Reliance on emotion promotes belief in fake news

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Abstract

What is the role of emotion in susceptibility to believing fake news? Prior work on the psychology of misinformation has focused primarily on the extent to which reason and deliberation hinder versus help the formation of accurate beliefs. Several studies have suggested that people who engage in more reasoning are less likely to fall for fake news. However, the role of reliance on emotion in belief in fake news remains unclear. To shed light on this issue, we explored the relationship between specific emotions and belief in fake news (Study 1; $N = 409$). We found that across a wide range of specific emotions, heightened emotionality was predictive of increased belief in fake (but not real) news. Then, in Study 2, we measured and manipulated reliance on emotion versus reason across four experiments (total $N = 3884$). We found both correlational and causal evidence that reliance on emotion increases belief in fake news: Self-reported use of emotion was positively associated with belief in fake (but not real) news, and inducing reliance on emotion resulted in greater belief in fake (but not real) news stories compared to a control or to inducing reliance on reason. These results shed light on the unique role that emotional processing may play in susceptibility to fake news.

Keywords: fake news, misinformation, dual-process theory, emotion, reason

Introduction

The 2016 U. S. presidential election and U. K. Brexit vote focused attention on the spread of "fake news" ("fabricated information that mimics news media content in form but not in organizational process or intent"; Lazer et al., 2018, p. 1094) via social media. Although the fabrication of ostensible news events has been around in media such as tabloid magazines since the early 20th century (Lazer et al., 2018), technological advances and the rise of social media provide opportunity for anyone to create a website and publish fake news that might be seen by many thousands (or even millions) of people. Indeed, the spread of misinformation about companies or products can have damaging financial effects. Furthermore, false rumors or conspiracy theories within organizations can disrupt productivity and severely compromise teamwork and cooperation.

The threat of misinformation is perhaps most prevalent and salient within the domain of politics. It is estimated, for example, that within the three months prior to the U. S. election, fake news stories favoring Trump were shared around 30 million times on Facebook, while those favoring Clinton were shared around 8 million times (Allcott & Gentzkow, 2017). Furthermore, a recent analysis suggests that among news stories fact-checked by the website Snopes.com, false stories spread farther, faster, and more broadly on Twitter than true stories, with false political stories reaching more people in a shorter period of time than all other types of false stories (Vosoughi, Roy, & Aral, 2018). These fake news stories are not only spread, but are also often believed to be true (Silverman & Singer-Vine, 2016). And, in fact, merely being exposed to a fake news headline increases later belief in that headline (Pennycook, Cannon, & Rand, 2018).

Thus, it is of substantial importance to develop a deeper understanding of the mechanisms that contribute to belief in – and rejection of – blatantly false information. In

addition to being of scientific interest, such an understanding can also help to guide interventions aimed at combatting incorrect beliefs. Here, we help to address this need by exploring the psychology underlying belief in news stories that are implausible and untrue. In particular, we focus on the role of emotional processing in such (mis)belief.

Motivated cognition versus classical reasoning

From a theoretical perspective, what role might we expect emotion to play? One popular perspective on belief in misinformation, which we will call the *motivated cognition account*, argues that analytic thinking - rather than emotional responses - are primarily to blame (Kahan, 2017). By this account, people reason like lawyers rather than scientists, using their reasoning abilities to protect their identities and ideological commitments rather than to undercover the truth (Kahan, 2013). Thus, our reasoning abilities are hijacked by partisanship, and therefore those who rely more on reasoning are better able to convince themselves of the truth of false stories that align with their ideology. This account is supported by evidence that people who engage in more analytic thinking show more political polarization regarding climate change (Kahan et al., 2012; see also Drummond & Fischhoff, 2017), gun control (Kahan, Peters, Dawson, & Slovic, 2017; see also Ballarini and Sloman, 2017; Kahan and Peters, 2017), and selective exposure to political information (Knobloch-Westerwick, Mothes, & Polavin, 2017).

An alternative perspective, which we will call the *classical reasoning account*, argues that reasoning and analytic thinking do typically help uncover the truth of news content (Pennycook & Rand, 2019a) – and, by extension, that misinformation often succeeds by pushing people to engage with news content in an emotional rather than logical fashion. By this account, emotional responses are less discerning, and thus more likely to promote belief in false content, whereas engaging in reasoning and reflection can help correct these mistakes. The classical

reasoning account fits within the tradition of dual-process theories of judgment, in which analytic thinking is thought to often (but not always) support sound judgment (Evans, 2003; Stanovich, 2005). Recent research supports this account as it relates to fake news by linking the propensity to engage in analytic thinking (rather than relying on "gut feelings") with skepticism about epistemically suspect beliefs (Pennycook, Fugelsang, & Koehler, 2015), such as paranormal and superstitious beliefs (Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012), conspiracy beliefs (Swami, Voracek, Stieger, Tran, & Furnham, 2014), delusions (Bronstein, Pennycook, Bear, Rand, & Cannon, 2019), and pseudo-profound bullshit (Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2015). Of most direct relevance, people who were more willing to think analytically when given a set of reasoning problems were less likely to erroneously believe fake news articles regardless of their partisan alignment (Pennycook & Rand, 2019a), and experimentally manipulating deliberation yields similar results (Bago, Pennycook & Rand, 2020). Moreover, analytic thinking is associated with lower trust in fake news sources (Pennycook & Rand, 2019b). Belief in fake news has also been associated with dogmatism, religious fundamentalism, and reflexive (rather than active/reflective) open-minded thinking (Bronstein et al., 2019; Pennycook & Rand, 2019c). A recent experiment has even shown that encouraging people to think deliberately, rather than intuitively, decreased self-reported likelihood of 'liking' or sharing fake news on social media (Effron & Raj, 2020), as did asking people to judge the accuracy of every headline prior to making a sharing decision (Fazio, 2020), or simply asking for a single accuracy judgment at the outset of the study (Pennycook et al., 2019; Pennycook et al., 2020).

Emotion and engagement with fake news

Regarding the role of emotion per se, emotional arousal has been linked to an increased propensity to spread information (Cotter, 2008; Peters, Kashima, & Clark, 2009). A recent study

showed that online political news articles with moral-emotional language were more likely to be

shared (Brady, Wills, Jost, Tucker, & Van Bavel, 2017), at least in part because moral-emotional

language is more attention-grabbing (Brady, Gantman, & Van Bavel, 2019). Likewise, social

media sites may favor emotionally provocative, 'supernormal' stimuli which are more likely to

go viral and generate revenue (Crockett, 2017). Indeed, much purposeful misinformation (i.e.

disinformation) is designed to be emotionally arousing and stimulating. A recent analysis

suggests that what most effectively differentiates fake news from other forms of content is its use

of emotional targeting (Bakir & McStay, 2018). Emotional reactivity to fake news has also been

proposed as an explanation for why fake news stories are spread faster and further than real news

stories (Vosoughi, Roy, & Aral, 2018). These observations fit with the classical reasoning

account, as emotionally inflammatory content may induce people to engage in fast, intuitive

thinking and forgo using analytic reasoning, thus increasing spread of fake news.

In addition to exploring the role of emotion in the dissemination of fake news, it is also

important to assess the impact of emotion on belief in fake news. Faith in intuition has been

associated with belief in conspiracy theories and falsehoods in science and politics (Garrett &

Weeks, 2017). One concrete example of this phenomenon is the effective use of emotional

storytelling to encourage belief in anti-vaccine information (Shelby & Ernst, 2013). Indeed, news

consumers may utilize an affect heuristic when evaluating online content, and consequently their

beliefs and preferences would be highly susceptible to emotional, often rapidly presented,

content (Slovic, Finucane, Peters, & MacGregor, 2007; Sivek, 2018). Current educational

programs aimed at promoting news literacy even encourage individuals to actively consider the

emotions induced by news stories – although, these same guides do not address how to combat

the effects of such emotions in assessing the veracity of news content beyond acknowledging

overly emotional language as a "red flag" (Sivek, 2018). Furthermore, analyses of the structure and content of fake news articles have suggested that fake news is designed to promote belief via the use of heuristics and simple claims, rather than through informative arguments (Horne & Adali, 2017). This suggests that individuals relying primarily on their intuitions are perhaps most susceptible towards believing emotionally-laden fake news stories.

Notably, different emotions have been suggested to differentially impact social judgment in general, as well as perceptions of political fake news in particular. An extensive literature assesses the differential impact of specific emotions on cognition and decision-making (e.g., Appraisal-Tendency Framework; Lerner & Keltner, 2001; Feelings-as-information theory; Schwarz, 2011). For instance, Bodenhausen and colleagues (1994) found that anger elicits greater reliance upon heuristic cues in a persuasion paradigm, whereas sadness promotes an opposite, decreased reliance on heuristic cues. More specifically within the domain of political fake news, anger has been suggested to promote politically-aligned motivated belief in misinformation, whereas anxiety has been posited to increase belief in politically discordant fake news due to increased general feelings of doubt (Weeks, 2015). In other words, anger may promote biased, intuitive motivated reasoning, whereas anxiety may encourage increased acceptance of any available information (MacKuen, Wolak, Keele, & Marcus, 2010; Valentino, Hutchings, Banks, & Davis, 2008). These hypotheses suggest that specific emotions may elicit distinct, dissociable effects on news accuracy perception. In contrast, the classical reasoning account simply predicts that heightened emotion of any kind may disrupt analytic thinking and therefore should increase belief in fake news (and, consequently, decrease people's ability to discern between fake and real news).

Current research

We aim to add to the current state of knowledge regarding belief in fake news in three main ways. First, very little previous work has looked at the effects of experiencing specific emotions on belief in fake news. Doing so will help us determine whether the potential effect(s) of emotion on fake news belief is isolated to a few specific emotions (presumably for a few idiosyncratic reasons), or rather if it is appropriate to apply a broader dual-process framework where emotion and reason are differentially responsible for the broad phenomenon of falling for fake news.

Second, much prior work on fake news has focused almost exclusively on reasoning, rather than investigating the role of emotional processing per se. In other words, prior research has treated the extent of reason and emotion as unidimensional, such that any increase in use of reason necessarily implies a decrease in use of emotion, and vice-versa. In contrast, both emotion and reason may complimentarily aid in the formation of beliefs (Mercer, 2010). The current study addresses this issue by separately modulating the use of reason and use of emotion. This, as well as the inclusion of a baseline condition in our experimental design, allows us to ask whether belief in fake news is more likely to be the result of merely failing to engage in reasoning rather than being specifically promoted by reliance on emotion. Furthermore, it allows for differentiable assessments regarding use of reason and use of emotion, rather than treating reason and emotion simply as two directions on the same continuum.

Third, prior work has been almost entirely correlational, comparing people who are predisposed to engage in more versus less reasoning. Therefore, it remains unclear whether there is a causal impact of reasoning on resistance to fake news – and/or a causal effect of emotion on susceptibility to fake news. In the current research, we address this issue by experimentally manipulating reliance on emotion versus reason when judging the veracity of news headlines.

Study 1

Methods

Materials and procedure.

In this exploratory study, $N = 409$ participants (227 female, $M_{age} = 35.18$) were recruited

via Amazon Mechanical Turk.[1] We did not have a sense of our expected effect size prior to this

study. However, we *a priori* committed to our sample size (as indicated in our pre-registration;

https://osf.io/gm4dp/?view_only=3b3754d7086d469cb421beb4c6659556) with the goal of

maximizing power within our budgetary constraints. Participants first completed demographics

questions, including age, sex, and political preferences. Next, participants completed the 20-item

Positive and Negative Affect Schedule scale (PANAS; Watson, Clark, & Tellegen, 1988). For

each item, participants were asked "To what extent do you feel [item-specific emotion] at this

moment?" Likert-scale: 1 = *Very slightly or not at all*, 2 = *A little*, 3 = *Moderately*, 4 = *Quite a*

bit, 5 = *Extremely*.

After completing this measure, participants were presented with a series of 20 actual

headlines that appeared on social media, half of which were factually accurate (*real news*) and

half of which were entirely untrue (*fake news*); Furthermore, half of the headlines were favorable

to the Democratic Party and half were favorable to the Republican Party (based on ratings

collected in a pre-test, described in Pennycook & Rand, 2019a). All fake news headlines were

taken from Snopes.com, a well-known fact-checking website. Real news headlines were selected

from mainstream news sources (e.g., NPR, The Washington Post) and selected to be roughly

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[1] Here we conduct an exploratory analysis of data from a study originally designed to investigate the effects of political echo chambers on belief in fake news. For simplicity, we focus on the results of participants who were randomly assigned to the control condition of this study in which participants saw a politically balanced set of headlines (although the results are virtually identical when including subjects from the other conditions, in which most headlines were either favorable to the Democrats or the Republicans).

contemporary to 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 (see

Figure 1).

FBI Agent Suspected in Hillary Email Leaks Found Dead in Apparent Murder-Suicide

Walkerville, MD – An FBI agent believed to be responsible for the latest email leaks "pertinent to the investigation" into Hillary Clinton's private email server while she was...

ENABON.COM

Figure 1. *Example article with picture, headline, byline, & source.*

Our news items are available online

(https://osf.io/gm4dp/?view_only=3b3754d7086d469cb421beb4c6659556). For each headline,

participants were asked: "To the best of your knowledge, how accurate is the claim in the above

headline" using a 4-point Likert-scale: 1 = *Not at all accurate,* 2 = *Not very accurate,* 3 =

Somewhat accurate, 4 = *Very accurate*.

Results

Across emotions, greater emotionality predicts increased belief in fake news and decreased truth discernment. In our first analysis, we assessed the relationship between emotionality and perceived accuracy of real and fake news. We used the R packages *lme4* (Bates, Maechler, Bolker, & Walker, 2015), *lmerTest* (Kuznetsova, Brockhoff, & Christensen, 2017), and *arm* (Gelman & Su, 2018) to perform linear mixed effects analyses of the relationship between perceived accuracy, specific emotions measured by the PANAS, and type of news headline (fake, real). A mixed effects model allows us to account for the interdependency between observations due to by-participant and by-item variation. As fixed effects, we entered into the model the PANAS score for the item of interest, type of news headline, and an interaction between the two terms. As random effects, we had intercepts for headline items and participants, as well as by-item random slopes for the effect of the PANAS emotion-item rating and by-participant random slopes for the effect of type of news headline. The reference level for type of news headline was 'fake'. Since there were 20 emotions assessed by the PANAS, we performed 20 linear mixed effects analyses. To further demonstrate the generalizability of our results across emotions, we also performed two additional linear mixed effects analyses with aggregated PANAS scores for negative and positive emotions, which were calculated via a varimax rotation on a 2-factor analysis of the 20 PANAS items. The beta coefficients for the interaction between emotion and news type are reported as 'Discernment' (i.e., the difference between real and fake news, with a larger coefficient indicating higher overall accuracy in media truth discernment), and the betas for real news were calculated via joint significance tests (i.e., F-tests of overall significance). Our results are summarized in Table 1.

Table 1. *Results of linear mixed effects analyses for each emotion measured by the PANAS scale.*

	Interested	Distressed	Excited	Upset	Strong	Guilty	Scared
Fake	0.05*	0.12***	0.15***	0.12***	0.10***	0.09***	0.16***
Real	0.03	0.003	0.004	0.01	-0.01	-0.02	-0.02
Discernment	-0.02	-0.12***	-0.14***	-0.11***	-0.11***	-0.10***	-0.18***

	Hostile	Enthusiastic	Proud	Irritable	Alert	Ashamed	Inspired
Fake	0.15***	0.13***	0.12***	0.11***	0.05*	0.12***	0.16***
Real	-0.01	0.01	-0.03	0.001	0.05*	-0.03	-0.0001
Discernment	-0.17***	-0.12***	-0.15***	-0.11***	-0.01	-0.15***	-0.16***

	Nervous	Determined	Attentive	Jittery	Active	Afraid	Positive	Negative
Fake	0.10***	0.07**	0.02	0.11***	0.11***	0.14***	0.14***	0.17***
Real	-0.01	0.01	0.04*	-0.01	0.01	-0.02	0.01	-0.02
Discernment	-0.11***	-0.06	0.03	-0.12***	-0.10**	-0.15***	-0.13***	-0.19***

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

Overall, our results indicate that for nearly every emotion evaluated by the PANAS scale, increased emotionality is associated with increased belief in fake news. Furthermore, we also find that nearly every emotion also has a significant interaction with type of news headline, such that greater emotionality also predicts decreased discernment between real and fake news. Indeed, the only emotions for which we do not see these effects are 'interested', 'alert', 'determined', and 'attentive', which arguably are all more closely associated with analytic thinking rather than emotionality per se. Our results also suggest that the relationship between emotion and news accuracy judgments appear to be specific to fake news – for every emotion except 'attentive' and 'alert', there is no significant relationship with real news belief.

Like the majority of our 20 previous linear mixed effects models, Figure 2 shows that both positive and negative emotion are associated with higher accuracy ratings for fake headlines, and that this relationship does not exist as clearly for real headlines.
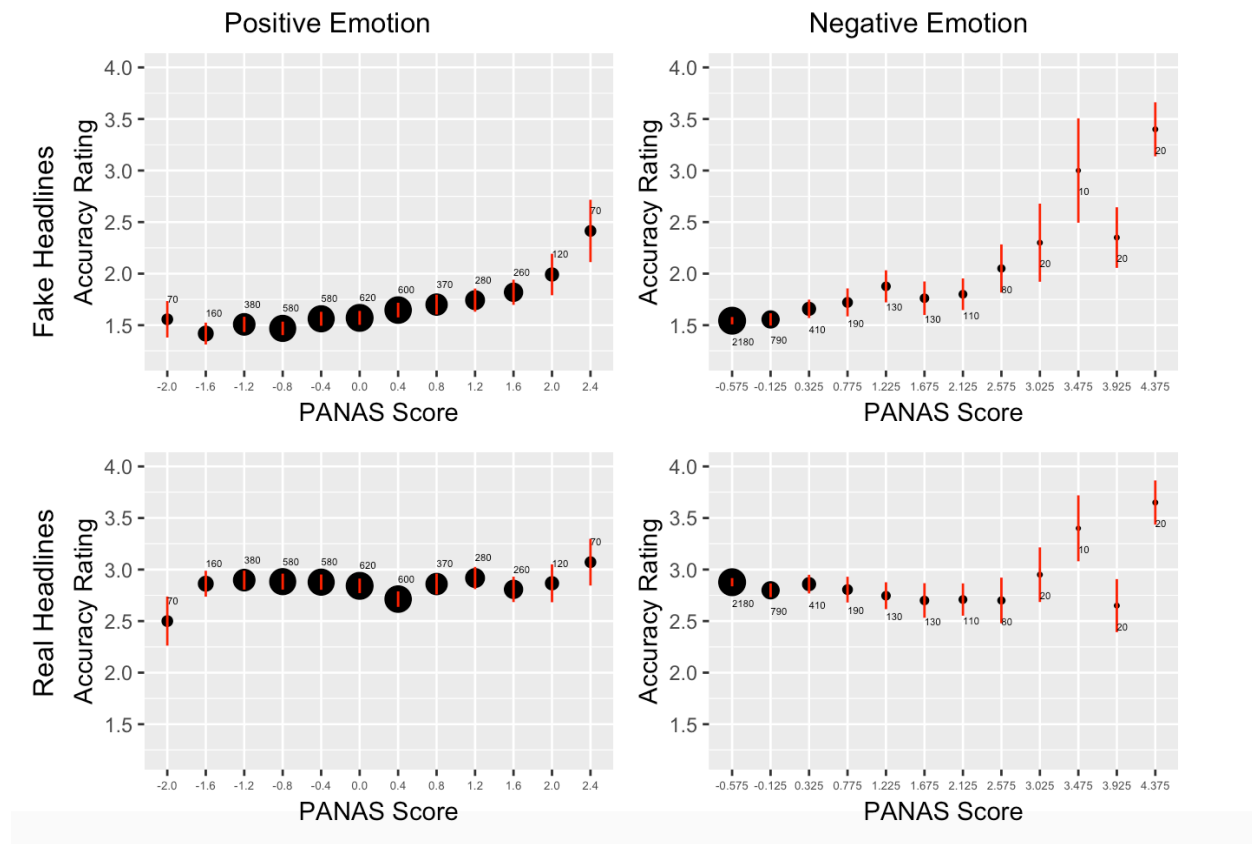
Figure 2. *Plotting reported news headline accuracy as a function of aggregated positive or negative PANAS score shows a positive relationship between both positive and negative emotion and belief in fake news. This relationship is not as evident for belief in real news. Dot size is proportional to the number of observations (i.e., a specific participant viewing a specific headline). Error bars, mean ± 95% confidence intervals.*

Interactions with headline political concordance. Some prior work has argued that there may be an interaction between specific types of emotions and political concordance of news when assessing belief in fake news (e.g., Weeks, 2015). Therefore, we next performed multiple linear mixed effects analyses of the relationship between specific emotions, type of news headline, participant's partisanship (z-scored; continuous Democrat v.s. Republican), and headline political concordance (z-scored; concordant [participant & headline partisanship align], discordant [participant & headline partisanship oppose]), allowing for interactions between all

items. Our maximal linear mixed model failed to converge, so we followed the guidelines for

how to achieve convergence in Brauer and Curtin (2018), and removed the by-unit random

slopes for within-unit predictors and lower-order interactions, leaving the by-unit random slopes

for the highest order interactions (see also: Barr, 2013). This left us with by-item random slopes

for the interaction between PANAS emotion, concordance, and political party, and by-participant

random slopes for the interaction between type of headline and concordance. We again assessed

how each emotion was associated with belief in fake news and real news, as well as the

interaction between news type and emotion. Furthermore, we also assessed the interaction

between emotion and concordance for fake news, as well as the three-way interaction between

news type, emotion, and political concordance (reported as 'Discernment x Concordant'). Our

key results are summarized in Table 2.

Table 2. *Results of linear mixed effects analyses for each emotion measured by the PANAS scale, plus interaction with headline political concordance.*

	Interested	Distressed	Excited	Upset	Strong	Guilty	Scared
Fake	0.05*	0.12***	0.14***	0.12***	0.10***	0.09***	0.16***
Real	0.03	-0.003	0.01	0.01	-0.001	-0.02	-0.02
Discernment	-0.02	-0.13***	-0.13***	-0.11***	-0.10***	-0.10***	-0.18***
Fake x Concordant	0.02	-0.03**	-0.02	-0.03*	0.001	-0.03*	-0.04**
Discernment x Concordant	-0.01	0.001	0.003	0.01	0.02	0.01	0.002

	Hostile	Enthusiastic	Proud	Irritable	Alert	Ashamed	Inspired
Fake	0.15***	0.13***	0.11***	0.11***	0.05**	0.13***	0.14***
Real	-0.01	0.02	-0.02	-0.004	0.05**	-0.02	0.004
Discernment	-0.16***	-0.11***	-0.13***	-0.11***	-0.001	-0.15***	-0.14***
Fake x Concordant	-0.03*	-0.02	-0.03*	-0.03*	0.003	-0.04**	-0.01
Discernment x Concordant	0.01	0.0003	0.03	0.01	0.001	0.004	-0.005

	Nervous	Determined	Attentive	Jittery	Active	Afraid	Positive	Negative
Fake	0.10***	0.05*	0.02	0.12***	0.11***	0.13***	0.13***	0.17***
Real	-0.01	0.02	0.04*	-0.01	0.01	-0.02	0.02	-0.01
Discernment	-0.11***	-0.04	0.02	-0.13***	-0.09***	-0.16***	-0.12***	-0.19***
Fake x Concordant	-0.03*	0.02	-0.01	-0.02	-0.01	-0.02	-0.01	-0.04**
Discernment x Concordant	-0.002	-0.002	0.01	0.02	0.01	-0.01	0.01	0.01

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

As in our prior models, we again find that for nearly all of the emotions assessed by the PANAS, greater emotionality is associated with heightened belief in fake news and decreased discernment between real and fake news. Emotion also appears to selectively affect fake news judgment, and is unrelated to belief in real news. Looking at the interaction between emotion and concordance, our results are less consistent: some emotions significantly interact with concordance, though these coefficients are relatively small compared to the interaction with type of news. Our results also suggest that there is a significant interaction between negative emotion and concordance, but not between positive emotion and concordance, indicating that there is

some specificity of effects of emotion on belief in fake news. However, there do not appear to be differences between emotions hypothesized to have differentiable effects on belief in fake news. For example, emotions such as 'hostile' and 'nervous' similarly interact with political concordance. This finding is in contrast with those of Weeks (2015), who suggests that anger selectively heightens belief in politically concordant fake news, while anxiety increases belief in politically discordant fake news. Rather, our results instead tentatively suggest that emotion in general heightens belief in fake news, and that different emotions do not necessarily interact with political concordance in a meaningful way. Furthermore, across all emotions, there are no significant three-way interactions between news type, emotion, and political concordance, suggesting that political concordance does not interact with the relationship between emotion and discernment.

A potential limitation of Study 1 is that our results could be in part driven by floor effects, such that participants with higher PANAS scores are simply less attentive, and these inattentive participants are those performing worse on discriminating between real and fake news. However, this alternative explanation does not account for our findings that certain emotions more associated with deliberation rather than emotionality (e.g., interested, alert, attentive) are not associated with decreased discernment between real and fake news. This demonstrates that our correlational findings are specific to a distinct set of emotions assessed by the PANAS, thus alleviating some concerns of floor effects driving our results.

Taken together, the results from Study 1 suggest that emotion in general, regardless of the specific type of emotion, predicts increased belief in fake news. Furthermore, nearly every type of emotion measured by the PANAS also appears to have a significant interaction with type of news, indicating an effect of emotion on differentiating real from fake news. Therefore, in Study

2, we causally assess the role of emotion in fake news perception using a dual-process framework - in which reliance on emotion in general is contrasted with reliance on reason - rather than by differentially assessing various roles of specific emotions.

Study 2

Methods

Materials and procedure.

Our results from Study 1 suggested that heightened emotion in general was predictive of increased belief in fake news. In order to further assess the relationship between emotion and fake news belief, Study 2 analyzes a total of four experiments that shared a virtually identical experimental design in which reliance on reason versus emotion was experimentally manipulated using an induction prompt from Levine, Barasch, Rand, Berman, and Small (2018). The general procedure across all four experiments was as follows. Participants were randomly assigned to one of three conditions: a reason induction ("Many people believe that reason leads to good decision-making. When we use logic, rather than feelings, we make rationally satisfying decisions. Please assess the news headlines by relying on reason, rather than emotion."), an emotion induction ("Many people believe that emotion leads to good decision-making. When we use feelings, rather than logic, we make emotionally satisfying decisions. Please assess the news headlines by relying on emotion, rather than reason."), or a control induction (with the exception of Study 1, which had no control condition; participants in all three conditions first read "You will be presented with a series of actual news headlines from 2017-2018. We are interested in your opinion about whether the headlines are accurate or not."). After reading the induction prompt, participants were presented with a series of actual headlines that appeared on social media, some of which were factually accurate (*real news*) and some of which were entirely

untrue (*fake news*); and some of which were favorable to the Democratic party and some of

which were favorable to the Republican party (based on ratings collected in a pre-test, described

in Pennycook & Rand, 2019a). Fake and real news headlines were selected via a process

identical to that described in Study 1. Our news items are available online

(https://osf.io/gm4dp/?view_only=3b3754d7086d469cb421beb4c6659556). For each headline,

real or fake, perceived accuracy was assessed. Participants were asked: "How accurate is the

claim in the above headline?". Likert-scale: 1 = *Definitely false,* 2 = *Probably false,* 3 = *Possibly*

false, 4 = *Possibly true,* 5 = *Probably true*, 6 = *Definitely true*.

After rating the headlines, participants completed various post-experimental

questionnaires. Most relevant for the current paper, participants were asked if they preferred that

Donald Trump or Hillary Clinton was the President of the United States[2]. Pro-Democratic

headlines rated by Clinton supporters and Pro-Republican headlines rated by Trump supporters

were classified as politically concordant headlines; whereas Pro-Republican headlines rated by

Clinton supporters and Pro-Democratic headlines rated by Trump supporters were classified as

politically discordant headlines.

Participants also completed a free-response manipulation check, in which they were

asked the question: "At the beginning of the survey, you were asked to respond using your __",

with words related to 'emotion' or 'intuition' being scored as accurate for the emotion induction

condition and words relating to 'reason' or 'logic' being scored as accurate for the reason

induction condition. Participants were also asked: "At the beginning of the survey, you were

asked to respond using your:" 1 = *Emotion*, 2 = *Reason*.

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[2] We used Clinton versus Trump because the first experiment was completed in April, 2017 – which was shortly
after the inauguration. This question was then used in all subsequent experiments to retain consistency.

Participants in experiments 2 through 4 further completed several questions asking about the extent to which they used reason or emotion. Participants were asked: "Please indicate the extent to which you used emotion/feelings when judging the accuracy of the news headlines?" and "Please indicate the extent to which you used reason/logic when judging the accuracy of the news headlines?". Likert-scale: 1 = *None at all*, 2 = *A little*, 3 = *A moderate amount*, 4 = *A lot*, 5 = *A great deal*.

Participants also completed several other measures (a shortened version of the actively open-minded thinking scale; Stanovich & West, 2007; a reworded version of the original CRT; Frederick, 2005; Shenhav, Rand, & Greene, 2012; and a four-item non-numeric CRT; Thomson & Oppenheimer, 2016) and standard demographics (e.g., age, sex, education), but we do not analyze them here. See Table 3 for further details on each experiment's participants, design, and procedures.

Table 3. *Description of participants, methods, and measures for each experiment.*

	Experiment 1	**Experiment 2**	**Experiment 3**	**Experiment 4**
Participants	472 from Amazon Mechanical Turk (M_{age} = 35.12, 243 female)	1108 from Amazon Mechanical Turk (M_{age} = 35.19, 618 female)	1129 from Amazon Mechanical Turk (M_{age} = 34.40, 645 female)	1175 from Lucid (M_{age} = 45.46, 606 female)
Conditions	Emotion Induction; Reason Induction	Emotion Induction; Reason Induction; Control	Emotion Induction; Reason Induction; Control	Emotion Induction; Reason Induction; Control

News headlines	6 Fake Headlines (half Democrat-consistent, half Republican-consistent)	6 Fake, 6 Real Headlines (half Democrat-consistent, half Republican-consistent)	5 Fake, 5 Real Headlines (all politically concordant based on force-choice Trump versus Clinton question)	6 Fake, 6 Real Headlines (half Democrat-consistent, half Republican-consistent)
Scale questions on use of reason/emotion (Likert: 1-5)	Not included	Included	Included	Included

We completed preregistrations of sample size, experimental design, and analyses for each

experiment (available online

https://osf.io/gm4dp/?view_only=3b3754d7086d469cb421beb4c6659556). We again did not

have a sense of our expected effect sizes prior to running these studies. However, we *a priori*

committed to our sample size (as indicated in our pre-registrations) with the goal of maximizing

power within our budgetary constraints. Additionally, our sample sizes are quite large relative to

typical sample sizes in this field.

Furthermore, it subsequently came to our attention that the subject-level analysis

approach proposed in all the preregistrations – calculating each subject's average accuracy rating

for each type of headline, and performing an ANOVA predicting these subject-level averages

based on condition and headline type – is problematic and may introduce bias (Judd, Westfall, &

Kenny, 2012). Thus, we do not follow our preregistered analyses, and instead follow the

guidelines of Judd et al. by conducting rating-level analyses using linear mixed effects models

with crossed random effects for subject and headline. Furthermore, since all four experiments

had essentially identical designs, we aggregate the data from each experiment, and nest subject

within experiment in our random effects. Thus, none of the analyses reported in this paper were preregistered.

Results

Correlational results

Greater reliance on reason relative to emotion predicts greater truth discernment. Before assessing the results of our causal manipulation, we examined the correlational relationship between self-reported use of reason, use of emotion, and headline accuracy ratings from the control conditions across experiments 2 through 4 ($N = 1089$). We start by investigating the *relative* use of reason versus emotion, and then (as argued above) treat reason and emotion as separate continua and investigate their unique roles in fake/real news belief.

We first calculated relative use of reason as a difference score of self-reported use of reason minus self-reported use of emotion. We then performed a linear mixed effects analysis of the relationship between perceived accuracy, relative use of reason versus emotion, and type of news headline (fake, real). Experiment (i.e., 'study') was also included in the model as a categorical covariate. As fixed effects, we entered into the model relative use of reason, type of news headline, an interaction between the two terms, and study. As random effects, we had intercepts for headline items and participants nested by study, as well as by-item random slopes for the effect of relative use of reason and by-nested participant random slopes for the effect of type of news headline. The reference level for type of news headline was 'fake'. Consistent with the classical account, we found that participants who self-reported greater relative use of reason rated fake news as less accurate, $b = -0.17$, $SE = 0.02$, $t(67.14) = -7.34$, $p < .001$. There was also a significant interaction between relative use of reason and type of news headline, $b = 0.20$, $SE = 0.03$, $t(48.66) = 6.65$, $p < .001$, such that there was no effect of relative use of reason on

perception of real headlines, $b = .02$, $F(1, 52.94) = 1.29$, $p = .260$. Thus, we found that participants who self-reported greater relative use of reason exhibited better discernment between news types. All study dummies were non-significant (p's > .05).

Unique relationships with use of emotion versus reason. We next ran a linear mixed effects analysis similar to the aforementioned model, except replacing relative use of reason with either self-reported use of emotion or self-reported use of reason. Considering use of emotion, we found that participants who reported greater use of emotion rated fake news headlines as more accurate, $b = 0.26$, $SE = 0.03$, $t(48.14) = 8.08$, $p < .001$. We also found a significant interaction between use of emotion and type of news headline, $b = -0.22$, $SE = 0.04$, $t(38.33) = -5.24$, $p < .001$, such that there was no effect of use of emotion on perceptions of real headlines, $b = .04$, $F(1, 40.39) = 2.29$, $p = .138$. Study dummies were again non-significant (p's > .05).

Considering use of reason, conversely, we found no significant relationship between use of reason and accuracy ratings of fake news, $p > .05$. There was, however, still a significant interaction between use of reason and type of news, $b = 0.17$, $SE = 0.04$, $t(78.82) = 4.27$, $p < .001$, because use of reason was positively associated with perceived accuracy of real headlines, $b = .22$, $F(1, 77.23) = 20.94$, $p < .001$. Study dummies were again non-significant (p's > .05). This evidence suggests that use of emotion may be uniquely linked to belief in false content whereas use of reason is uniquely linked to belief in true content. Figure 3 visually summarizes the results of our analyses – use of emotion is positively associated with belief in fake news but not real news, and use of reason is positively associated with belief in real news but is unrelated to belief in fake news.
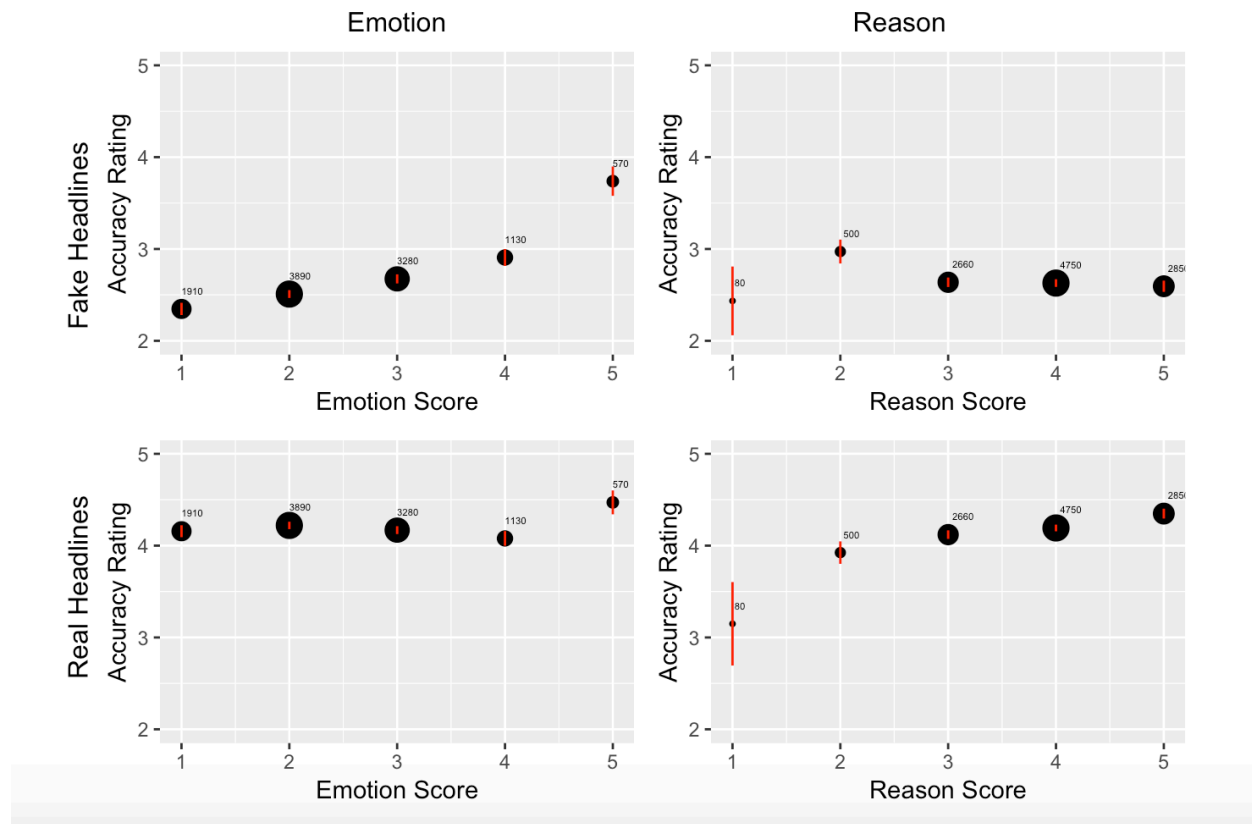
Figure 3. *Plotting reported news headline accuracy as a function of use of emotion or use of reason shows a positive relationship between emotion and belief in fake news, and a positive association between reason and belief in real news. Dot size is proportional to the number of observations (i.e., a specific participant viewing a specific headline). Error bars, mean ± 95% confidence intervals.*

Interactions with participant partisanship and headline political concordance. We then performed a linear mixed effects analysis of the relationship between relative use of reason, type of news headline, participant's partisanship (Clinton supporter, Trump supporter), and headline political concordance (concordant, discordant), allowing for interactions between all terms. Study was added as a covariate, without interactions. Our maximal linear mixed model failed to converge, so we followed the guidelines for how to achieve convergence in Brauer and Curtin (2018), and removed the by-unit random slopes for within-unit predictors and lower-order interactions, while leaving the by-unit random slopes for the highest order interactions (also see

Barr, 2013). As a result, our random effects included intercepts for headline items and participants nested by study, by-item random slopes for the three-way interaction between relative use of reason, concordance, and partisanship, and by-nested participant random slopes for the interaction between type of headline and concordance. The reference levels were 'fake' for news type, 'Clinton' for partisanship, and 'discordant' for concordance. As in our model without partisanship and concordance, we found that relative use of reason was negatively associated with perceived accuracy of fake stories ($p < .001$) and had a significant interaction with type of headline ($p < .001$), such that there was no relationship between relative use of reason and real news perception, $b = .01$, $F(1, 114.61) = 0.12$, $p = .730$. We found no effect of study (p's $> .05$).

Our model also suggested a significant interaction between relative use of reason and concordance, $b = 0.11$, $SE = 0.02$, $t(10,240) = 4.41$, $p < .001$. The motivated account of fake news would predict that higher relative reasoners perceive concordant fake news as more accurate as compared to lower relative reasoners. However, we found the opposite: for concordant fake news headlines, relative use of reason was associated with decreased accuracy ratings, $b = -.09$, $F(1, 609.63) = 9.72$, $p = .002$. Both accounts would predict higher relative reasoners to perceive concordant real news as more accurate. We found that relative use of reason had a marginally significant positive associated with accuracy ratings of concordant real news headlines, $b = .05$, $F(1, 600.57) = 3.08$, $p = .080$.

Our model also revealed a three-way interaction between relative use of reason, type of news, and partisanship, $b = -0.04$, $SE = 0.02$, $t(5,200) = -2.58$, $p = .010$. For both Clinton and Trump supporters, relative use of reason was negatively associated with perceived accuracy of fake headlines ($b = -.20$ for both). The relationship between relative use of reason and perceived

accuracy of real headlines, however, differed slightly based on partisanship: for Clinton supporters the relationship was (barely) positive, $b = .01$, whereas for Trump supporters the relationship was somewhat negative, $b = -.04$. However, neither of the latter two effects were themselves significant ($p > .1$ for both), thus we do not think that this three-way interaction is particularly meaningful.

Experimental Manipulation Results

Manipulation check of causal manipulation. A brief manipulation check reveals that across all four experiments, participants reported greatest use of emotion in the emotion condition ($M = 3.47$), followed by in the control condition ($M = 2.50$) and the reason condition ($M = 2.06$), $F(2, 3386) = 479.80$, $p < .001$. Similarly, participants reported greatest use of reason in the reason condition ($M = 4.14$), followed by in the control condition ($M = 3.90$) and the emotion condition ($M = 2.91$), $F(2, 3395) = 479.20$, $p < .001$. Follow-up pairwise Tukey tests revealed significant differences between all conditions for both use of emotion and reason, p's < .001.

Participants also reported greatest relative use of reason in the reason condition ($M = 2.08$), followed by the control condition ($M = 1.41$), and finally the emotion condition ($M = -0.56$), $F(2, 3372) = 748.60$, $p < .001$. These results suggest that (1) participants used relatively more emotion than reason in the emotion condition, (2) participants used relatively more reason than emotion in the reason and control conditions (based on self-report), and (3) the self-reported relative use of reason in the control condition was more similar to that of the reason condition than the emotion condition – suggesting that the manipulation was more successful at shifting people who typically rely on reason towards emotion than vice versa.

Manipulation effect on news accuracy perceptions. We next examined whether there was a condition effect on the perceived accuracy of fake and real news across all four experiments. We performed a linear mixed effects analysis of the relationship between perceived news accuracy, experimental condition (emotion, control, reason), and type of news headline. As fixed effects, we entered condition and type of news headline, with an interaction term. We also added study as a covariate. As random effects, we included intercepts for headline items and participants nested by study, and we also included by-item random slopes for condition and by-nested participant random slopes for type of news headline. The reference level for condition was 'emotion' and the reference level for type of news headline was 'fake'. The results of this analysis are shown in Table 4 (with 'study' variables omitted – there was no effect of study, all *p*'s > .05).

Table 4. *Results of linear mixed effects analysis of accuracy by condition and type of news article.*

	beta	*SE*	*df*	*|t|*	*p*
Intercept	2.32	1.69	0.0002	1.37	.999
Control (condition)	-0.12	0.04	140.20	-3.01	.003
Reason (condition)	-0.09	0.04	102.60	-2.23	.028
Real (headline truth)	1.21	0.14	38.00	8.36	< .001
Control : Real	0.10	0.05	75.99	2.01	.048
Reason : Real	0.11	0.05	61.77	2.20	.031

A joint significance test revealed a significant effect of condition on fake news accuracy judgments, $F(2, 186.54) = 4.72$, $p = .010$[3]. From our model, we see that fake news headlines

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[3] Degrees of freedom calculated via joint significant tests within the lmer R package are computed using the Kenward-Roger degrees of freedom approximation – hence why the denominator degrees of freedom in our joint significance tests tend not to be integers.

were reported as significantly more accurate in the emotion condition as compared to the control condition (p = .003) and the reason condition (p = .028), respectively.
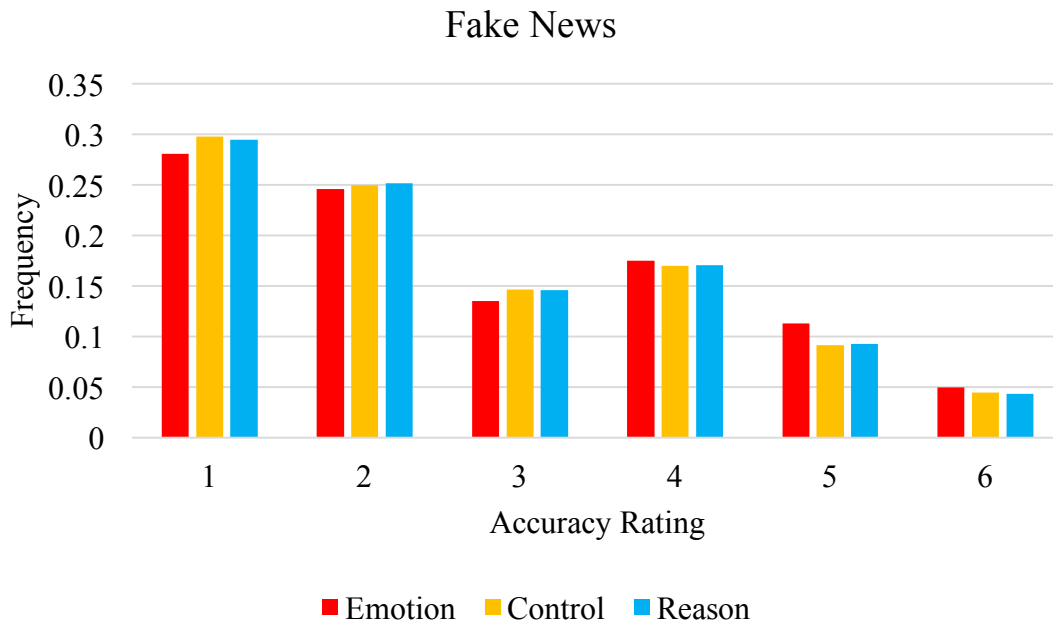
Fake News

Figure 4. *Higher accuracy ratings were more frequently given to fake news headlines in the emotion condition, as compared to the control and reason conditions.*

Figure 4 shows that participants in the emotion condition more frequently assigned higher accuracy ratings to fake stories, whereas participants in the control and reason conditions more frequently assigned low accuracy ratings to fake stories.

In contrast, a joint significance test of condition on real news accuracy perception did not show a significant effect, $F(2, 114.42) = 1.18$, $p = .312$. In other words, there was no effect of thinking mode on real news accuracy perception (see Figure 5).
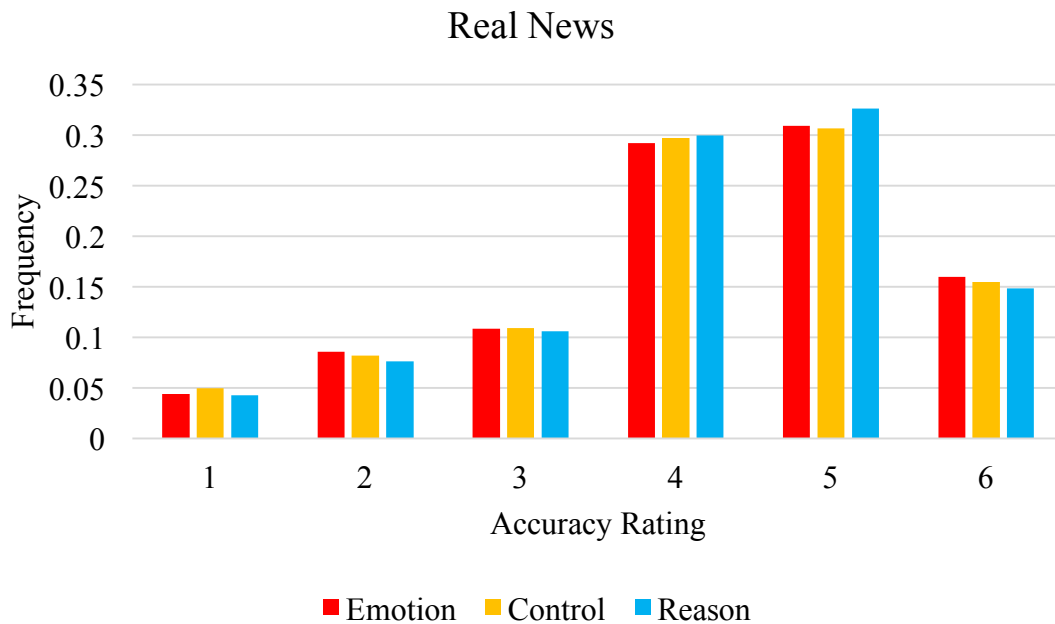
Figure 5. *All three conditions produce similar accuracy ratings of real news stories.*

We next performed a joint significance test of the interaction between condition and news type. This revealed a marginally significant interaction, $F(2, 112.60) = 2.75$, $p = .069$. The coefficients of our model show that media truth discernment, as indicated by the interaction between condition and news type, is significantly greater in the control condition than in the emotion condition ($p = .048$), and also significantly greater in the reason condition than in the emotion condition ($p = .031$), but did not significantly differ between the reason condition and the control condition ($p = .821$) – hence the larger p-value for the joint significance test. Therefore, it appears that there is a marginal effect of condition on media truth discernment, such that discernment is worst in the emotion condition, and comparatively better in both the control and reason conditions. This suggests that inducing emotional, intuitive thinking may hinder the ability to discern fake from real news.

Interactions with participant partisanship and headline concordance. We next performed a linear mixed effects analysis including partisanship and political concordance. Our maximal linear mixed model failed to converge, so we followed the guidelines for how to achieve convergence in Brauer & Curtin (2018). Ultimately, the only model that would converge was a model with random intercepts but without random slopes, which does inflate Type I error rate (Barr, 2013). Our fixed effects included condition, real, concordance, and partisanship, allowing for all interactions. Study was included as a covariate without interactions. Our random effects included intercepts for headline items and participants nested by study. The reference levels were 'fake' for news type, 'Clinton' for partisanship, and 'discordant' for concordance.

According to the motivated account, there should be an interaction between condition and concordance, such that fake concordant headlines have higher perceived accuracy in the reason condition than the emotion condition, and fake discordant headlines have lower perceived accuracy in the reason condition than the emotion condition. However, a joint significance test of the interaction between condition and concordance revealed a non-significant interaction, $F(2, 39081.07) = 1.09$, $p = .335$. A joint significant test of the three-way interaction between condition, concordance, and type of news headline also yielded non-significant results, $F(2, 36302.32) = 0.45$, $p = .636$.

However, there was joint significance for the three-way interaction between condition, type of news, and partisanship, $F(2, 36946.68) = 4.24$, $p = .014$. For Clinton supporters, discernment in the emotion condition was comparatively lower ($M = 1.73$) than discernment in either the control condition ($M = 1.86$) or reason condition ($M = 1.81$). However, for Trump supporters, discernment scores in the emotion ($M = 1.11$) and control ($M = 1.12$) conditions were lower than in the reason condition ($M = 1.26$). (None of these differences were statistically

significant, perhaps due to the reduction in sample size – and thus power – arising from subsetting on partisanship). In other words, in the control condition, Clinton supporters exhibit media truth discernment capabilities more similar to the reason condition, whereas Trump supporters exhibit media truth discernment more similar to the emotion condition.

A joint significant test also revealed a significant three-way interaction between condition, concordance, and partisanship, $F(2, 39042.94) = 5.52$, $p = .004$. This three-way interaction was such that Clinton supporters nominally, though not significantly, perceived concordant fake headlines as most accurate in the emotion condition ($M = 2.88$) and as less accurate in both the control and reason conditions (M's $= 2.76$), while Trump supporters perceived concordant fake headlines as nominally most accurate in both the emotion ($M = 3.16$) and reason ($M = 3.15$) conditions, and as least accurate in the control condition ($M = 3.05$). Interestingly, this pattern also emerged in Clinton supporters' perceptions of discordant fake headlines, with higher accuracy perceptions in the emotion and reason conditions (M's $= 2.21$) than in the control condition ($M = 2.03$). However, Trump supporters perceived discordant fake headlines as least accurate in the reason condition ($M = 2.37$) and as more accurate in the control ($M = 2.44$) and emotion ($M = 2.54$) conditions. Although these differences between conditions within partisan groups were not significant themselves, they suggest a potential interplay between thinking mode, partisanship, and political concordance. Notably, there was no evidence of either Clinton or Trump supporters perceiving concordant fake headlines as more accurate in the reason condition than in the emotion condition, which is further evidence against the motivated account.

Some evidence of interaction between condition, type of news, and study. To account for variation between experiments in our analyses, we fit a linear mixed model with condition, type

of news, and study as fixed effects, allowing for all interactions. Experiment 2 served as our

reference level for study. As random effects, we included random intercepts by item and by

participant nested by study. We were unable to include random slopes, as no random slopes

model was able to converge. We found a joint significant interaction between condition, type of

news, and study, $F(4, 37541.93) = 3.00$, $p = .017$. This joint significant interaction appeared to

be driven by the interaction between the reason condition, type of news, and experiment 4 ($p =$

.001). Since experiment 4 utilized a different online platform (Lucid) than the other three

experiments (MTurk), we fit a model replacing study with platform as a fixed effect. MTurk was

the reference level platform. In this model, we were able to include random slopes by item for

the interaction between condition and platform, as well as random slopes for type of news for

participants nested by studies. With random slopes, we did not find a significant joint interaction

between platform, condition, and type of news, $F(2, 35.65) = 2.32$, $p = .113$. The interaction

between the reason condition, type of news, and platform was only marginally significant ($p =$

.050). Taken together, these analyses suggest some evidence of a three-way interaction between

study, type of news, and condition. As a result, we performed two separate versions of our main

linear mixed effects analysis looking at the relationship between accuracy, condition, and type of

news – one with only our data from experiments 1 through 3 (MTurk), and one with the data

from experiment 4 (Lucid). We found that the MTurk-specific results are similar to the results

from our aggregated analyses, except the effects are even stronger – there is a significant effect

of condition on fake news, $F(2, 88.12) = 5.62$, $p = .005$, and a significant interaction between

condition and type of news, $F(2, 66.37) = 4.83$, $p = .011$. Conversely, our results from only the

Lucid experiment were essentially null, with no condition effects. The results of these analyses

are presented in the Supplemental Materials.

Discussion

Our results suggest several conclusions about the roles of emotion and reason in fake news perception. First, our findings from Study 1 indicate that momentary emotion, regardless of the specific type or valence of emotion, is predictive of increased belief in fake news and decreased discernment between real and fake news. Our results also suggest that emotion is specifically associated with belief in fake news. Therefore, rather than assessing how specific emotions impact perceptions of fake news, it is perhaps best to first assess how emotion, in general, impacts belief in misinformation.

Second, our results from Study 2 further suggest that there is clear correlational and experimental evidence that reliance on emotion increases belief in fake news. We found a positive association between self-reported use of emotion and belief in fake news, and that the more participants relied on emotion over reason, the more they perceived fake stories as accurate. Our manipulation also revealed causal evidence showing that inducing reliance on emotion results in greater belief in fake news as compared to both a control and a condition where we induced analytic, logical thinking.

Our findings also provide some evidence that the effect of emotion on perceptions of accuracy is specific to fake news. We found a significant correlational interaction between self-reported use of emotion and type of news headline (fake, real), suggesting that heightened emotion decreases people's ability to discern between real and fake news. Our correlational analyses also showed that use of emotion was unrelated to real news accuracy perceptions. Additionally, we found no experimental effect of thinking mode on real news accuracy ratings. Although we only found a marginal overall interaction between condition and type of news headline, the interactions with type of news were significant when comparing emotion vs control

and emotion vs reason; and the overall interaction was significant when consider the MTurk experiments (there were no manipulation effects at all on Lucid). This tentatively suggests that inducing emotional thinking using a simple induction manipulation may impair the ability distinguish fake news from real, although further work is required. Furthermore, the current studies suggest that belief in fake news is driven largely by over-reliance on emotion, relative to a simple lack of analytic reasoning. Use of reason was unrelated to fake news accuracy perceptions, and there was no difference in accuracy perception between our experimental reason condition and the control condition. Therefore, emotion may be actively and uniquely promoting heightened belief in fake news relative to a baseline condition, and heightened emotion appears to be underlying susceptibility to fake news above and beyond a simple lack of reasoning.

Our evidence builds on prior work using the Cognitive Reflection Test (CRT; Frederick, 2005), demonstrating that there is a negative correlational relationship between CRT performance and perceived accuracy of fake news, and a positive correlational relationship between CRT performance and the ability to discern fake news from real news (Pennycook & Rand, 2019a). Beyond these correlational results, the current studies provide causal evidence that inducing heightened emotionality increases susceptibility to believing fake news, and tentatively suggest that increasing emotional thinking hinders media truth discernment.

Furthermore, our findings provide further evidence against the motivated account of fake news perception. Whereas the motivated account would predict analytic reasoning to increase ideologically motivated belief of politically concordant fake news (see Kahan, 2017), our results show no interaction between condition and concordance. We find no evidence suggesting that people utilize ideologically motivated reasoning to justify believing in fake news – rather, people appear to believe fake news if they rely too heavily on intuitive, emotional thinking. The

motivated account would also predict analytic thinking to justify greater belief in concordant real news – however, we only find a weak, marginally significant association between relative use of reason and perceived accuracy of concordant real news. Our findings support the classical account of fake news perception, which posits that a failure to identify fake news stems from some combination of a lack of analytic, deliberative thinking and heightened emotionality. Therefore, the mechanism by which individuals fall prey to fake news stories closely resembles how people make mistakes on questions such as the bat-and-ball problem from the CRT – people mistakenly "go with their gut" when it would be prudent to stop and think more reflectively. Just as the bat-and-ball problem has an intuitive, albeit wrong, answer, there is evidence to suggest that people have an intuitive truth bias (see Bond & DePaulo, 2006), and thus analytic reasoning aids in overcoming such intuitions in some contexts. Indeed, an abundance of evidence suggests that individuals assume they are being informed of the truth and are bad at identifying lies and misinformation (e.g., Bond & DePaulo, 2006; Levine, Park, & McCornack, 1999). This suggests that an over-reliance on intuition – and, specifically, having a reflexively open-minded thinking style (Pennycook & Rand, 2019c) – is likely to result in people being more susceptible to believing fake news. As we find, inducing emotional, intuitive reasoning does in fact increase the propensity to believe fake news stories.

Our findings have important practical implications. If emotional, non-deliberative thinking results in heightened belief of fake news, then the extent to which social media platforms bias people to think with emotion over reason may contribute to the viral success of fake news. Indeed, sentiment analysis of fake news articles reveal that fake news tends to contain increased negative emotional language (Zollo et al., 2015; Horne & Adali, 2017). Even true yet emotionally stimulating content may result in people being biased to think with emotion instead

of reason. Further applied research into how social media platforms may separately display non-news related yet emotionally provocative content and news articles may provide insight into how to prevent inducing emotional thinking in individuals online, thereby potentially decreasing general susceptibility to fake news.

Emotion may also amplify the pervasiveness of fake news stories in society, as emotion has been generally linked to better, more accurate memories of central information (for review, see Levine & Pizarro, 2004). However, emotional misinformation does not appear to be more or less susceptible to correction compared to neutral misinformation (Ecker, Lewandowsky, & Apai, 2011). Regardless, fake news stories, by virtue of being more emotionally arousing, may be more easily remembered and recalled compared to real news stories.

Limitations

There are several potential limitations of the current research. First, the induction manipulation used across all four experiments was somewhat heavy-handed, and therefore there may be the question of experimenter demand effects. Future work should investigate whether similar patterns hold with alternative manipulations.

Second, the classical account purports that analytic reasoning aids in overcoming intuitions such as automatic belief in false headlines. However, in the current research, we did not find evidence that inducing reason improves perceived accuracy of fake news or discernment between real and fake news relative to the control. Rather, we found that inducing intuitive, emotional thinking increased perceived accuracy of fake news. Therefore, susceptibility to fake news appears to be more about increased emotionality rather than decreased analytical thinking. One potential explanation for why our induction of analytic thinking did not improve perceptions of fake news or discernment between real and fake news relative to the control is that

participants in the control condition may have already generally been relying more on reason than emotion. This is supported by our manipulation check data, which suggests that people in the emotion condition used emotion relatively more than reason, whereas people in the control and reason conditions used reason relatively more than emotion.

Third, as discussed earlier in this paper, fake news is often aimed at eliciting high emotionality, and specific emotions such as moral outrage (e.g., Crockett, 2017). However, our current work does not specifically assess the relative emotionality of fake news and real news in the context of accuracy assessments. It remains unclear whether similar results would be found if fake news stimuli were adjusted to have the same emotional content as our real news stimuli. An interesting future research direction would be to assess the interaction between emotional processing and the emotional content of fake and real news.

Fourth, our analyses rely primarily on a convenience sample of online Mechanical Turk workers (experiments 1-3). 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, when assessing the causal role of reason and emotion in perceiving fake news accuracy, obtaining a nationally representative population may not be as important as sampling from groups of people who are frequent internet and social media users, and therefore likely encounter fake news stories more regularly. Thus, Mechanical Turk may be an even more appropriate resource than a nationally representative sample. Even still, it is unclear how our findings may generalize to different populations. In experiment 4, which utilized a more nationally representative sample via Lucid, we found no effect of condition on fake news

perception or on media truth discernment. However, this was not a precisely estimated null, as it was also not significantly different from the overall estimate. Additionally, the null effect may have been caused by Lucid participants being less attentive than MTurkers, rather than due to their differential demographic characteristics, as Lucid participants are perhaps less professionalized than the MTurk population (Coppock & McClellan, 2019). Therefore, it remains unclear whether the manipulation used in our study is effective in more representative samples. Future work should identify whether the effects we found in our MTurk data generalize to other platforms.

Finally, our experiments used only a small subset of all contemporary fake and real news headlines. Although these headlines were selected to be representative of fake and real news headlines in general, further research is required to ascertain how our findings would generalize to different headlines, or to different displays of headlines other than the Facebook news article format.

Conclusion

Dictionary.com recently named 'misinformation' its 2018 word of the year, defined as: "false information that is spread, regardless of whether there is intent to mislead." The online dissemination of misinformation and fake news is a troubling consequence of our digital age, and it is critical for psychologists to develop an understanding of the cognitive mechanisms behind why people fall trap to misinformation and fake stories so commonly viewed online. The current results show that emotion plays a causal role in people's susceptibility to incorrectly perceiving fake news as accurate. Contrary to the popular motivated cognition account, our findings indicate that people fall for fake news, in part, because they rely too heavily on intuition and emotion; not because they think in a motivated or identity-protective way. This suggests that interventions that

are directed at making the public less emotional consumers of news media may have promise in

reducing belief in fake news.

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Supplemental Materials

Evidence of causal manipulation effect on news accuracy perception in MTurk experiments.

We examined whether there was a condition effect on the perceived accuracy of fake and real news across experiments 1 through 3, which were all performed on Amazon Mechanical Turk (MTurk). We performed a linear mixed effects analysis of the relationship between perceived news accuracy, experimental condition (emotion, control, reason), and type of news headline. As fixed effects, we entered condition and type of news headline, with an interaction term. As random effects, we included intercepts for headline items and participants nested by study, and we also included by-item random slopes for condition and by-nested participant random slopes for type of news headline. The reference level for condition was 'emotion' and the reference level for type of news headline was 'fake'. The results of this analysis are shown in Table S1.

Table S1. *Results of linear mixed effects analysis of accuracy by condition and type of news article, for experiments 1-3 (MTurk).*

	beta	SE	df	$|t|$	p
Intercept	2.79	.23	3.52	11.96	.001
Control (condition)	-0.14	0.05	72.27	-3.20	.002
Reason (condition)	-0.12	0.04	49.11	-2.70	.009
Real (headline truth)	1.13	0.18	26.93	6.44	< .001
Control : Real	0.14	0.06	46.87	2.47	.017

Emotion condition heightens belief in fake news in MTurk experiments.

A joint significance test revealed a significant effect of condition on fake news accuracy perception, $F(2, 88.12) = 5.62$, $p = .005$. Fake news headlines were reported as significantly more accurate in the emotion condition as compared to the control condition ($p = .002$) and the

reason condition ($p = .009$). A joint significance test of condition on real news accuracy perception did not show a significant effect, $F(2, 66.42) = 1.89$, $p = .159$.

Significant effect of condition on discerning fake from real news in MTurk experiments.
We next performed a joint significance test of the interaction between condition and news type. This revealed a significant interaction, $F(2, 66.37) = 4.83$, $p = .011$. The coefficients of our model show that media truth discernment, as indicated by the interaction between condition and news type, is greater in the control condition than in the emotion condition ($p = .017$), and also greater in the reason condition than in the emotion condition ($p = .004$). Therefore, it appears that there is a strong effect of condition on media truth discernment when looking only at the experiments performed on MTurk. However, the results of our aggregated data analysis, which includes experiment 4 (Lucid), suggest only a marginal effect on discernment.

No condition effect on fake news or discernment in Lucid experiment.
We next performed a nearly identical linear mixed effects analysis except selecting for data from experiment 4, which was performed on the platform Lucid. The only difference in the model itself was that random effects were accounted for by participant rather than participant nested by experiment, since this model only utilizes data from a single study. Unlike our results from collapsing across all four experiments and our results looking only at the MTurk experiments, this model revealed no condition effect on accuracy judgements of fake news, $F(2, 166.12) = 0.65$, $p = .524$. We again found no condition effect for real headlines, $F(2, 55.07) = 0.56$, $p = .576$. Finally, there was no condition effect on discernment, $F(2, 61.22) = 0.30$, $p = .739$. Taken together, these results suggest that the induction manipulation was ineffective on Lucid, and that

there appears to be a notable difference between our results from MTurk and our results from

Lucid, despite there only being a marginally significant interaction effect of platform on

discernment.

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