



Original Articles

Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning

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ABSTRACT

Why do people believe blatantly inaccurate news headlines (“fake news”)? Do we use our reasoning abilities to convince ourselves that statements that align with our ideology are true, or does reasoning allow us to effectively differentiate fake from real regardless of political ideology? Here we test these competing accounts in two studies (total $N = 3446$ Mechanical Turk workers) by using the Cognitive Reflection Test (CRT) as a measure of the propensity to engage in analytical reasoning. We find that CRT performance is negatively correlated with the perceived accuracy of fake news, and positively correlated with the ability to discern fake news from real news – even for headlines that align with individuals’ political ideology. Moreover, overall discernment was actually better for ideologically aligned headlines than for misaligned headlines. Finally, a headline-level analysis finds that CRT is negatively correlated with perceived accuracy of relatively implausible (primarily fake) headlines, and positively correlated with perceived accuracy of relatively plausible (primarily real) headlines. In contrast, the correlation between CRT and perceived accuracy is unrelated to how closely the headline aligns with the participant’s ideology. Thus, we conclude that analytic thinking is used to assess the plausibility of headlines, regardless of whether the stories are consistent or inconsistent with one’s political ideology. Our findings therefore suggest that susceptibility to fake news is driven more by lazy thinking than it is by partisan bias per se – a finding that opens potential avenues for fighting fake news.

1. Introduction

One of the more captivating developments of the 2016 US Presidential election was the apparent rise of political fake news stories on social media. One analysis indicated that Facebook engagement (likes, comments, shares) was actually greater for the top 20 fake news stories than the top 20 real news stories in the three months leading up to the election (Silverman, Strapagiel, Shaban, & Hall, 2016). What are the cognitive mechanisms that explain why patently false (and often quite implausible) news stories have been able to gain traction on social media? Here we contrast two broad accounts of the cognitive mechanisms that explain belief in fake news: A motivated reasoning account that suggests that belief in fake news is driven primarily by partisanship, and a classical reasoning account where belief in fake news is driven by a failure to engage in sufficient analytic reasoning.

1.1. Defining fake news

Fake news is not a new phenomenon. Tabloid magazines have been

around since the beginning of the 20th century (Lazer et al., 2018). Nonetheless, fake news as it has been discussed recently (e.g., Allcott & Gentzkow, 2017; Shane, 2017) seems to have gained an unprecedented level of prominence through the rise of social media. Lazer et al. define fake news as (p. 1094): “... fabricated information that mimics news media content in form but not in organizational process or intent.” Fake news, in its present form, consists primarily of highly salient (if implausible) fabricated claims that are created to spread on social media. A common tactic among fake news creators is to use highly partisan political content to drive engagement.

1.2. A motivated reasoning account of fake news

What cognitive factors drive belief in, versus rejection of, fake news? Perhaps the most broadly accepted claim is that belief in political fake news – the category that has captured the majority of the public’s attention – is driven primarily by partisanship (Kahan, 2017; Van Bavel & Pereira, 2018). This claim is supported by pervasive effects of motivated reasoning on various forms of judgment (Haidt, 2012; Kahan,

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2013; Mercier & Sperber, 2011). For example, voters are *more* inclined to support a preferred political candidate when presented with negative information (up to a point; Redlawsk, Civettini, & Emmerson, 2010). Individuals also forcefully debate arguments that are inconsistent with their political ideology but passively and uncritically accept arguments that support their political ideology (Strickland, Taber, & Lodge, 2011). Moreover, there is some evidence that political misconceptions are resistant to explicit corrections (Berinsky, 2017; Nyhan & Reifler, 2010; but see Ecker, Hogan, & Lewandowsky, 2017; Swire, Ecker, & Lewandowsky, 2017). Given the political nature of fake news, similar motivated reasoning effects may explain why entirely fabricated claims have received so much attention on social media. That is, individuals may be susceptible to fake news stories that are amenable to their political ideology. In addition to its support among experts (Kahan, 2017; Van Bavel & Pereira, 2018), this narrative has also been favored in media coverage of belief in fake news (e.g., Beck, 2017; Taub, 2017).

One form of the motivated reasoning account that has gained particular traction is the Motivated System 2 Reasoning (MS2R) account, which posits that explicit deliberation causes people to preferentially believe information which aligns with their ideological identity – that is, cognitive reflection *increases* the propensity to engage in ideologically motivated reasoning (Kahan, 2013). By this account, deliberation exacerbates partisan differences, and people who are more analytical thinkers wind up more polarized, rather than more accurate, in their beliefs. Supporting this prediction, there is evidence that the propensity to think analytically increases political polarization in the context of climate change (Kahan et al., 2012; see also Drummond & Fischhoff, 2017), gun control (Kahan, Peters, Dawson, & Slovic, 2017; see also Ballarini & Sloman, 2017; Kahan & Peters, 2017), and selective exposure to political information (Knobloch-Westerwick, Mothes, & Polavin, 2017).

In the context of fake news and misinformation, the MS2R account predicts a *positive* correlation between analytic thinking and perceived accuracy of politically consistent fake news headlines (see Kahan, 2017). The MS2R account is of theoretical importance because it conflicts with an alternative broad perspective in the tradition of dual-process theories of reasoning in which analytic thinking is thought to support sound judgment (Evans, 2003; Stanovich, 2005). We will refer to this alternative account as, simply, the classical reasoning account.

1.3. A classical reasoning account of fake news

According to dual-process theory, human cognition can be characterized by a distinction between autonomous, intuitive (System 1) processes and deliberative, analytic (System 2) processes (De Neys, 2012; Evans & Stanovich, 2013; Kahneman, 2011; Pennycook, Fugelsang, & Koehler, 2015a). Consider the following problem from the Cognitive Reflection Test (CRT; Frederick, 2005):

A bat and ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?

The problem elicits a fast, intuitive response (10 cents) that, upon reflection, is obviously wrong (if the ball cost 10 cents, the bat would have to cost \$1.10 and they would total \$1.20). Nonetheless, the incorrect intuitive response is typically the modal response (e.g., 65% in Pennycook, Cheyne, Koehler, & Fugelsang, 2016), indicating an overall failure to engage in reflective reasoning processes (Pennycook & Ross, 2016).

It has been argued that the bat-and-ball problem – and others of its type – reflect a crucial aspect of our cognitive architecture: the willingness or propensity to think analytically (Pennycook, Fugelsang, & Koehler, 2015b). Humans are cognitive misers, in that resource-demanding cognitive processes are typically avoided (Fiske & Taylor, 2013; Stanovich, 1999; Stanovich & West, 2000). Nonetheless, some are less miserly than others and participants who do well on the CRT also perform better on rational thinking tests (Stanovich, West, & Toplak, 2011; Toplak, West, & Stanovich, 2014).

This research supports the presumption, pervasive in “classical reasoning” approaches (Kohlberg, 1969; Piaget, 1932), that reasoning supports sound judgment. Indeed, a surge of recent research has broadened the support for this approach further by linking the propensity to engage deliberative reasoning processes (rather than relying on “gut feelings” or intuitions) with skepticism about epistemically suspect beliefs (Pennycook et al., 2015b). For example, analytic thinking has been associated with religious and paranormal disbelief (Gervais & Norenzayan, 2012; Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012; Pennycook, Ross, Koehler, & Fugelsang, 2016; Shenhav, Rand, & Greene, 2012), acceptance of some scientific claims (e.g., evolution: Gervais, 2015; astronomy, evolution, geology, mechanics, perception, and thermodynamics: Shtulman & McCallum, 2014), rejection of conspiracy theories (Swami, Voracek, Stieger, Tran, & Furnham, 2014), and the detection of pseudo-profound bullshit (Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2015).

In the context of fake news and misinformation, therefore, the classical reasoning account suggests that analytic thinking will support *accurate* belief formation about fake news content. Thus, in contrast to the MS2R account, the classical reasoning account predicts that analytic thinking will positively predict the ability to discern between fake and real news, regardless of whether it is consistent or inconsistent with one’s political ideology.

1.4. The current study

The question of whether analytic thinking *supports* or *undermines* fake news susceptibility has consequences for broader perspectives on dual-process theories of cognitive function. The MS2R account suggests that the typical framing of dual-process theories (in which analytic thinking supports sound judgment) may be misguided. The classical reasoning account suggests that the effects of motivated System 2 reasoning uncovered in the context of political claims may be exceptions, rather than the rule. Given that fake news is both highly partisan and plainly untrue, it represents a strong test case to compare the relative scope of these two perspectives. Does analytic reasoning help or hurt? In this paper, we investigate this question by examining the correlation between CRT performance and perceived accuracy of fake and real news headlines that are either ideologically concordant or discordant.

2. Study 1

We compiled list of fake and real news items (via Pennycook, 2017) that were ideologically attractive to Democrats (e.g., “Pennsylvania Federal Court Grants Legal Authority to REMOVE TRUMP After Russian Meddling,” which we will refer to as Democrat-consistent) or Republicans (e.g., “Election Night: Hillary Was Drunk, Got Physical With Mook and Podesta,” which we will refer to Republican-consistent). If cognitive reflection supports (and exacerbates) motivated reasoning in the realm of news – as per the MS2R account – CRT should be *positively* correlated with perceived accuracy of Democrat-consistent fake news headlines among those who support Hillary Clinton over Donald Trump (and, conversely, for Republican-consistent headlines among Trump supporters).¹ We also included a set of neutral news stories that did not contain political content (e.g., “Because Of The Lack Of Men, Iceland Gives \$5000 Per Month To Immigrants Who Marry Icelandic Women!”) as a baseline.

2.1. Method

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. Our data and

¹ For ease of exposition, we will refer to individuals who choose Clinton over Trump as “Clinton supporters” and those who choose Trump over Clinton as “Trump supporters”.

preregistration are available online (<https://osf.io/tuw89/>).

2.1.1. Participants

Our preregistered sample for Study 1 was 800 participants from Amazon Mechanical Turk. In total, 843 participants completed some portion of the study. We had complete data for 802 participants (41 participants did not finish). The final sample (Mean age = 37.2) included 387 males and 414 females (3 did not respond to the gender question). This study was completed on January 5th and 6th, 2017.

2.1.2. Materials and procedure

We presented participants with 15 headlines that were factually accurate (*real news*) and 15 that were entirely untrue (*fake news*). All fake news headlines were originally taken from [Snopes.com](https://snopes.com), a well-known fact-checking website. Real news headlines were selected from mainstream news sources (e.g., NPR, The Washington Post) and were contemporary with the fake news headlines. The headlines were presented in the format of a Facebook post – namely, with a picture accompanied by a headline, byline, and a source (e.g., “thelastlineofdefense.org”). Our news items can be found in [Supplementary Materials](#) (SM).

As mentioned, five stories of each type were selected to be Democrat-consistent, Republican-consistent, and politically neutral. To validate this sorting of items, we conducted a pretest ($N = 195$) where participants rated the relative partisanship of a set of real or fake political news headlines (including all items used in Studies 1 and 2, along with additional items). Participants were asked to assume the headline was entirely accurate and to judge how favorable it would be for Democrats versus Republicans (on a 5-point scale from “more favorable to Democrats” to “more favorable to Republicans”). This analysis confirmed that the items that were selected to be Democrat-consistent were, in fact, less favorable for Republicans ($M_{fake} = 2.3$; $M_{real} = 2.4$) than the items selected to be Republican-consistent items ($M_{fake} = 3.7$; $M_{real} = 3.7$), $t(99) = 12.8$, $p < .001$, $d = 1.28$; real: $t(96) = 11.73$, $p < .001$, $d = 1.19$. Moreover, the two classes of items (Democrat-consistent v. Republican-consistent) were equally different from scale-midpoint (i.e., 3) for both real and fake news headlines, t 's < 1 . The non-political neutral headlines were not included in the pretest (which focused on determining the partisanship of political news headlines).

For each headline, participants answered three questions: “Have you seen or heard about this story before?” (response options: no/unsure/yes), 2) “To the best of your knowledge, how accurate is the claim in the above headline?” (response options: not at all accurate/not very accurate/somewhat accurate/very accurate), and 3) “Would you consider sharing this story online (for example, through Facebook or Twitter)?” (response options: I would never share something political online (data removed from analysis), no, maybe, yes). Headlines were presented in a random order for each participant.

Next, participants completed seven items from two versions of the Cognitive Reflection Test (CRT). First, they received a reworded version of the original [Frederick \(2005\)](#) CRT (via [Shenhav, et al., 2012](#)). Second, we administered the 4-item non-numeric CRT from [Thomson and Oppenheimer \(2016\)](#). The two versions were significantly correlated, $r(800) = .57$, and the full 7-item CRT had acceptable reliability, Cronbach's $\alpha = .75$.

Participants also completed a pseudo-profound bullshit receptivity task. For this, participants were presented with 10 randomly generated sentences filled with abstract buzzwords (e.g., “We are in the midst of a high-frequency blossoming of interconnectedness that will give us access to the quantum soup itself”) and were asked to rate how profound they took them to be on a 5-point scale (from “not at all profound” to “very profound”). The items were taken from [Pennycook, Cheyne, et al., \(2015\)](#), Study 1. As this is not the focus of the present manuscript, these data will not be analyzed here.

Demographic questions came at the end of the survey. These

included age, sex, education, proficiency in English, political party (Democratic, Republican, Independent, other), and two questions about the 2016 election. For this, participants were first asked to indicate who they voted for (given the following options: Hillary Clinton, Donald Trump, Other Candidate (such as Jill Stein or Gary Johnson), I did not vote for reasons outside my control, I did not vote but I could have, and I did not vote out of protest. Participants were then asked “If you absolutely had to choose between only Clinton and Trump, who would you prefer to be the next President of the United States?”. Finally, participants were asked to indicate their political ideology with respect to economic and social issues (in two separate questions).

2.2. Results and discussion

We preregistered our hypotheses and primary analyses. A detailed description of our preregistration can be found in SM. We preregistered the intention to use a dichotomous scoring of our 4-point accuracy measure (i.e., combining “not at all” with “not very” accurate, and “somewhat” with “very” accurate), but upon further consideration decided that using full continuous measures was more appropriate. The main text therefore reports analyses using the continuous accuracy measure, but the results are equivalent when using the preregistered dichotomous scoring (see SM; also note that correlations between continuous and dichotomous versions of the same measure ranged from $r = .85$ to $r = .97$ across items). With the exception of this altered scoring of the dependent variable, all analyses were preregistered, except for those described as *post hoc*.² Descriptive statistics for primary variables can be found in the SM.

Correlations between CRT performance and perceived accuracy for fake and real news stories are presented in [Table 1](#). Mean accuracy judgments for partisan fake and real news headlines as a function of CRT performance and political ideology are presented in [Fig. 1](#). First, there was no evidence of the *positive* correlation between CRT and perceived accuracy of politically-consistent fake news predicted by the MS2R account. The same was true for social media sharing of fake news ([Table 1b](#)). Thus, cognitive reflection does *not* increase the likelihood that individuals will judge politically-consistent fake news headlines as accurate, contrary to the MS2R account ([Kahan, 2013; 2017](#)). Rather, as per the classical reasoning account, more analytic individuals rated fake news as less accurate regardless of whether it was consistent or inconsistent with their political ideology. Moreover, there was a general tendency for more analytic individuals to rate *real* news as *more* accurate (although not for Republican-consistent and neutral news headlines among Clinton supporters). As a result, a *post hoc* analysis of media truth discernment (average accuracy ratings of real news minus average accuracy ratings of fake news) found that, regardless of the partisanship of the participant or the headline, more analytic individuals were better able to differentiate between fake and real news. (Similar results are obtained when scoring the CRT based on number of intuitive responses, rather than correct responses, which shows that this relationship was not simply the result of participants who responded randomly to all questions; see SM for details).

To visualize this overall effect, the distribution of media truth discernment scores of low versus high CRT scorers (collapsing across partisanship of participant and headline) is presented in [Fig. 2](#). In addition, we note that a *post hoc* analysis indicates that the overall correlation between CRT and discernment, collapsing over all participants and headlines, is robust to including a range of demographic variables as covariates. Media truth discernment was entered into a multiple regression model as a dependent variable with age, gender, education,

² We also preregistered analyses that pertain to issues which are not the focus of the current paper, but will instead be presented in future work (specifically, correlations of fake and real news with familiarity and bullshit receptivity, as well as differences in sharing likelihood of fake versus real news).

Table 1

Correlation (Pearson r) between Cognitive Reflection Test performance and primary variables in Study 1 as a function of Hillary Clinton versus Donald Trump support (based on a forced choice). Participants indicated perceived accuracy (a) and willingness to share (b) for both fake and real news stories of three types: Democrat-consistent political news, Republican-consistent political news, and Neutral (non-political) news. “Discernment” refers to media truth discernment, which was computed by subtracting z-scores for fake news (false alarms) from z-scores for real news (hits) (the analysis of discernment scores was *post hoc*). Responses for which participants selected the option indicating that they were unwilling to ever share political news on social media were removed from the social media sharing analysis. Clinton supporters: $N = 483$ for perceived accuracy; $N = 400$ for social media sharing. Trump supporters: $N = 317$ for perceived accuracy; $N = 265$ for social media sharing.

	Democrat-consistent			Republican-consistent			Neutral		
	Fake	Real	Discernment	Fake	Real	Discernment	Fake	Real	Discernment
a) Perceived accuracy									
Clinton supporters	-.25***	.13**	.28***	-.16***	-.03	.10*	-.16**	.07	.19***
Trump supporters	-.12*	.15**	.23***	-.08	.16**	.20***	-.09	.18**	.23***
b) Social media sharing									
Clinton supporters	-.25***	-.11**	.10*	-.26***	-.26***	.01	-.25***	-.14**	.12*
Trump supporters	-.19**	-.12*	.12	-.14*	-.14*	-.002	-.17**	-.09	.10

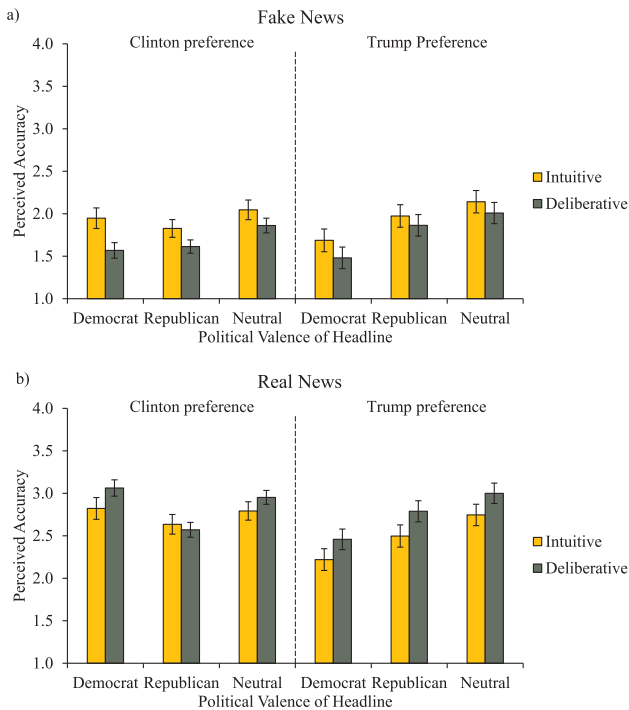
*** $p < .001$.** $p < .01$.* $p < .05$.

Fig. 1. Mean perceived accuracy of (a) fake and (b) real news headlines as a function of political ideology (support for Hillary Clinton or Donald Trump), political valence of headline (Democrat-consistent, Republican-consistent, or neutral), and Cognitive Reflection Test performance (bottom quartile = “intuitive”; top quartile = “deliberative”). Clinton support: $N_{intuitive} = 73$; $N_{deliberative} = 129$. Trump support: $N_{intuitive} = 62$; $N_{deliberative} = 69$. Error bars represent 95% CIs.

political conservatism, and CRT as independent variables (see Table 2). CRT remained a significant predictor, $t(792) = 6.46$, $p < .001$, and the CRT effect size was similar without ($r = .27$) versus with demographic covariates ($\beta = .22$). Finally, we note that a *post hoc* analysis shows that the positive correlation between CRT and discernment was robust to excluding items that participants indicated they had seen previously (fake news: $r = -.15$; real news: $r = .13$; discernment: $r = .24$, all p 's $< .001$). Thus, it is not the case that more analytic thinkers were more discerning merely because they were more knowledgeable about the headlines.

In addition to contradicting the specific predictions of the MS2R

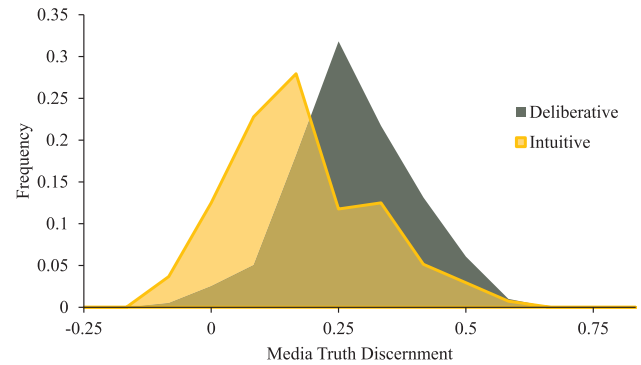


Fig. 2. Distribution of mean media truth discernment scores (a high score indicates an increased capacity to distinguish real from fake news) as a function of Cognitive Reflection Test performance (bottom quartile = “intuitive”; top quartile = “deliberative”). Media truth discernment scores were computed by subtracting perceived accuracy of fake news from perceived accuracy of real news and dividing by 4 (i.e., the potential scale ranges from -1 to 1 with -1 indicating complete belief in fake news and disbelief in real news, 0 indicating no discernment between the fake and real, and 1 indicating complete belief in real news and disbelief in fake news).

Table 2

Final step of hierarchical multiple regression analysis (Study 1) predicting media truth discernment with age, gender (1 = male, 2 = female), education, conservatism (combined social and economic conservatism), and performance on the Cognitive Reflection Test (CRT) as predictors. Media truth discernment was computed by subtracting z-scores for fake news (false alarms) from z-scores for real news (hits); i.e., a high score indicates an increased capacity to distinguish real from fake news). The first column indicates pairwise correlations, while the remaining columns show the final step of hierarchical multiple regression analysis predicting media truth discernment with the other variables. VIF = Variance inflation factor (test of multicollinearity). $N = 797$.

	r	β	t	p	Tolerance	VIF
Intercept			6.92	$< .001$		
CRT	.27	.22	6.46	$< .001$	0.94	1.07
Age	.09	.09	2.64	.008	0.96	1.04
Gender	-.08	-.07	1.95	.052	0.97	1.04
Education	.13	.08	2.47	.014	0.98	1.02
Conservatism	-.16	-.15	4.22	$< .001$	0.95	1.05

account, the results are also inconsistent with more general motivated reasoning accounts which do not take a specifically dual-process perspective. Collapsing across CRT scores, a *post hoc* analysis revealed that

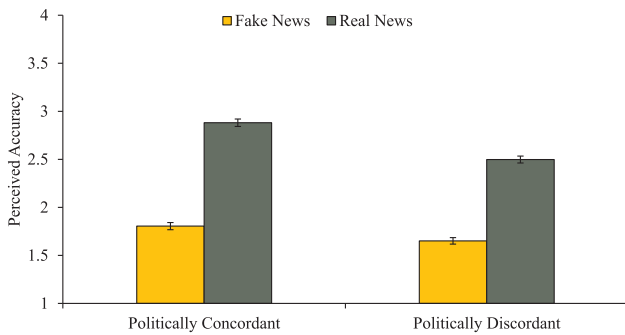


Fig. 3. Mean perceived accuracy of fake and real news headlines (Study 1) as a function of political concordance (Concordant = Democrat-consistent headlines for Clinton supporters/Republican-consistent headlines for Trump supporters; Discordant = Republican-consistent headlines for Clinton supporters/Democrat-consistent headlines for Trump supporters). $N = 800$. Error bars represent 95% CIs.

there was a significant interaction between political concordance and type of news headline (fake, real), $F(1, 799) = 83.02$, $p < .001$, $\eta^2 = .09$, such that the difference in perceived accuracy between fake and real news was significantly larger for politically concordant headlines than politically discordant headlines (Fig. 3); put differently, our participants were actually better able to discern real from fake news among headlines that were consistent with their political ideology rather than inconsistent, $t(799) = 9.11$, $p < .001$, $d = .32$. This suggests that motivated reasoning is not leading people to preferentially believe fake news.

A secondary (but preregistered) question is whether Clinton and Trump supporters are equally susceptible to fake news. To investigate this possibility, we entered perceived accuracy into a 2 (fake, real) \times 3 (Democrat-consistent, Republican-consistent, Neutral) \times 2 (Clinton support, Trump support) mixed design ANOVA. There was a main effect of political ideology, $F(1, 798) = 4.81$, $p = .029$, $\eta^2 = .01$, such that perceived accuracy across all items (both real and fake) was larger for Clinton supporters ($M = 2.31$) than Trump supporters ($M = 2.26$). However, all other main effects and two-way interactions were significant, all F 's > 28 , p 's $< .001$. There was also a strong three-way interaction (for means and standard deviations, see SM), $F(1, 798) = 35.10$, $p < .001$, $\eta^2 = .04$.

Given that the key question is whether left-leaning and right-leaning individuals are equally likely to discern fake from real news, in a *post hoc* analysis we decomposed the three-way interaction by examining three media truth discernment scores for Democrat-consistent, Republican-consistent, and Neutral headlines.³ The media truth discernment scores were entered into a 3 (Democrat-consistent, Republican-consistent, Neutral) \times 2 (Clinton support, Trump support) mixed design ANOVA. This revealed a main effect of political ideology, $F(1, 798) = 28.95$, $p < .001$, $\eta^2 = .04$, such that Clinton supporters were better able to discern fake from real news across the full range of items than Trump supporters. Crucially, there was an interaction between type of news and political ideology (see Fig. 4), $F(1, 798) = 20.14$, $p < .001$, $\eta^2 = .03$. Surprisingly, Clinton supporters were far better at discerning Democrat-consistent real from fake news than were Trump supporters, $t(798) = 7.95$, $p < .001$, $d = .58$. However, as is also evident from Fig. 4, the opposite was not true for Trump supporters. In fact, if anything, Clinton supporters were also better able to discern real from fake Republican-consistent news than were Trump supporters, although the difference was not significant, $t(798) = 1.56$, $p = .120$, $d = .11$.

³ The media truth discernment measure was computed using z-scores and therefore can be considered an analog to d' (via signal detection theory; Wickens, 2002). However, the data in Fig. 4 is presented using raw data divided by 4 to ease interpretability. The two analyses are nearly identical.

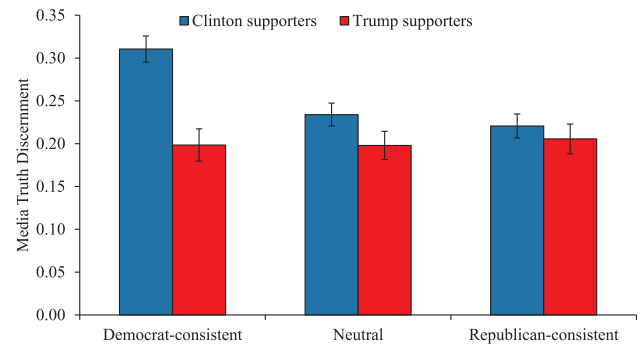


Fig. 4. Media truth discernment (a high score indicates an increased capacity to distinguish real from fake news) as a function of political ideology (support of Hillary Clinton versus Donald Trump) and political valence of headline (Democrat-consistent, Republican-consistent, or neutral). Media truth discernment scores were computed by subtracting perceived accuracy of fake news from perceived accuracy of real news and dividing by 4 (i.e., the potential scale ranges from -1 to 1 with -1 indicating complete belief in fake news and disbelief in real news, 0 indicating no discernment between fake and real, and 1 indicating complete belief in real news and disbelief in fake news). Clinton supporters: $N = 483$. Trump supporters: $N = 317$; Error bars represent 95% CIs.

Nonetheless, it is possible that the pattern of results for partisan news is driven by the underlying plausibility of the items that we happened to select (e.g., our Democrat-consistent fake news may have been relatively implausible but the Democrat-consistent real news may have been relatively plausible). Thus, as an additional test of ideological differences we turn to the politically neutral news stories. Supporting our previous analysis, Trump supporters in our sample were less able to discern neutral (non-political) fake and real news than Clinton supporters, $t(798) = 3.33$, $p = .001$, $d = .24$. Thus, our results indicate that Trump supporters were, overall, less likely to form accurate beliefs about news content (although the difference was not particularly large in magnitude).

3. Study 2

In Study 2, we report a replication of Study 1 with a larger set of items and in a larger sample. Data for Study 2 were taken from the control condition of a set of five identical experiments that assessed a fact-checking intervention for fake news (Pennycook & Rand, 2017). CRT scores were collected in these experiments, but their correlation with perceived accuracy and sharing of fake versus real news was not previously analyzed.

The items for Study 2 were created following a large pretest of 25 fake and 25 real political news headlines. As outlined in Pennycook and Rand (2017), 12 fake and 12 real news headlines were selected, with half of each set being Democrat-consistent items and the other half Republican-consistent items. As in Study 1, the items were equally partisan for both fake and real news headlines, t 's < 1.03 , p 's $> .300$.

3.1. Method

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. The preregistrations for the five combined experiments pertained to the fact-checking intervention reported in Pennycook and Rand (2017). Thus, the analyses reported here were not preregistered. Nonetheless, we apply the identical analysis approach used in Study 1, and Study 2 is therefore confirmatory. Our data is available online (<https://osf.io/tuw89/>).

3.1.1. Participants

Our sample consisted of 2644 Americans from Amazon Mechanical Turk ($M_{age} = 36.9$, 45.3% male; 9 did not respond to the gender

question). Following our preregistrations for the intervention experiments (see Pennycook & Rand, 2017 for details), some participants were removed for indicating that they responded randomly ($N = 51$) or searching online for the news headlines during the study ($N = 33$). Our sample size was determined based on our preregistration for the intervention experiments. Naturally, since our analysis is being restricted to the control condition, our sample is half the size of the preregistered target sample. A subset of the participants ($N = 1463$) consisted of individuals who were invited to participate (through Mechanical Turk) because they previously indicated a conservative political affiliation. This was done to increase the number of political conservatives relative to liberals. As a result, Study 2 had a sample that was roughly balanced with respect to partisanship: 55.6% of participants preferred Clinton to Trump in a forced choice. Participants completed this study between July 7th and August 14th, 2017.

3.1.2. Materials and procedure

We selected the fake and news headlines using the same procedure as Study 1. Participants were presented with 12 fake and 12 real news headlines in a random order. Almost half of the headlines (11 out of 24) were novel to Study 2 (all headlines can be found in the SM). As mentioned, the stories were selected to be Democrat-consistent or Republican-consistent. Headlines were presented in a random order for each participant. For each headline, participants answered two questions: 1) “To the best of your knowledge, how accurate is the claim in the above headline?” (response options: not at all accurate/not very accurate/somewhat accurate/very accurate), and 2) “Would you consider sharing this story online (for example, through Facebook or Twitter)?” (response options: no, maybe, yes). Participants were asked at the end of the study whether they would consider sharing something political on social media (rather than being provided with that option in the social media sharing question for every item as in Study 1).

Participants completed the same CRT measure and demographic questionnaire as in Study 1. A series of questions about trust in the media and fact-checkers that are not relevant for present purposes were also included.

3.2. Results and discussion

Correlations between CRT performance and perceived accuracy for fake and real news stories are presented in Table 3. Mean accuracy judgments for partisan fake and real news headlines as a function of CRT performance and political ideology are presented in Fig. 5. Additional descriptive statistics for primary variables can be found in the SM. With a few exceptions, the pattern of results replicated Study 1. First, as in Study 1, there was no evidence for a *positive* correlation between CRT and accuracy ratings of politically-consistent fake news for either Clinton or Trump supporters. The same pattern was also

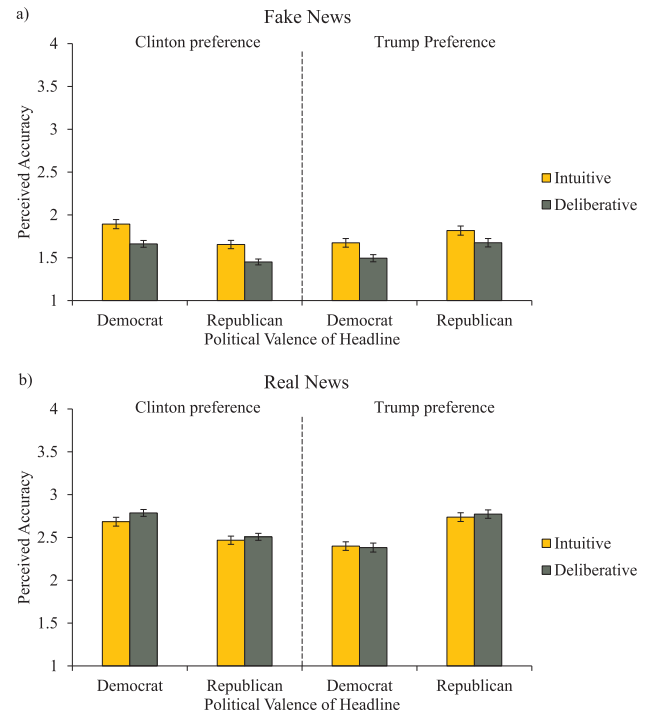


Fig. 5. Mean perceived accuracy of (a) fake and (b) real news headlines as a function of political ideology (support for Hillary Clinton or Donald Trump), political valence of headline (Democrat-consistent or Republican-consistent), and Cognitive Reflection Test performance (bottom quartile = “intuitive”; top quartile = “deliberative”). Clinton support: $N_{\text{intuitive}} = 457$; $N_{\text{deliberative}} = 577$. Trump support: $N_{\text{intuitive}} = 422$; $N_{\text{deliberative}} = 386$. Error bars represent 95% CIs.

evident for social media sharing (Table 3b). Instead of higher CRT participants being stronger believers of politically-consistent fake news, we found – as in Study 1 – that regardless of the partisanship of the participant or the headline, more analytic individuals were better able to differentiate between fake and real news (and the overall correlation between CRT and media truth discernment, collapsing over all participants and headlines, was robust to including demographic variables as covariates, $r = .22$ with controls versus $\beta = .19$ with controls; see Table 4). Moreover, again replicating Study 1, our participants were *better* able to discern real from fake news for politically *concordant* headlines (Fig. 6), $t(2628) = 9.27$, $p < .001$, $d = .18$. Thus, we once again find no evidence of motivated reasoning. Instead, the results are consistent with the classical reasoning account.

Turning from cognitive reflection to partisanship per se, we entered perceived accuracy into a 2 (Type: fake, real) \times 2 (Political valence: Democrat-consistent, Republican-consistent) \times 2 (Ideology: Clinton

Table 3

Correlation (Pearson r) between Cognitive Reflection Test performance and primary variables in Study 2 as a function of Hillary Clinton versus Donald Trump support (based on a forced choice). Participants indicated perceived accuracy (a) and willingness to share on social media (b) for both fake and real news stories of Democrat-consistent and Republican-consistent political news. “Discernment” refers to media truth discernment, which was computed by subtracting z-scores for fake news (false alarms) from z-scores for real news (hits). Participants who indicated an unwillingness to ever share political news on social media were removed from the social media sharing analysis. Clinton supporters: $N = 1461$ for perceived accuracy; $N = 786$ for social media sharing. Trump supporters: $N = 1168$ for perceived accuracy; $N = 594$ for social media sharing.

	Democrat-consistent			Republican-consistent		
	Fake	Real	Discernment	Fake	Real	Discernment
a) Perceived accuracy						
Clinton supporters	-.20***	.08**	.23***	-.21***	.04	.19***
Trump supporters	-.17***	-.01	.15***	-.14***	.04	.15***
b) Social media sharing						
Clinton supporters	-.25***	-.15***	.11**	-.24***	-.24***	.01
Trump supporters	-.19***	-.20***	-.02	-.17***	-.17***	-.001

Table 4

Final step of hierarchical multiple regression analysis (Study 2) predicting media truth discernment with age, gender (1 = male, 2 = female), education, conservatism (combined social and economic conservatism), and performance on the Cognitive Reflection Test (CRT) as predictors. Media truth discernment was computed by subtracting z-scores for fake news (false alarms) from z-scores for real news (hits); i.e., a high score indicates an increased capacity to distinguish real from fake news). The first column indicates pairwise correlations, while the remaining columns show the final step of hierarchical multiple regression analysis predicting media truth discernment with the other variables. VIF = Variance inflation factor (test of multicollinearity). $N = 2631$.

	<i>r</i>	β	<i>t</i>	<i>p</i>	Tolerance	VIF
Intercept			6.71	< .001		
Age	.15	.16	8.46	< .001	0.96	1.05
Gender	-.08	-.06	3.08	.002	0.95	1.05
Education	.13	.10	5.23	< .001	0.98	1.02
Conservatism	-.06	-.07	3.73	< .001	0.96	1.04
CRT	.22	.19	9.86	< .001	0.95	1.06

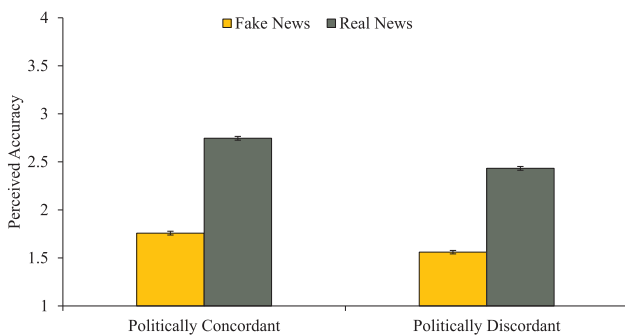


Fig. 6. Mean perceived accuracy of fake and real news headlines (Study 2) as a function of political concordance (Concordant = Democrat-consistent headlines for Clinton supporters/Republican-consistent headlines for Trump supporters; Discordant = Republican-consistent headlines for Clinton supporters/Democrat-consistent headlines for Trump supporters). $N = 2629$. Error bars represent 95% CIs.

support, Trump support) mixed design ANOVA. There was no main effect of political ideology, $F(1, 2627) = 1.84, p = .175, \eta^2 = .001$, and no effect of political valence, $F(1, 2627) = 1.98, p = .160, \eta^2 = .001$. However, all other main effects and two-way interactions were significant, all F 's $> 6.5, p$'s $< .012$, and there was a strong three-way interaction (for means and standard deviations, see SM), $F(1, 2627) = 98.19, p < .001, \eta^2 = .04$. As in Study 1, we decomposed the three-way interaction by examining media truth discernment scores separately for Democrat-consistent and Republican-consistent content. The media truth discernment scores were entered into a 2 (Political valence: Democrat-consistent, Republican-consistent) \times 2 (Ideology: Clinton support, Trump support) mixed design ANOVA. This revealed a main effect of political ideology, $F(1, 2627) = 5.28, p = .022, \eta^2 = .002$, such that Clinton supporters were better able to discern fake from real news across the full range of items than Trump supporters. Crucially, there was an interaction between type of news and political ideology (see Fig. 7), $F(1, 2627) = 76.51, p < .001, \eta^2 = .03$. As in Study 1, Clinton supporters were better at discerning Democrat-consistent real from fake news than were Trump supporters, $t(2627) = 6.71, p < .001, d = .27$. However, unlike Study 1, the opposite was also true: Trump supporters were better at discerning Republican-consistent real from fake news than were Clinton supporters, $t(2627) = 2.45, p = .015, d = .10$. Thus, far from being particularly vulnerable to fake news that was constructed to accord with their political ideology, our participants – be they supporters of Clinton or Trump – were actually *more* accurate when judging politically-consistent news headlines.

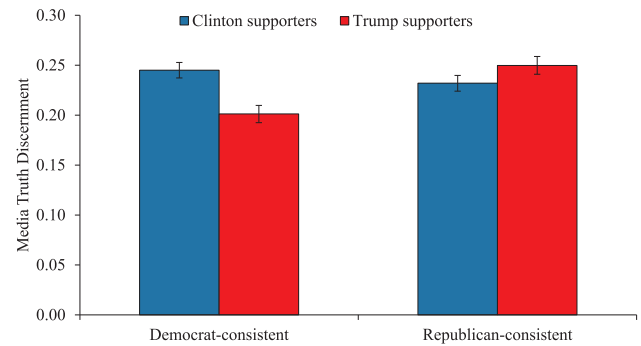


Fig. 7. Media truth discernment (a high score indicates an increased capacity to distinguish real from fake news) as a function of political ideology (support of Hillary Clinton versus Donald Trump) and political valence of headline (Democrat-consistent, Republican-consistent, or neutral). Media truth discernment scores were computed by subtracting perceived accuracy of fake news from perceived accuracy of real news and dividing by 4 (i.e., the potential scale ranges from -1 to 1 with -1 indicating complete belief in fake news and disbelief in real news, 0 indicating no discernment between fake and real, and 1 indicating complete belief in real news and disbelief in fake news). Clinton supporters: $N = 1461$. Trump supporters: $N = 1168$; Error bars represent 95% CIs.

4. Study 3

Across two studies, we found no evidence for the motivated System 2 reasoning account (Kahan, 2013, 2017) in the context of political fake news. Specifically, whereas research on political topics such as climate change (Kahan et al., 2012) and gun control (Kahan et al., 2017) indicates that political polarization *increases* as a function of increased analytic ability, our findings indicate that more analytic people are *less* (not more) likely to believe politically-consistent fake news than less analytic people. Moreover, there was only inconsistent evidence for a positive correlation between analytic thinking and belief in legitimate news stories. Thus, to better understand the mechanisms that lead more analytic individuals to more readily reject even identity-consistent fake news, it is worthwhile to consider the features of fake news as a class of stimuli.

As discussed by Pennycook, Cannon and Rand (2018), one of the most salient characteristics of fake news stories that spread widely on social media is that the underlying claims are largely implausible. This occurs because fake news represents entirely fabricated claims that are constructed with the explicit goal of “going viral” online. Thus, while fake news may succeed in drawing attention (and, potentially, facilitating social media sharing; Vosoughi, Roy, & Aral, 2018), the focus on virality likely undermines plausibility and, therefore, perceptions of accuracy for analytic individuals. Indeed, previous research based on the classical reasoning account has shown that analytic thinking is correlated with skepticism about a wide range of epistemically suspect claims (reviewed in Pennycook, et al., 2015a; Pennycook, 2018), such as those pertaining to supernatural beliefs (Pennycook et al., 2012) and conspiracy theories (Swami et al., 2014). One possibility, then, is that analytic individuals are better at using implausibility as a cue for perceived accuracy. This suggests that perceptions of news items that are relatively implausible should be more negatively impacted by individual differences in CRT performance than relatively plausible news items. We investigate this possibility in Study 3 by combining the item-level data from the first two studies and correlating plausibility (i.e. mean perceived likelihood for each item, as determined out-of-sample in a pre-test) with the direction and magnitude of the correlation between CRT and perceived accuracy for each individual item.

Our pretest also included the extent to which each item would be “favorable for” Democrats versus Republicans and participants in the pretest indicated their political ideology using the same Clinton/Trump

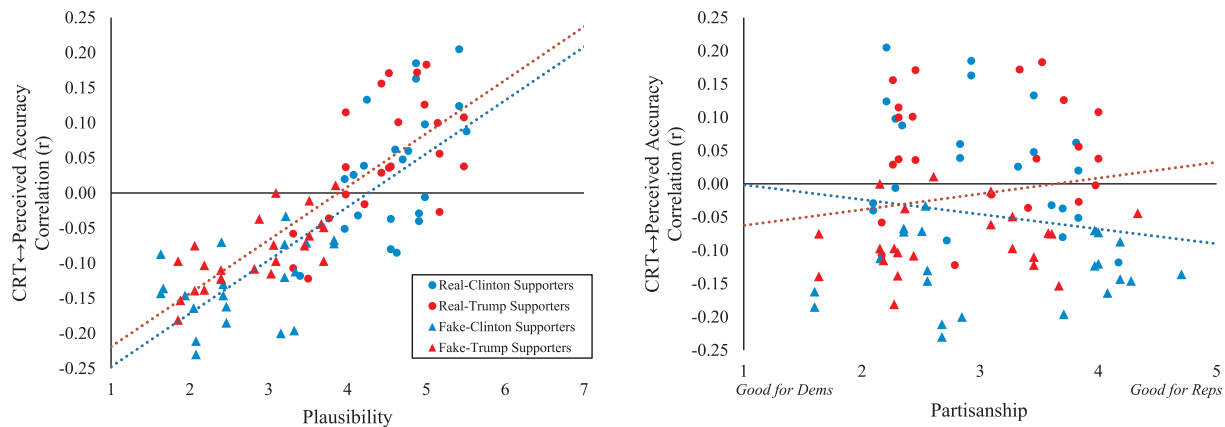


Fig. 8. Scatterplots displaying, for each headline in Studies 1 and 2, the correlation between Cognitive Reflection Test performance (CRT) and perceived accuracy (y-axis) as a function of item-level (a) plausibility (low score = high implausibility; high score = high plausibility) and (b) Republican partisanship (low score = favorable for Democrats; high score = favorable for Republicans). Results for Clinton supporters are shown in blue, and for Trump supporters in red. Real news headlines are represented with circles, and fake news headlines are represented with triangles. The figure shows that CRT correlates positively with perceived accuracy of relatively plausible political news headlines, but negatively with relatively implausible political news headlines for both Clinton ($r = .80, p < .001$) and Trump supporters ($r = .82, p < .001$). The role of relative political news partisanship is, in contrast, not significant for either Clinton ($r = -.16, p = .292$) or Trump ($r = .17, p = .261$) supporters. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

preference measure that was used in Studies 1 and 2. This also allows us to investigate, at the level of specific headlines, the relative role of partisanship in driving CRT correlations. If belief in news headlines is driven by MS2R, then partisanship should positively predict the relationship between CRT performance and perceived accuracy: the most partisan and politically concordant items should show the most strongly positive correlations.

4.1. Method

Across the two studies there were 22 political fake news items and 22 political real news items. We took the correlation between CRT and perceived accuracy for each item separately for individuals who indicated support for Hillary Clinton or Donald Trump, producing 88 correlations. Mean plausibility for each item was determined out-of-sample using the pretest that was used to validate the items in Studies 1 and 2. Specifically, participants in the pretest were asked: “What is the likelihood that the above headline is true?” and responded on a scale from 1 (Extremely unlikely) to 7 (Extremely likely). They were also asked to rate the relative partisanship of each item: “Assuming the above headline is entirely accurate, how favorable would it be to Democrats versus Republicans” using a scale from 1 (More favorable for Democrats) to 5 (More favorable for Republicans). Participants in the pre-test were either presented with a full set of fake or real headlines, but not both. Each set consisted of 25 items, some of which were not included in either Studies 1 or 2. Mean plausibility and partisanship ratings for each item were defined based on whether the individual in the pretest indicated supporting Clinton or Trump in a forced choice. Thus, the correlation between CRT and perceived accuracy among Clinton [Trump] supporters in Studies 1 and 2 was correlated with mean plausibility and partisanship from the pretest among Clinton [Trump] supporters. This *post hoc* analysis was conducted following the completion of our first two studies.

4.2. Results

As is evident from Fig. 8a, there is a strong association between the size and direction of the correlation between CRT and perceived accuracy (CRT-accuracy relationship, hereafter) for the items employed in Studies 1 and 2 and the out-of-sample plausibility ratings for those items. Specifically, CRT correlates *negatively* with relatively implausible

political news headlines (i.e., below scale midpoint of 4), but *positively* with perceived accuracy of relatively plausible political news headlines (i.e., above scale midpoint of 4).⁴ The correlation between plausibility and the CRT-accuracy relationship was strong and significant for supporters of both Clinton, $r(42) = .80, p < .001$, and Trump, $r(42) = .82, p < .001$. In contrast, the relative partisanship of each item (on a scale from 1-Favorable for Democrats to 5-Favorable for Republicans) was not significantly predictive of the CRT-accuracy relationship for supporters of either Clinton, $r(42) = -.16, p = .292$, or Trump, $r(42) = .17, p = .261$. Thus, whereas implausibility seems to play a strong role in determining whether analytic thinking will influence perceptions of accuracy versus inaccuracy, the correspondence between the partisanship of the item and the political affiliation of the individual plays little role in the impact of analytic thinking on perceptions of accuracy. This conclusion is also supported by an alternative analysis approach using linear mixed models (see Appendix). In other words, we find that the relationship between CRT and perceptions of accuracy is moderated by plausibility, and not by partisanship. These observations fit well with the classical reasoning account, and are in stark contrast to the predictions of the MS2R account.

Finally, as can be seen in Fig. 8, the differential relationship between CRT and perceived accuracy of fake versus real news reported in Studies 1 and 2 was not driven by just a few items. On the contrary, the correlation was negative for nearly all fake news items, and positive for a large majority of real news items. This demonstrates the robustness of the finding that higher CRT scores leads to better media truth discernment.

5. General discussion

Across two studies with 3446 participants, we found consistent evidence that analytic thinking plays a role in how people judge the accuracy of fake news. Specifically, individuals who are more willing to think analytically when given a set of reasoning problems (i.e., two versions of the Cognitive Reflection Test) are less likely to erroneously

⁴ Although it should be noted that splitting the sample based on plausibility (i.e., above or below scale midpoint) produces a significant correlation for implausible items, $r(52) = .65, p < .001$, but only a marginally significant correlation for plausible items, $r(32) = .30, p = .086$. This is likely due to lack of power, and a lack of highly plausible items in our stimulus set.

think that fake news is accurate. Crucially, this was not driven by a general skepticism toward news media: More analytic individuals were, if anything, *more* likely to think that legitimate (“real”) news was accurate. All of the real news stories that we used – unlike the fake ones – were factually accurate and came from mainstream sources. Thus, our evidence indicates that analytic thinking helps to accurately discern the truth in the context of news headlines. More analytic individuals were also better able to discern real from fake news regardless of their political ideology, and of whether the headline was Pro-Democrat, Pro-Republican, or politically neutral; and this relationship was robust to controlling for age, gender, and education.

5.1. Motivated reasoning and fake news

The present results are relevant for the theoretical debate about the role of analytic thinking broadly in belief formation and retention. Notably, there is some evidence that the propensity to think analytically (as indexed by the CRT and related measures) actually *exacerbates* motivated reasoning (Kahan, 2013; Kahan et al., 2012; Kahan, Jenkins-Smith, & Braman, 2011; Kahan, et al., 2017), thereby lowering accuracy and increasing political polarization. That is, the disposition to think analytically may lead people to use deliberative reasoning to *justify* their prior beliefs and to *protect* their political (or otherwise) identity. In keeping with this Motivated System 2 Reasoning account, one of the most common explanations of the recent rise of fake news is that it is driven by people convincing themselves that even implausible fake news is accurate if it corresponds with their political ideology (Beck, 2017; Calvert, 2017; Kahan, 2017; Singal, 2017). In contrast, however, other work – rooted in what we call the classical reasoning account – has found analytic thinking to be linked to the *override* of prior belief and values in a variety of realms (for a review see Pennycook, et al., 2015b).

Contrary to the MS2R account, and consistent with the classical reasoning account, we found that analytic thinking was *not* associated with increased acceptance of politically concordant fake news. In fact, the precise opposite pattern of results was observed: analytic thinking was associated with the *rejection* of or *disbelief* in even politically concordant fake news articles. Thus, the evidence indicates that people fall for fake news because they *fail* to think; not because they think in a motivated or identity-protective way. While it was also true that there was an overall tendency for Democrats/Clinton supporters to rate Democrat-consistent fake news as more accurate than Republican-consistent fake news (and vice versa for Republicans/Trump supporters), our results suggest that this tendency may be driven by different prior beliefs about what is or is not plausible. If so, our results suggest that analytic thinking supports the override of these priors (as opposed to the exacerbation of them, as implied by the MS2R account).

How, then, do we make sense of the seemingly contradictory finding that analytic thinking exacerbates motivated reasoning in terms of attitudes about topics such as global warming (Kahan et al., 2012), but not perceived accuracy of fake news? One possibility is that exceptions to analytic thinking’s general tendency to protect against epistemically suspect beliefs occur in cases where analytic thinking is unlikely to be successful. That is, even the most reflective members of the general population cannot overcome their lack of training and knowledge in the realm of, for example, climate science. Thinking analytically about extremely complex scientific issues is not likely to have a directional effect because the factors that climate scientists think about when judging the likelihood of anthropogenic global warming will not be the same as the factors that lay people think about. In contrast, as evidenced by our item analysis in Study 3, plausibility may play a strong role in whether more analytic individuals are more or less likely to believe a news headline. Specifically, analytic thinking is more strongly negatively associated with acceptance of implausible news headlines (as is common for fake news) but more strongly positively associated with acceptance of plausible news headlines (as is common for

mainstream news).⁵ Further research is necessary to map the domains in which analytic thinking helps or hurts. This may help reveal how and when analytic thinking might support versus exacerbate motivated reasoning.

Another possibility is that explicitly asking participants to assess fake and real news led them to be more analytic and objective than they otherwise might be.⁶ Research in the context of science communication shows that asking individuals about facts instead of personal beliefs massively decreases political and religious differences (Kahan, 2015). It is possible that changing the wording of our perceived accuracy question to be more about belief would mitigate or even reverse the correlation with analytic thinking. Moreover, a manipulation that highlights the importance of political identity may lead to increased motivated reasoning and, potentially, a positive correlation between analytic thinking and perceptions of fake news accuracy. Alternatively, adding a pre-emptive inoculation statement (Cook et al., 2017), such as a warning that not all news stories are accurate, may further increase the strength of the correlation between analytic thinking and media truth discernment. Ultimately, our results indicate that analytic thinking facilitates the detection of fake news under standard experimental conditions – future research is required to investigate additional contexts (and, of course, different cultures).

5.2. Political ideology and fake news

The overall capacity to discern real from fake news was lower among those who preferred Donald Trump over Hillary Clinton, relative to those who preferred Hillary Clinton over Donald Trump (the one exception being that in Study 2, those who preferred Trump were better at discerning Republican-consistent items). This finding is relevant for the current debate surrounding potential ideological asymmetries in cognitive processing styles (see Ditto et al., 2018; Jost, 2017 for reviews). A recent *meta-analysis* indicates that liberals and conservatives do *not* differ in terms of partisan bias for politically salient content (i.e., there is no ideological asymmetry when it comes to the acceptance of information that confirms rather than challenges one’s belief) (Ditto et al., 2018). This occurs despite research indicating that political conservatives in the US tend to be more cognitively rigid, dogmatic, and less tolerant of ambiguity than liberals (Jost, 2017). To muddy the waters further, the evidence for ideological asymmetry in the disposition to think analytically has been more equivocal (Jost, 2017; Kahan, 2013; Yilmaz & Saribay, 2017a, 2017b, 2016). Indeed, a recent *meta-study* (Pennycook & Rand, 2018) found that the Trump voters scored lower than Clinton voters on the CRT, but that this difference was driven by *Democrats* who voted for Trump.⁷

The present results indicate that there is, in fact, a political asymmetry when it comes to the capacity to discern the truth in news media. Moreover, the association between conservatism and media truth discernment held independently of CRT performance. This may help explain why Republican-consistent fake news was apparently more common than Democrat-consistent fake news leading up to the 2016 Presidential election (Allcott & Gentzkow, 2017; Guess, Nyhan, & Reifler, 2018) and why the media ecosystem (including open web links, and both Twitter and Facebook sharing) is more polarized on the political right than on the left in the US (Faris et al., 2017). Nonetheless, it

⁵ These results are in contrast to work on belief bias, in which higher CRT people are less likely to be misled by plausibility when answering deductive logic problems with implausible but logically correct conclusions (Trippas, Pennycook, Verde, & Handley, 2015). In these cases, plausibility is a *misleading* cue – and therefore a case where our account predicts analytic thinking would lead one to ignore implausibility. We do not argue that high CRT people are more likely to rely on plausibility per se, but rather that high CRT individuals use plausibility to judge the accuracy of news headlines given the connection between plausibility and truth in the context of our stimuli.

⁶ We thank Dan Kahan for suggesting this possibility.

⁷ The study by Pennycook and Rand (2018) includes data from Studies 1 and 2, so we therefore do not analyze ideological differences in CRT performance here.

remains unclear precisely why Republicans (at least in Mechanical Turk samples) are apparently worse at discerning between fake and real news.

5.3. Limitations

There are a number of potential limitations or criticisms of the current work that should be highlighted. Foremost, the present analysis relies on a convenience sample of online Mechanical Turk workers. Although previous work has shown that Amazon Mechanical Turk is a reasonably reliable resource for research on political ideology (Coppock, 2016; Krupnikov & Levine, 2014; Mullinix, Leeper, Druckman, & Freese, 2015), our samples were not nationally representative and our political ideology comparisons should be interpreted with this in mind. However, with respect to the correlation between analytic thinking and fake news accuracy, it should be noted that obtaining nationally representative populations may not be as important as sampling from groups of people who are most likely to come across fake news stories; presumably, frequent internet and social media users. For this, Mechanical Turk may actually be a better resource than a nationally representative sample.

It should be noted that although our studies were completed online with news stories in the format of a Facebook post, our study environment was otherwise not a close analog to the social media environment. For one, participants were presented with a steady stream of news articles with no other interspersed content. Moreover, we presented participants with a mix of politically concordant and discordant news stories, which does not necessarily coincide with the media echo chambers that are usually encountered on Facebook (or elsewhere online). For example, Bakshy, Messing, and Adamic (2015) found that politically discordant news stories only constituted 24% of American liberals' and 35% of American conservatives' news feeds.

Another potential criticism of the current work is that the effect sizes are modest. Correlations between CRT and media truth discernment ranged from .10 (for Republican-consistent items among Clinton supporters in Study 1) to .28 (for Democrat-consistent items among Clinton supporters in Study 1). According to a recent meta-analysis of effect sizes in individual differences research, correlations (r) of .10, .20, and .30 can be considered relatively small, medium, and large, respectively (Gignac & Szodorai, 2016). Thus, while some of the correlations reported here are relatively small, others are actually relatively large. Put differently, our effect sizes are typical for this type of research.

We relied entirely on the CRT to assess analytic thinking. There are two potential criticisms of this: 1) Many MTurkers have been exposed to the CRT, such that it may no longer be a valid measure in that population (Haigh, 2016), and 2) The CRT is a measure of cognitive ability or numeracy (Sinayev & Peters, 2015) and not the disposition to think analytically (as argued here). Regarding the first point, a recent analysis that included over 2500 participants and 17 variables of interest did not find a single case where the predictive power of the CRT was significantly undermined by repeated exposure (Bialek & Pennycook, 2017).

Regarding the criticism that the CRT is *not* a measure of the disposition to think analytically, but is actually a measure of numeracy or (more generally) cognitive ability (Sinayev & Peters, 2015), there is now considerable evidence that CRT predicts numerous psychological

factors (such as religious belief, moral judgments, etc.) even after numeracy and cognitive ability have been taken into account (Pennycook, 2017; Pennycook, Fugelsang, & Koehler, 2015b; Pennycook & Ross, 2016; Shenhav et al., 2012). Nonetheless, numeracy is clearly a component of CRT performance and there are cases where the ability to think analytically is more influential than the disposition to think analytically (e.g., Pennycook et al., 2014). Thus, future work is needed to determine if the propensity to think analytically *per se* is associated with media truth discernment. At any rate, the present results provide evidence for an association between analytic thinking and media truth discernment regardless of whether disposition or ability are of primary importance.

Finally, future work should investigate not only perceptions of fake (and real) news accuracy, but also the consequences of reading news headlines for subsequent beliefs and behaviors. Much has been made of the potential effect that fake news had on voting for the 2016 US Presidential election (e.g., Allcott & Gentzkow, 2017; Faris et al., 2017; Lazer et al., 2018); the underlying presumption is that people are, in fact, responsive to fake news in important ways. Empirical tests that assess the downstream impacts of misinformation on social media (and elsewhere) are sorely needed.

6. Conclusion

The Oxford Dictionary declared “post-truth” to be the word of the year in 2016 and defined it as such: “relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief.” This is a reflection of a growing issue in the modern world and it is imperative for psychologists to develop a clear understanding of why people fall prey to the various forms of disinformation that we now appear to be inundated with on a daily basis. The present results indicate that analytic thinking plays an important role in people's self-inoculation against political disinformation. Contrary to the popular Motivated System 2 Reasoning account of political cognition, our evidence indicates that people fall for fake news because they *fail* to think; not because they think in a motivated or identity-protective way. This suggests that interventions that are directed at making the public more thoughtful consumers of news media may have promise. Ironically, the invention of the internet and social media – which resulted from a great deal of analytic thinking – may now be exacerbating our tendency to rely on intuition (Barr, Pennycook, Stolz, & Fugelsang, 2015; Fisher, Goddu, & Keil, 2015; Ward, Duke, Gneezy, & Bos, 2017), to the potential peril of both ourselves and society as a whole (Rand, Tomlin, Bear, Ludvig, & Cohen, 2017; Tomlin, Rand, Ludvig, & Cohen, 2015; Toupou, Strogatz, & Cohen, 2015). In a time where truth is embattled, it is particularly important to understand of whom (and why) inaccurate beliefs take hold.

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Appendix A

The conclusions of Study 3 are also supported by an alternative analysis approach using linear mixed models. Here we take perceived accuracy rating at the level of the individual headline as the dependent variable unit of analysis (30 or 24 observations per participant, depending on the study) and predict this DV using participant CRT score, headline characteristic (plausibility or partisanship, depending on the analysis; normalized to the interval [0,1]), and the interaction between CRT score and headline characteristic. The mixed models allowed intercepts and headline characteristic slopes to vary across subjects (models where intercepts and/or CRT slopes also varied across headlines failed to converge). The results are shown in Table 5. We found large positive interactions between CRT and plausibility for both Clinton and Trump supporters, such that the coefficient

Table 5

Mixed models predicting perceived accuracy, with intercepts and slopes for plausibility/partisanship allowed to vary across subjects.

	Prefer Clinton	Prefer Trump	Prefer Clinton	Prefer Trump
CRT	–0.622*** (0.0380)	–0.577*** (0.0482)	–0.042 (0.049)	–0.214*** (0.0585)
Plausibility	2.270*** (0.0479)	2.293 (0.0539)		
CRT × Plausibility	1.164*** (0.0785)	1.125*** (0.0946)		
Partisanship			–0.844*** (0.0477)	0.990*** (0.0577)
CRT × Partisanship			–0.135 (0.0781)	0.274** (0.101)
Constant	1.227*** (0.0232)	1.166*** (0.0275)	2.663*** (0.0300)	1.697*** (0.0333)
Observations	44,665	34,325	44,665	34,325
Number of groups	1944	1485	1944	1485

Standard errors in parentheses.

*p < 0.05.

*** p < 0.001.

** p < 0.01.

on CRT when predicting perceived accuracy was negative for relatively implausible headlines (at minimum plausibility, extrapolated coefficient on CRT is $b = -0.622$ for Clinton supporters and $b = -0.577$ for Trump supporters) and positive for relatively plausible headlines (at maximum plausibility, extrapolated coefficient on CRT is $b = 0.542$ for Clinton supporters and $b = 0.548$ for Trump supporters). Conversely, we found much smaller interactions (albeit still statistically significant among Trump supporters) between CRT and partisanship, such that the coefficient on CRT when predicting perceived accuracy did not change substantially based on headline partisanship (at maximally liberal, extrapolated coefficient on CRT is $b = -0.042$ for Clinton supporters and $b = -0.214$ for Trump supporters; at maximally conservative, extrapolated coefficient on CRT is $b = -0.177$ for Clinton supporters and $b = 0.060$ for Trump supporters).

Appendix B. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.cognition.2018.06.011>.

References

- Allcott, H., & Gentzkow, M. (2017). Social Media and Fake News in the 2016 Election. NBER Working Paper No. 23098. Retrieved from < <http://www.nber.org/papers/w23098> > .
- Bakshy, E., Messing, S., & Adamic, L. (2015). Exposure to ideologically diverse news and opinion on Facebook. *Science*, 348, 1130–1132.
- Ballarín, C., & Sloman, S. A. (2017). Reasons and the “Motivated Numeracy Effect.” In Proceedings of the 39th Annual Meeting of the Cognitive Science Society, (pp. 1580–1585).
- Barr, N., Pennycook, G., Stolz, J. A., & Fugelsang, J. A. (2015). The brain in your pocket: Evidence that Smartphones are used to supplant thinking. *Computers in Human Behavior*, 48, 473–480. <http://dx.doi.org/10.1016/j.chb.2015.02.029>.
- Beck, J. (2017). This article won't change your mind: The fact on why facts alone can't fight false beliefs. *The Atlantic* Retrieved from <https://www.theatlantic.com/science/archive/2017/03/this-article-wont-change-your-mind/519093/>.
- Berinsky, A. A. J. (2017). Rumors and health care reform: Experiments in political misinformation. *British Journal of Political Science*, 47, 241–246. <http://dx.doi.org/10.1017/S0007123415000186>.
- Bialek, M., & Pennycook, G. (2017). The cognitive reflection test is robust to multiple exposures. *Behavior Research Methods*. <http://dx.doi.org/10.3758/s13428-017-0963-x>.
- Calvert, D. (2017). The Psychology Behind Fake News. Retrieved August 2, 2017, from < <https://insight.kellogg.northwestern.edu/article/the-psychology-behind-fake-news> > .
- Cook, J., Lewandowsky, S., Ecker, U., Jacobs, P., Cowtan, K., & Green, S. (2017). Neutralizing misinformation through inoculation: Exposing misleading argumentation techniques reduces their influence. *PLoS One*, 12(5), e0175799. <http://dx.doi.org/10.1371/journal.pone.0175799>.
- Coppock, A. (2016). Generalizing from Survey Experiments Conducted on Mechanical Turk: A Replication Approach. Retrieved from < https://alexandercoppock.files.wordpress.com/2016/02/coppock_generalizability2.pdf > .
- De Neys, W. (2012). Bias and conflict: A case for logical intuitions. *Perspectives on Psychological Science*, 7(1), 28–38. <http://dx.doi.org/10.1177/1745691611429354>.
- Ditto, P. H., Liu, B. S., Clark, C. J., Wojcik, S. P., Chen, E. E., Grady, R. H., & Zinger, J. F. (2018). At least bias is bipartisan: A meta-analytic comparison of partisan bias in liberals and conservatives. *Perspectives on Psychological Science*. <http://dx.doi.org/10.1007/s10551-015-2769-z>.For.
- Drummond, C., & Fischhoff, B. (2017). Individuals with greater science literacy and education have more polarized beliefs on controversial science topics. *Proceedings of the National Academy of Sciences*, 114, 9587–9592. <http://dx.doi.org/10.1073/pnas.1704882114>.
- Ecker, U., Hogan, J., & Lewandowsky, S. (2017). Reminders and repetition of misinformation: Helping or hindering its retraction? *Journal of Applied Research in Memory and Cognition*, 6, 185–192.
- Evans, J. S. B. T. (2003). In two minds: Dual-process accounts of reasoning. *Trends in Cognitive Sciences*, 7(10), 454–459. <http://dx.doi.org/10.1016/j.tics.2003.08.012>.
- Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on Psychological Science*, 8(3), 223–241. <http://dx.doi.org/10.1177/1745691612460685>.
- Faris, R. M., Roberts, H., Etling, B., Bourassa, N., Zuckerman, E., & Benkler, Y. (2017). Partisanship, Propaganda, and Disinformation: Online Media and the 2016 U.S. Presidential Election. Berkman Klein Center for Internet & Society Research Paper. Retrieved from < https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3019414 > .
- Fisher, M., Goddu, M. K. M., & Keil, F. C. F. (2015). Searching for explanations: How the Internet inflates estimates of internal knowledge. *Journal of Experimental Psychology: General*, 144(3), 674–687. <http://dx.doi.org/10.1037/xge0000070>.
- Fiske, S., & Taylor, S. (2013). *Social cognition: From brains to culture* (2nd ed.). New York, NY: McGraw-Hill.
- Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, 19(4), 25–42. <http://dx.doi.org/10.1257/089533005775196732>.
- Gervais, W. M. (2015). Override the controversy: Analytic thinking predicts endorsement of evolution. *Cognition*, 142, 312–321. <http://dx.doi.org/10.1016/j.cognition.2015.05.011>.
- Gervais, W. M., & Norenzayan, A. (2012). Analytic thinking promotes religious disbelief. *Science*, 336(6080), 493–496. <http://dx.doi.org/10.1126/science.1215647>.
- Gignac, G. E., & Szodorai, E. T. (2016). Effect size guidelines for individual differences researchers. *Personality and Individual Differences*, 102, 74–78. <http://dx.doi.org/10.1016/j.paid.2016.06.069>.
- Guess, A., Nyhan, B., & Reifler, J. (2018). Selective Exposure to Misinformation: Evidence from the consumption of fake news during the 2016 U.S. presidential campaign. [Working Paper]. Retrieved from < <http://www.dartmouth.edu/~nyhan/fake-news-2016.pdf> > .
- Haidt, J. (2012). *The righteous mind: Why good people are divided by politics and religion*. New York, NY: Paragon.
- Haigh, M. (2016). Has the standard cognitive reflection test become a victim of its own success? *Advances in Cognitive Psychology*, 12(3), 145–149. <http://dx.doi.org/10.5709/acp-0193-5>.
- Jost, J. T. (2017). Ideological asymmetries and the essence of political psychology. *Political Psychology*, 38(2), 167–208. <http://dx.doi.org/10.1111/pops.12407>.

- Kahan, D. (2015). Climate-science communication and the measurement problem. *Political Psychology*, 36, 1–43. <http://dx.doi.org/10.1111/pops.12244/full>.
- Kahan, D. M. (2013). Ideology, motivated reasoning, and cognitive reflection. *Judgment and Decision Making*, 8(4), 407–424. <http://dx.doi.org/10.2139/ssrn.2182588>.
- Kahan, D. M. (2017). Misconceptions, misinformation, and the logic of identity-protective cognition. *SSRN Electronic Journal*. <http://dx.doi.org/10.2139/ssrn.2973067>.
- Kahan, D. M., Jenkins-Smith, H., & Braman, D. (2011). Cultural cognition of scientific consensus. *Journal of Risk Research*, 14(2), 147–174. <http://dx.doi.org/10.1080/13669877.2010.511246>.
- Kahan, D. M., & Peters, E. (2017). Rumors of the “Nonreplication” of the “Motivated Numeracy Effect” are Greatly Exaggerated. Retrieved from < https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3026941 > .
- Kahan, D. M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L. L., Braman, D., & Mandel, G. (2012). The polarizing impact of science literacy and numeracy on perceived climate change risks. *Nature Climate Change*, 2(10), 732–735. <http://dx.doi.org/10.1038/nclimate1547>.
- Kahan, D., Peters, E., Dawson, E., & Slovic, P. (2017). Motivated numeracy and enlightened self-government. *Behavioural Public Policy*, 1(1), 54–86.
- Kahneman, D. (2011). *Thinking, fast and slow*. New York, NY: Farrar, Straus and Giroux.
- Knobloch-Westernick, S., Mothes, C., & Polavin, N. (2017). Confirmation bias, ingroup bias, and negativity bias in selective exposure to political information. *Communication Research*, 9365021771959. <http://dx.doi.org/10.1177/0093650217719596>.
- Kohlberg, L. (1969). Stage and sequence: The cognitive-developmental approach to socialization. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 347–480).
- Krupnikov, Y., & Levine, A. (2014). Cross-sample comparisons and external validity. *Journal of Experimental Political Science*, 1, 59–80.
- Lazer, D., Baum, M., Benkler, J., Berinsky, A., Greenhill, K., Metzger, M., ... Zittrain, J. (2018). The science of fake news. *Science*, 9, 1094–1096.
- Mercier, H., & Sperber, D. (2011). Why do humans reason? Arguments for an argumentative theory. *Behavioral and Brain Sciences*, 34(2), 57–74. <http://dx.doi.org/10.1017/S0140525X10000968>.
- Mullinix, K., Leeper, T., Druckman, J., & Freese, J. (2015). The generalizability of survey experiments. *Journal of Experimental Political Science*, 2, 109–138.
- Nyhan, B., & Reifler, J. (2010). When corrections fail: The persistence of political misperceptions. *Political Behavior*, 32(2), 303–330. <http://dx.doi.org/10.1007/s11109-010-9112-2>.
- Pennycook, G. (2017). A perspective on the theoretical foundation of dual-process models. In W. De Neys (Ed.), *Dual Process Theory 2.0* (pp. 34). Psychology Press.
- Pennycook, G. (2018). *The new reflectionism in cognitive psychology: Why reason matters*. New York, NY: Routledge.
- Pennycook, G., Cannon, T. D., & Rand, D. G. (2018). Prior exposure increases perceived accuracy of fake news. *Journal of Experimental Psychology: General* Retrieved from < https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2958246 > .
- Pennycook, G., Cheyne, J. A., Barr, N., Koehler, D. J., & Fugelsang, J. A. (2014). The role of analytic thinking in moral judgements and values. *Thinking & Reasoning*, 20(2), 188–214. <http://dx.doi.org/10.1080/13546783.2013.865000>.
- Pennycook, G., Cheyne, J. A., Barr, N., Koehler, D. J., & Fugelsang, J. A. (2015). On the reception and detection of pseudo-profound bullshit. *Judgment and Decision Making*, 10(6), 549–563. <http://dx.doi.org/10.3389/fpsyg.2013.00279>.
- Pennycook, G., Cheyne, J. A. J. A., Seli, P., Koehler, D. J. D. J., & Fugelsang, J. A. J. A. (2012). Analytic cognitive style predicts religious and paranormal belief. *Cognition*, 123(3), 335–346. <http://dx.doi.org/10.1016/j.cognition.2012.03.003>.
- Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2016). Is the cognitive reflection test a measure of both reflection and intuition? *Behavior Research Methods*, 48, 341–348. <http://dx.doi.org/10.3758/s13428-015-0576-1>.
- Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015a). Everyday consequences of analytic thinking. *Current Directions in Psychological Science*, 24(6), 425–432. <http://dx.doi.org/10.1177/0963721415604610>.
- Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015b). What makes us think? A three-stage dual-process model of analytic engagement. *Cognitive Psychology*, 80, 34–72. <http://dx.doi.org/10.1016/j.cogpsych.2015.05.001>.
- Pennycook, G., & Rand, D. (2017, December 8). The Implied Truth Effect: Attaching Warnings to a Subset of Fake News Stories Increases Perceived Accuracy of Stories Without Warnings. Retrieved from < https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3035384 > .
- Pennycook, G., & Rand, D. G. (2018). Cognitive reflection and the 2016 US presidential election. *SSRN Electronic Journal*. <http://dx.doi.org/10.2139/ssrn.3110929>.
- Pennycook, G., & Ross, R. M. (2016). Commentary on: Cognitive reflection vs. calculation in decision making. *Frontiers in Psychology*, 7, 9. <http://dx.doi.org/10.3389/fpsyg.2015.00532>.
- Pennycook, G., Ross, R. M., Koehler, D. J., & Fugelsang, J. A. (2016). Atheists and agnostics are more reflective than religious believers: Four empirical studies and a meta-analysis. *Plos One*, 11(4), e0153039. <http://dx.doi.org/10.1371/journal.pone.0153039>.
- Piaget, J. (1932). *The moral judgment of the child*. London, UK: Routledge Kegan Paul.
- Rand, D., Tomlin, D., Bear, A., Ludvig, E., & Cohen, J. (2017). Cyclical population dynamics of automatic versus controlled processing: An evolutionary pendulum. Retrieved from *Psychological Review*, 124, 626–642. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2972420.
- Redlawsk, D. P., Civettini, A. J. W., & Emmerson, K. M. (2010). The affective tipping point: Do motivated reasoners ever “Get It”? *Political Psychology*, 31(4), 563–593. <http://dx.doi.org/10.1111/j.1467-9221.2010.00772.x>.
- Shane, S. (2017). From Headline to Photograph, a Fake News Masterpiece. New York Times. Retrieved from < <https://www.nytimes.com/2017/01/18/us/fake-news-hillary-clinton-cameron-harris.html> > .
- Shenhav, A., Rand, D. G., & Greene, J. D. (2012). Divine intuition: Cognitive style influences belief in God. *Journal of Experimental Psychology: General*, 141(3), 423–428. <http://dx.doi.org/10.1037/a0025391>.
- Shtulman, A., & McCallum, K. (2014). Cognitive Reflection Predicts Science Understanding. In Proceedings of the 36th Annual Conference of the Cognitive Science Society, (pp. 2937–2942).
- Silverman, C., Strapagiel, L., Shaban, H., & Hall, E. (2016). Hyperpartisan Facebook pages are publishing false and misleading information at an alarming rate. *Buzzfeed News* Retrieved from < <https://www.buzzfeed.com/craigsilverman/partisan-fb-pages-analysis> > .
- Sinayev, A., & Peters, E. (2015). Cognitive reflection vs. calculation in decision making. *Frontiers in Psychology*, 6, 1–16. <http://dx.doi.org/10.3389/fpsyg.2015.00532>.
- Singal, J. (2017). This is a great psychological framework for understanding how fake news spreads. New York Magazine. Retrieved from < <http://nymag.com/scienceofus/2017/01/a-great-psychological-framework-for-understanding-fake-news.html> > .
- Stanovich, K. (1999). *Who is rational?: Studies of individual differences in reasoning*. Mahwah, NJ: Erlbaum.
- Stanovich, K. (2005). *The robot's rebellion: Finding meaning in the age of Darwin*. Chicago, IL: Chicago University Press.
- Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: implications for the rationality debate? *Behavioral and Brain Sciences*, 23(5), 645–665. <http://dx.doi.org/10.1017/S0140525X00003435>.
- Stanovich, K. E., West, R. F., & Toplak, M. E. (2011). The complexity of developmental predictions from dual process models. *Developmental Review*, 31(2–3), 103–118. <http://dx.doi.org/10.1016/j.dr.2011.07.003>.
- Strickland, A. A., Taber, C. S., & Lodge, M. (2011). Motivated reasoning and public opinion. *Journal of Health Politics, Policy and Law*, 36(6), 89–122. <http://dx.doi.org/10.1215/03616878->.
- Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014). Analytic thinking reduces belief in conspiracy theories. *Cognition*, 133(3), 572–585. <http://dx.doi.org/10.1016/j.cognition.2014.08.006>.
- Swire, B., Ecker, U. K. H., & Lewandowsky, S. (2017). The role of familiarity in correcting inaccurate information. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. <http://dx.doi.org/10.1037/xlm0000422>.
- Taub, A. (2017). The Real Story About Fake News Is Partisanship. The New York Times. Retrieved from < <https://www.nytimes.com/2017/01/11/upshot/the-real-story-about-fake-news-is-partisanship.html> > .
- Thomson, K. S., & Oppenheimer, D. M. (2016). Investigating an alternate form of the cognitive reflection test. *Judgment and Decision Making*, 11(1), 99–113.
- Tomlin, D., Rand, D., Ludvig, E., & Cohen, J. (2015). The evolution and devolution of cognitive control: The costs of deliberation in a competitive world. *Scientific Reports*, 5, 11002.
- Toplak, M. E., West, R. F., & Stanovich, K. E. (2014). Assessing miserly information processing: An expansion of the Cognitive Reflection Test. *Thinking & Reasoning*, 20(2), 147–168. <http://dx.doi.org/10.1080/13546783.2013.844729>.
- Toupo, D., Strogatz, S., & Cohen, J. (2015). Evolutionary game dynamics of controlled and automatic decision-making. *Chaos*, 25, 73120. <http://dx.doi.org/10.1063/1.4927488>.
- Trippas, D., Pennycook, G., Verde, M. F., & Handley, S. J. (2015). Better but still biased: Analytic cognitive style and belief bias. *Thinking & Reasoning*, 21, 431–455.
- Van Bavel, J. J., & Pereira, A. (2018). The partisan brain: An identity-based model of political belief. *Trends in Cognitive Sciences*.
- Vosoughi, S., Roy, D., & Aral, S. (2018). The spread of true and false news online. *Science*, 359(6380), 1146–1151. <http://dx.doi.org/10.1126/science.aap9559>.
- Ward, A., Duke, K., Gneezy, A., & Bos, M. W. (2017). Brain drain: The mere presence of one's own smartphone reduces available cognitive capacity. *Journal of the Association of Consumer Research*. <http://dx.doi.org/10.1086/691462>.
- Wickens, T. (2002). *Elementary signal detection theory*. New York, NY: Oxford University Press.
- Yilmaz, O., & Saribay, S. A. (2016). An attempt to clarify the link between cognitive style and political ideology: A non-western replication and extension. *Judgment and Decision Making*, 11(3), 287–300. <http://dx.doi.org/10.1017/CBO9781107415324.004>.
- Yilmaz, O., & Saribay, S. A. (2017a). Analytic thought training promotes liberalism on contextualized (but not stable) political opinions. *Social Psychological and Personality Science*, 8, 789–795. <http://dx.doi.org/10.1177/1948550616687092>.
- Yilmaz, O., & Saribay, S. A. (2017b). The relationship between cognitive style and political orientation depends on the measures used. Retrieved from *Judgment and Decision Making*, 12(2), 140–147. <http://search.proquest.com/docview/1883834797?pq-origsite=gscholar>.