlawsk, D. P. (2002). Hot cognition or cool consideration? Testing the effects of motivated reasoning on political decision making. *The Journal of Politics*, *64*, 1021-1044.
doi:10.1111/1468-2508.00161
- Richards, Z., & Hewstone, M. (2001). Subtyping and subgrouping: Processes for the prevention and promotion of stereotype change. *Personality and Social Psychology Review*, *5*, 52-73. doi:10.1207/s15327957pspr0501_4
- Seifert, C. M. (2002). The continued influence of misinformation in memory: What makes a correction effective? *The Psychology of Learning and Motivation*, *41*, 265-292.
doi:10.1016/S0079-7421(02)80009-3
- Sharot, T., Korn, C. W., & Dolan, R. J. (2011). How unrealistic optimism is maintained in the face of reality. *Nature Neuroscience*, *14*, 1475-1479. doi:10.1038/nn.2949
- Smaldino, P. E., & Epstein, J. M. (2015). Social conformity despite individual preferences for distinctiveness. *Royal Society Open Science*, *2*, 140437. doi:10.1098/rsos.140437
- Stadtler, M., Scharer, L., Brummernhenrich, B., & Bromme, R. (2013). Dealing with uncertainty: Readers' memory for and use of conflicting information from science texts as function of presentation format and source expertise. *Cognition and Instruction*, *31*, 130-150. doi:10.1080/07370008.2013.769996
- Swire, B., Berinsky, A. J., Lewandowsky, S., & Ecker, U. K. H. (2017). Processing political misinformation: Comprehending the Trump phenomenon. *Royal Society Open Science*, *4*, 160802. doi:10.1098/rsos.160802
- Swire, B., & Ecker, U. K. H. (2018). Misinformation and its correction: Cognitive mechanisms and recommendations for mass communication. In B. G. Southwell, E. A. Thorson, & L. Sheble (Eds.), *Misinformation and mass audiences*. Austin, TX: University of Texas Press.

Taber, C. S., & Lodge, M. (2006). Motivated skepticism in the evaluation of political beliefs.

American Journal of Political Science, 50, 755-769. doi:10.1111/j.1540-5907.2006.00214.x

Thórisdóttir, H., & Jost, J. T. (2011). Motivated closed-mindedness mediates the effect of threat on political conservatism. *Political Psychology*, 32, 785-811.

doi:10.1111/j.1467-9221.2011.00840.x

Thorson, E. (2016). Belief echoes: The persistent effects of corrected misinformation.

Political Communication, 33, 460-480. doi:10.1080/10584609.2015.1102187

Travis, S. (2010). *CNN poll: Quarter doubt Obama was born in U.S.* Retrieved from

<http://politicalticker.blogs.cnn.com/2010/08/04/cnn-poll-quarter-doubt-president-was-born-in-u-s/>

Trevors, G. J., Muis, K. R., Pekrun, R., Sinatra, G. M., & Winne, P. H. (2016). Identity and epistemic emotions during knowledge revision: A potential account for the backfire effect.

Discourse Processes, 53, 339-370. doi:10.1080/0163853X.2015.1136507

Vraga, E. K. (2015). How party affiliation conditions the experience of dissonance and

explains polarization and selective exposure. *Social Science Quarterly*, 96, 487-502.

doi:10.1111/ssqu.12138

Vraga, E. K. (2016). Party differences in political content on social media. *Online*

Information Review, 40, 595-609. doi:10.1108/OIR-10-2015-0345

Washburn, A. N., & Skitka, L. J. (in press). Science denial across the political divide:

Liberals and conservatives are similarly motivated to deny attitude-inconsistent science. *Social Psychological and Personality Science*.

doi:10.1177/1948550617731500

- Weeks, B. E. (2015). Emotions, partisanship, and misperceptions: How anger and anxiety moderate the effect of partisan bias on susceptibility to political misinformation. *Journal of Communication, 65*, 699-719. doi:10.1111/jcom.12164
- Wilkes, A. L., & Leatherbarrow, M. (1988). Editing episodic memory following the identification of error. *The Quarterly Journal of Experimental Psychology A, 40*, 361-387. doi:10.1080/02724988843000168
- Wood, A. M., Linley, P. A., Maltby, J., Baliouis, M., & Joseph, S. (2008). The authentic personality: A theoretical and empirical conceptualization and the development of the authenticity scale. *Journal of Counseling Psychology, 55*, 385-399. doi:10.1037/0022-0167.55.3.385
- Wood, T., & Porter, E. (in press). The elusive backfire effect: Mass attitudes' steadfast factual adherence. *Political Behavior*. doi: 10.1007/s11109-018-9443-y
- Zhou, J. (2016). Boomerangs versus javelins: How does polarization constrain communication on climate change? *Environmental Politics, 25*, 788-811. doi:10.1080/09644016.2016.1166602
- Zollo, F., Bessi, A., Del Vicario, M., Scala, A., Caldarelli, G.,...Quattrociocchi, W. (2017). Debunking in a world of tribes. *PLOS ONE, 12*, e0181821. doi:10.1371/journal.pone.0181821

Figure 1. Mean inference scores, measuring the number of references to the critical (mis)information, across conditions of Experiment 1. Error bars indicate standard errors of the mean.

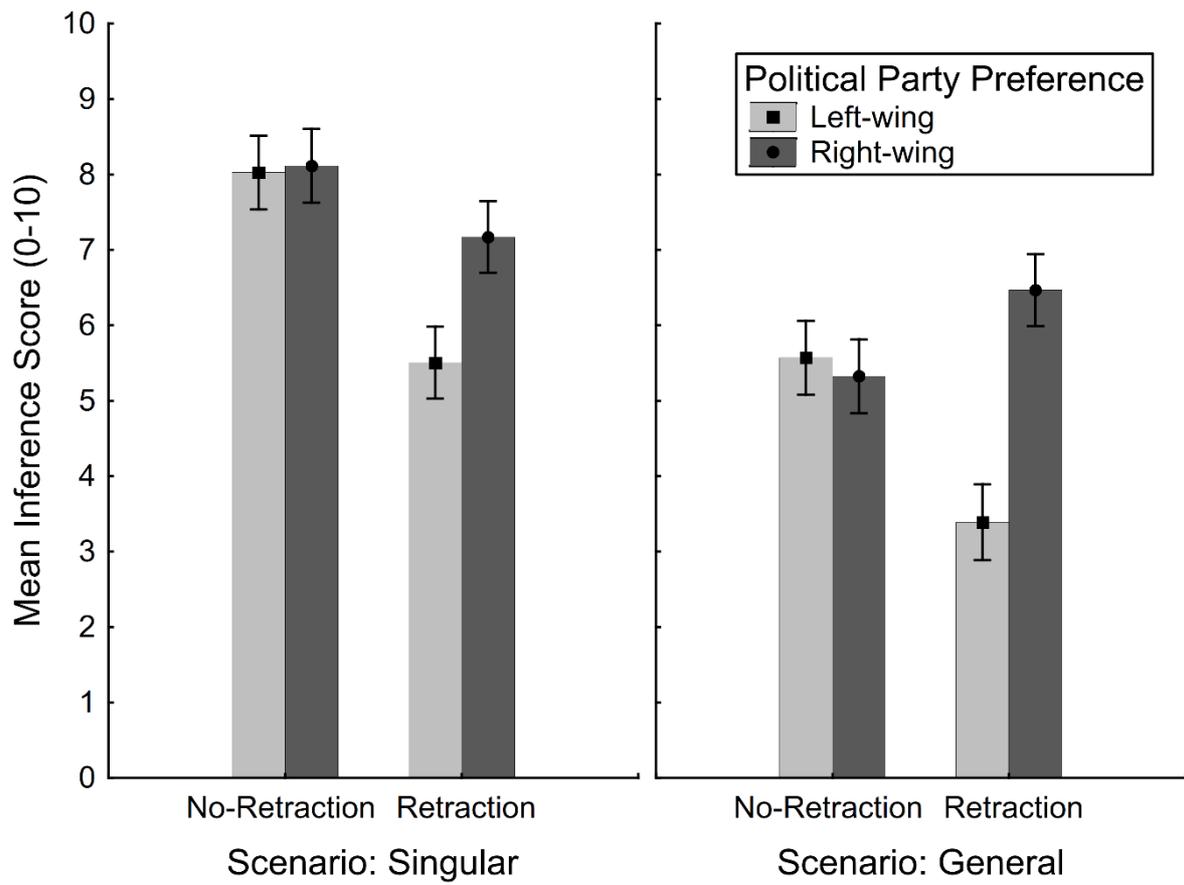
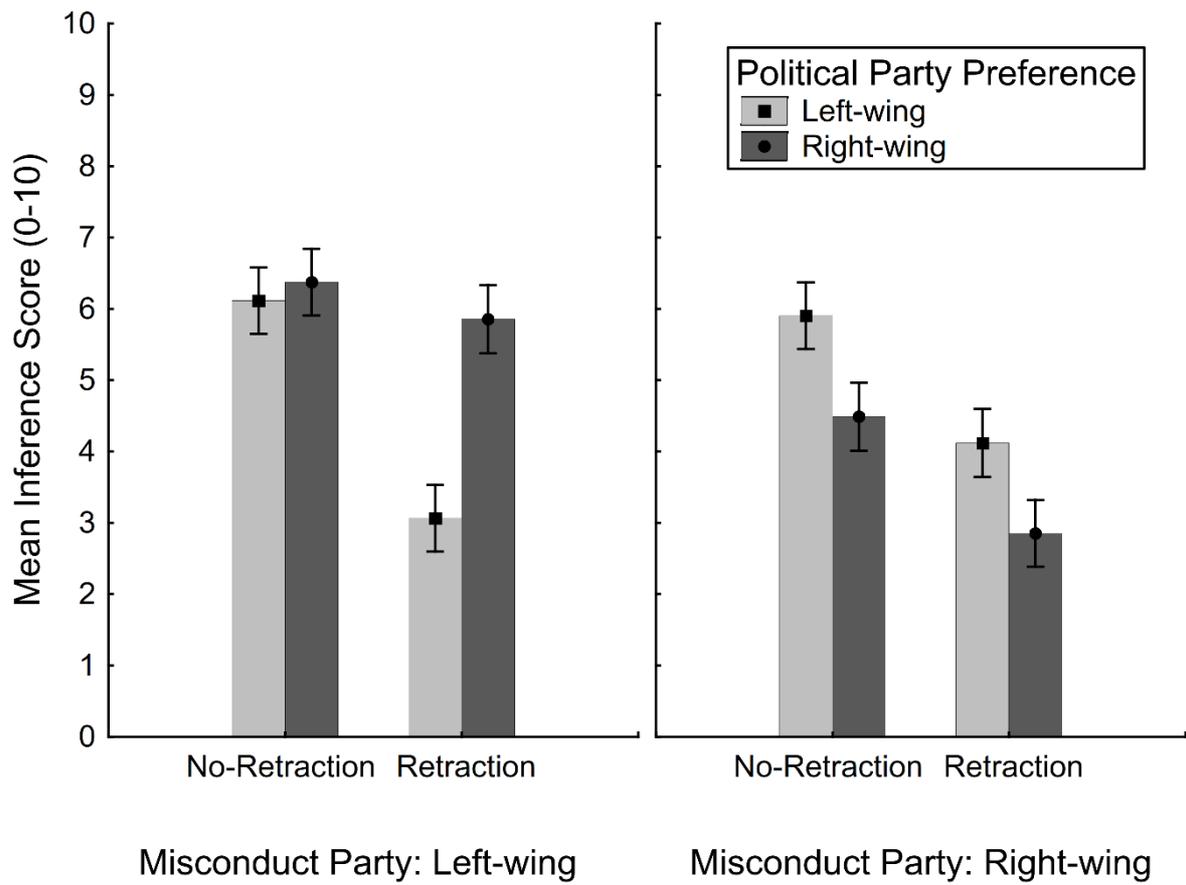


Figure 2. Mean inference scores, measuring the number of references to the critical (mis)information, across conditions of Experiment 2. Error bars indicate standard errors of the mean.



Appendix

Liberal-Labor Questionnaire

A modified version of the conservatism-liberalism scale (Mehrabian, 1996) was used. Instructions were “The following items contain statements about political party preference. Please carefully read the following statements and mark the answer that best reflects your viewpoint. All answers will be treated confidential.” All items were rated on a five-point scale ranging from “strongly disagree” to “strongly agree.” Note that (R) indicates reverse-coded items:

Question 1: I am politically more in line with the Labor party than the Liberal party.

Question 2: In any election, given a choice between a Liberal and a Labor candidate, I will select the Liberal over the Labor candidate. (R)

Question 3: I cannot see myself ever voting to elect Liberal candidates.

Question 4: The major national media are too protective of the Labor party for my taste. (R)

Question 5: On balance, I lean politically more to the left (Labor) than to the right (Liberal).