



Ecker, U. K. H., Lewandowsky, S., Cook, J., Schmid, P., Fazio, L. K., Brashier, N., Kendeou, P., Vraga, E. K., & Amazeen, M. A. (2022). The psychological drivers of misinformation belief and its resistance to correction. *Nature Reviews Psychology*, 1, 13–29 (2022).
<https://doi.org/10.1038/s44159-021-00006-y>

Peer reviewed version

Link to published version (if available):
[10.1038/s44159-021-00006-y](https://doi.org/10.1038/s44159-021-00006-y)

[Link to publication record on the Bristol Research Portal](#)
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Springer Nature at <https://doi.org/10.1038/s44159-021-00006-y> . Please refer to any applicable terms of use of the publisher.

University of Bristol – Bristol Research Portal

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available:
<http://www.bristol.ac.uk/red/research-policy/pure/user-guides/brp-terms/>

The Psychological Drivers of Misinformation Belief and its Resistance to Correction

Ullrich K. H. Ecker^{1†}, Stephan Lewandowsky^{1,2}, John Cook³, Philipp Schmid⁴, Lisa K. Fazio⁵,
Nadia Brashier^{6,7}, Panayiota Kendeou⁸, Emily K. Vraga⁹, & Michelle A. Amazeen¹⁰

¹ School of Psychological Science, University of Western Australia, Perth, Australia

² School of Psychological Science, University of Bristol, Bristol, UK

³ Climate Change Communication Research Hub, Monash University, Melbourne, Australia

⁴ Media and Communication Science, University of Erfurt, Erfurt, Germany

⁵ Department of Psychology and Human Development, Vanderbilt University, Nashville, USA

⁶ Department of Psychology, Harvard University, Cambridge, USA

⁷ Department of Psychological Sciences, Purdue University, West Lafayette, USA

⁸ Department of Educational Psychology, University of Minnesota, Minneapolis, USA

⁹ Hubbard School of Journalism and Mass Communication, University of Minnesota,
Minneapolis, USA

¹⁰ College of Communication, Boston University, Boston, USA

†email: ullrich.ecker@uwa.edu.au

Acknowledgements

U.E. acknowledges support from the Australian Research Council (Future Fellowship FT190100708); S.L. acknowledges support from the Alexander von Humboldt Foundation, the Volkswagen Foundation (large grant 'Reclaiming individual autonomy and democratic discourse online'), and the Economic and Social Research Council through a Knowledge Exchange Fellowship. S.L. and P.S. acknowledge support from the European Commission (Horizon 2020 grant agreement No 964728 JITSUVAX).

Author contributions

UE, SL and JC were lead authors; section leads worked on individual sections with the lead authors: PS on the Introduction; LF (with NB) on the 'False Beliefs' section; PK on the 'Knowledge Revision' section; EV on the 'Interventions' section; MA on the 'Implications' section. Authors are ordered in this manner. All authors commented on and revised the entire manuscript before submission. JC developed the figures.

Competing interests

The authors declare no competing interests.

Peer review information

Nature Reviews Psychology thanks [Referee#1 name], [Referee#2 name] and the other, anonymous, reviewer(s) for their contribution to the peer review of this work.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Abstract

Misinformation has been identified as a major contributor to a variety of contentious contemporary events ranging from elections and referenda to the response to the COVID-19 pandemic. Not only can belief in misinformation lead to poor judgements and decision making, it also exerts a lingering influence on people's reasoning after it has been corrected—an effect known as the continued influence effect. In this Review, we describe the cognitive, social, and affective factors that lead people to form or endorse misinformed views, and the psychological barriers to knowledge revision after misinformation is corrected, including theories of continued influence. We discuss the effectiveness of both pre-emptive ('prebunking') and reactive ('debunking') interventions to reduce the impacts of misinformation, as well as implications for information consumers and practitioners in various areas including journalism, public health, policy-making, and education.

[H1] Introduction

Misinformation—which we define as any information that turns out to be false—poses an inevitable challenge for human cognition and social interaction because it is a consequence of the fact that people frequently err and sometimes lie ¹. However, this fact is insufficient to explain the rise of misinformation, and its subsequent influence on memory and decision-making, as a major challenge in the twenty-first century ^{2,3,4}. Misinformation has been identified as a contributor to a variety of contentious events, ranging from elections and referenda ⁵ to political or religious persecution ⁶ to the global response to the COVID-19 pandemic ⁷.

The psychology and history of misinformation cannot be fully grasped without taking into account contemporary technology. Misinformation helped bring Roman emperors to power ⁸, who used messages on coins as a form of mass communication ⁹, and Nazi propaganda heavily relied on the printed press, radio, and cinema ¹⁰. Today, misinformation campaigns can leverage digital infrastructure that is unparalleled in its reach. The internet reaches billions of individuals and enables senders to tailor persuasive messages to the specific psychological profiles of individual users ^{11,12}. Moreover, social-media users' exposure to information that challenges their worldviews can be limited when communication environments foster confirmation of previous beliefs—so-called echo chambers ^{13,14}. Although there is some controversy about echo chambers and their impact on people's beliefs and behaviours ^{12,15}, the internet is an ideal medium for the fast spread of falsehoods at the expense of accurate information ¹⁶. However, the prevalence of misinformation cannot only be attributed to technology: conventional efforts to combat misinformation have also not been as successful as hoped ²—these include educational efforts that focus on merely conveying factual knowledge and corrective efforts that merely retract misinformation.

For decades, science communication has relied on an information deficit model when responding to misinformation: misinformation is the result of people's misunderstanding of, or lack of access to, facts¹⁷. Thus, a thorough and accessible explanation of facts should overcome the impact of misinformation. However, the information deficit model ignores the cognitive, social, and affective drivers of attitude formation and truth judgements^{18,19,20}. For example, some individuals deny the existence of climate change or reject vaccinations despite being aware of a scientific consensus to the contrary^{21,22}. This rejection of science is not the result of mere ignorance but is driven by factors such as conspiratorial mentality, fears, identity expression, and motivated reasoning—reasoning driven more by personal or moral values than objective evidence^{19,23,24,25,26}. Thus, to understand the psychology of misinformation and how it might be countered, it is essential to consider the cognitive architecture and social context of individual decision makers.

In this Review, we describe the cognitive, social, and affective processes that make misinformation stick and leave people vulnerable to the formation of false beliefs. We review the theoretical models that have been proposed to explain misinformation's resistance to correction. We provide guidance on countering misinformation, including educational and pre-emptive interventions, refutations, and psychologically-informed technological solutions. Finally, we return to the broader societal trends that have contributed to the rise of misinformation and discuss its practical implications on journalism, education, and policymaking.

Different types of misinformation exist—for example misinformation that goes against scientific consensus or misinformation that contradicts simple, objectively-true facts. Moreover, the term disinformation is often specifically used for the subset of misinformation that is spread intentionally²⁷. More research is needed on the extent to which different types of misinformation

might be associated with differential psychological impacts and barriers for revision, and to establish the extent to which people infer intentionality and how this might affect their processing of the false information. Thus, in this Review we do not draw a sharp distinction between misinformation and disinformation, or different types of misinformation. We use the term misinformation as an umbrella term referring to any information that turns out to be false and reserve the term disinformation for misinformation that is spread with intention to harm or deceive.

[H1] Drivers of False Beliefs

The formation of false beliefs all but requires exposure to false information. However, lack of access to high-quality information is not necessarily the primary precursor to false-belief formation; a range of cognitive, social, and affective factors influence the formation of false beliefs (Fig. 1). False beliefs generally arise through the same mechanisms that establish accurate beliefs^{28,29}. When deciding what is true, people are often biased to believe in the validity of information³⁰, and ‘go with their gut’ and intuitions instead of deliberating^{31,32}. For example, in March 2020, 31% of Americans agreed that COVID-19 was purposefully created and spread³³, despite the absence of any credible evidence for its intentional development. People likely encountered conspiracy theories about the source of the virus multiple times, which might have contributed to this widespread belief because simply repeating a claim makes it more believable than presenting it only once^{34,35}. This illusory truth effect arises because people use peripheral cues like familiarity (a signal that a message has been encountered before)³⁶, processing fluency (a signal that a message is either encoded or retrieved effortlessly)^{37,38}, and cohesion (a signal that the elements of a message have references in memory that are internally consistent)³⁹ as signals for truth, and the strength of these cues increases with repetition. Thus,

repetition increases belief in both misinformation and facts^{40,41,42,43}. Illusory truth can persist months after first exposure⁴⁴, regardless of cognitive ability⁴⁵, and despite contradictory advice from an accurate source⁴⁶ or accurate prior knowledge^{18,47}.

Another ‘shortcut’ for truth might involve defaulting to one’s own personal views. Overall belief in news headlines is higher when the news headlines complement the reader’s worldview⁴⁸. Political partisanship can also contribute to false memories for made-up scandals⁴⁹. However, difficulties discerning true from false news headlines can also arise from intuitive (or ‘lazy’) thinking rather than the impact of worldviews⁴⁸. In one study, participants received questions (‘If you’re running a race and you pass the person in second place, what place are you in?’) with intuitive, but incorrect, answers (‘first place’). Participants who answered these questions correctly were better able to discern fake from real headlines than participants who answered these questions incorrectly, independently of whether the headlines aligned with their political ideology⁵⁰. A link has also been reported between intuitive thinking and greater belief in COVID-19 being a hoax, and reduced adherence to public-health measures⁵¹.

Similarly, allowing people to deliberate can improve their judgements. If quick evaluation of a headline is followed by an opportunity to rethink, belief in fake news—but not factual news—is reduced⁵². Likewise, encouraging people to ‘think like fact checkers’ leads them to rely more on their own prior knowledge instead of heuristics. For example: prior exposure to statements like ‘Deer meat is called veal’ makes these statements seem truer than similar statements encountered for the first time, even when people know the truth (in this case that the correct term is venison⁴⁷). However, asking people to judge whether the statement is true at initial exposure protects them from subsequently accepting contradictions of well-known facts⁵³.

The information source also provides important social cues that influence belief formation. In general, messages are more persuasive and seem more true when they come from sources perceived to be credible rather than non-credible⁴². People trust human information sources more if they perceive the source as attractive, powerful, and similar to themselves⁵⁴. These source judgments are naturally imperfect—people believe in-group members more than out-group members⁵⁵, tend to weigh opinions equally regardless of the competence of those expressing them⁵⁶, and overestimate how much their beliefs overlap with other people's, which can lead to the perception of a false consensus⁵⁷. Experts and political elites are trusted by many and have the power to shape public perceptions^{58,59}; therefore, it can be especially damaging when leaders make false claims. For example, false claims about public-health threats such as COVID-19 made by political leaders can reduce the perceived threat as well as the perceived efficacy of countermeasures, decreasing adherence to public-health measures^{60,61}.

Moreover, people often overlook, ignore, forget, or confuse cues about the source of information⁶². For example, for online news items, a logo banner specifying the publisher (for example, a reputable media outlet or a dubious web page) has been found not to decrease belief in fake news or increase belief in factual news⁶³. In the aggregate, groups of laypeople perform as well as professional fact-checkers at categorizing news outlets as trustworthy, hyperpartisan, or fake⁶⁴. However, when acting alone, individuals—unlike fact-checkers—tend to disregard the quality of the news outlet and judge a headline's accuracy based primarily on the plausibility of the content⁶³. Similarly, although people are quick to distrust others who share fake news⁶⁵, they frequently forget information sources⁶⁶. This tendency is concerning: even though a small number of social media accounts spread an outsized amount of misleading content^{67,68,69}, if consumers do not remember the dubious origin, they might not discount the content accordingly.

The emotional content of the information shared also affects false-belief formation. Misleading content that spreads quickly and widely ('virally') on the internet often contains appeals to emotion, which can increase persuasion. For example, messages that aim to generate fear of harm can successfully change attitudes, intentions, and behaviours under certain conditions if recipients feel they can act effectively to avoid the harm⁷⁰. Moreover, according to a preprint that has not been peer-reviewed, 'happy thoughts' are more believable than neutral ones⁷¹. People seem to understand the association between emotion and persuasion and naturally shift towards more emotional language when attempting to convince others⁷². For example, anti-vaccination activists frequently use emotional language⁷³. Emotion can be persuasive because it distracts readers from potentially more diagnostic cues, such as source credibility. In one study, participants read positive, neutral, and negative headlines about the actions of specific people; social judgements about the people featured in the headlines were strongly determined by emotional valence of the headline but unaffected by trustworthiness of the news source⁷⁴.

Inferences about information are also affected by people's own emotional states. People tend to ask themselves 'How do I feel about this claim?' which can lead to influences of a person's mood on claim evaluation⁷⁵. Using feelings as information can leave people susceptible to deception⁷⁶, and encouraging people to 'rely on their emotions' increases their vulnerability to misinformation⁷⁷. Likewise, some specific emotional states such as a happy mood can make people more vulnerable to deception⁷⁸ and illusory truth⁷⁹. Thus, one functional feature of a sad mood might be that it reduces gullibility⁸⁰. Anger has also been shown to promote belief in politically concordant misinformation⁸¹ as well as COVID-19 misinformation⁸². Finally, social exclusion, which likely induces a negative mood, can increase susceptibility to conspiratorial content^{83,84}.

In sum, the drivers of false beliefs are multifold and largely overlooked by a simple information deficit model. The drivers include cognitive factors, such as use of intuitive thinking and memory failures; social factors, such as reliance on source cues to determine truth; and affective factors, such as the influence of mood on credulity. Although we have focused on false-belief formation here, the psychology behind sharing misinformation is a related area of active study (Box 1).

[H1] Barriers to Belief Revision

A tacit assumption of the information deficit model is that false beliefs can easily be corrected by providing relevant facts. However, misinformation can often continue to influence people's thinking even after they receive a correction and accept it as true. This persistence is known as the continued influence effect (CIE) ^{85,86,87,88}.

In the typical CIE laboratory paradigm, participants are presented with a report of an event (for example, a fire) that contains a critical piece of information related to the event's cause ('the fire was likely caused by arson'). That information might be subsequently challenged by a correction, which can take the form of a retraction (a simple negation, such as 'it is not true that arson caused the fire') or a refutation (a more detailed correction that explains why the misinformation was false). When reasoning about the event later (for example, responding to questions such as 'what should authorities do now?'), individuals often continue to rely on the critical information even after receiving—and being able to recall—a correction ⁸⁹. Variants of this paradigm have used false real-world claims or urban myths ^{90,91,92}. Corrected misinformation can also continue to influence the amount a person is willing to pay for a consumer product or their propensity to promote a social-media post ^{93,94,95}. The CIE might be an influential factor in the persistence of beliefs that there is a link between vaccines and autism

despite strong evidence discrediting this link^{96,97} or that weapons of mass destruction were found in Iraq in 2003 despite no supporting evidence⁹⁸. The CIE has primarily been conceptualized as a cognitive effect, with social and affective underpinnings.

[H3] Cognitive factors

Theoretical accounts of the CIE draw heavily on models of memory in which information is organized in interconnected networks and the availability of information is determined by its level of activation^{99,100} (Fig. 2). When information is encoded into memory and then new information that discredits it is learned, the original information is not simply erased or replaced¹⁰¹. Instead, misinformation and corrective information co-exist and compete for activation. For example, misinformation that a vaccine has caused an unexpectedly large number of deaths might be incorporated with knowledge related to diseases, vaccinations, and causes of death. A subsequent correction that the information about vaccine-caused deaths was inaccurate will also be added to memory and will likely result in some knowledge revision. However, the misinformation will remain in memory and can potentially be reactivated and retrieved later on.

One school of thought—the integration account—suggests that the CIE arises when a correction is not sufficiently encoded and integrated with the misinformation in the memory network (Fig. 2a). There is robust evidence that integration of the correction and misinformation is a necessary, albeit not sufficient, condition for memory updating and knowledge revision¹⁰⁰. This view implies that a successful revision requires detecting a conflict between the misinformation and the correction, the co-activation of both representations in memory, and their subsequent integration¹⁰². Evidence for this account comes from the success of interventions that bolster conflict detection, co-activation, and integration of misinformation and correction^{103,104}. Assuming that information integration relies on processing in working memory (the short-term

store used to briefly hold and manipulate information in the service of thinking and reasoning), the finding that lower working memory capacity predicts greater susceptibility to the CIE is also in line with this account¹⁰⁵ (although this has not been replicated¹⁰⁶). This theory further assumes that as the amount of integrated correct information increases, memory for the correction becomes stronger at the expense of memory for the misinformation¹⁰². Thus, both the interconnectedness and the amount of correct information can influence the success of memory revision.

An alternative account is based on the premise that the CIE arises from selective retrieval of the misinformation even when corrective information is present in memory (Fig. 2b). For example, it has been proposed that a retraction causes the misinformation representation to be tagged as false¹⁰⁷. The misinformation can be retrieved without the false tag, but the false tag cannot be retrieved without concurrent retrieval of the misinformation. One instantiation of this selective-retrieval view appeals to a dual-process mechanism, which assumes that retrieval can occur based on an automatic, effortless process signaling information familiarity ('I think I have heard this before') or a more strategic, effortful process of recollection that includes contextual detail ('I read about this in yesterday's newspaper')¹⁰⁸. According to this account of continued influence, the CIE can arise if there is automatic, familiarity-driven retrieval of the misinformation (for example, in response to a cue), without explicit recollection of the corrective information and associated post-retrieval suppression of the misinformation^{107,109}.

Evidence for this account comes from studies demonstrating that the CIE increases as a function of factors associated with increased familiarity (such as repetition)¹⁰⁷, and reduced recollection (such as advanced participant age and longer study-test delays)⁹². Neuroimaging studies have suggested that activity during retrieval, when participants answer inference

questions about an encoded event—but not when the correction is encoded—is associated with continued reliance on corrected misinformation^{110,111}. This preliminary neuroimaging evidence generally supports the selective-retrieval account of the CIE, although it suggests that the CIE is driven by misinformation recollection rather than misinformation familiarity, which is at odds with the dual-process interpretation.

Both of these complementary theoretical accounts of the CIE can explain the superiority of detailed refutations over retractions^{92,112,113}. Provision of additional corrective information can strengthen the activation of correct information in memory or provide more detail to support recollection of the correction^{89,103}, which makes a factual correction more enduring than the misinformation⁹⁰. Because a simple retraction will create a gap in a person's mental model, especially in situations that require a causal explanation (for example, a fire must be caused by something), a refutation that can fill in details of a causal, plausible, simple, and memorable alternative explanation will reduce subsequent recall of the retracted misinformation.

[H3] Social and affective factors

These cognitive accounts do not explicitly consider the influence of social and affective mechanisms on the CIE. One socio-affective factor is source credibility, the perceived trustworthiness and expertise of the sources providing the misinformation and correction. Although source credibility has been found to exert little influence on acceptance of misinformation if the source is a media outlet^{63,114}, there is generally strong evidence that credibility has significant impact on acceptance of misinformation from non-media sources^{42,88,115}.

The credibility of a correction source also matters for (post-correction) misinformation reliance¹¹⁶, although perhaps less than the credibility of the misinformation source⁸⁸. The

effectiveness of factual corrections might depend on perceived trustworthiness rather than perceived expertise of the correction source^{117,118}, although perceived expertise might matter more in science-related contexts, such as health misinformation^{119,120}. It can also be quite rational to discount a correction if the correction source is low in credibility^{121,122}. Further complicating matters, the perceived credibility of a source varies across recipients. In extreme cases, people with strong conspiratorial ideation tendencies might mistrust any official source (for example, health authorities)^{19,26}. More commonly, people tend to trust sources that are perceived to share their values and worldviews^{54,55}.

A second key socio-affective factor is worldview—a person’s values and belief system that grounds their personal and sociocultural identity. Corrections attacking a person’s worldview can be ineffective¹²³ or backfire^{25,124}. Such corrections can be experienced as attacking one’s identity, resulting in a chain reaction of appraisals and emotional responses that hinder information revision^{19,125}. For example, if a message is appraised as an identity threat (for example, a correction that the risks of a vaccine do not outweigh the risks of a disease might be perceived as an identity threat by a person identifying as an anti-vaxxer), this can lead to intense negative emotions that motivate strategies such as discrediting the source of the correction, ignoring the worldview-inconsistent evidence, or selectively focusing on worldview-bolstering evidence^{24,126}. However, how a person’s worldview influences misinformation corrections is still hotly debated (Box 2), and there is a developing consensus that even worldview-inconsistent corrections typically have some beneficial impact^{91,127,128,129,130,131}.

The third socio-affective factor that influences the CIE is emotion. One study found that corrections can produce psychological discomfort that motivates a person to disregard the correction to reduce the feeling of discomfort¹³². Misinformation conveying negative emotions

such as fear or anger might be particularly likely to evoke a CIE ^{133,134}. This influence might be due to a general negativity bias ^{11,135} or more specific emotional influences. For example, misinformation damaging the reputation of a political candidate might spark outrage or contempt, which might promote continued influence of this misinformation (in particular among non-supporters) ¹³⁴. However, there seems to be little continued influence of negative misinformation on impression formation when the person subjected to the false allegation is not a disliked politician, perhaps because reliance on corrected misinformation might be seen as biased or judgemental (that is, it might be frowned upon to judge another person even though allegations have been proven false) ¹³⁶.

Other studies have compared emotive and non-emotive events—for example, a plane crash falsely assumed to have been caused by either a terror attack, resulting in many fatalities, versus a technical fault, resulting in zero fatalities—and found no impact of misinformation emotiveness on the magnitude of the CIE ¹³⁷. Moreover, just as a sad mood can protect against initial misinformation belief ⁸⁰, it also seems to facilitate knowledge revision when a correction is encountered ¹³⁸. People who exhibit both sub-clinical depression and rumination tendencies have even been shown to exhibit particularly efficient correction of negative misinformation relative to control individuals, presumably because the salience of negative misinformation to this group facilitates revision ¹³⁹.

Finally, there is evidence that corrections can also benefit from emotional recalibration. For example, when misinformation downplays a risk or threat (for example, misinformation that a serious disease is relatively harmless), corrections that provide a more accurate risk evaluation operate partly through their impact on emotions such as hope, anger, and fear. This emotional mechanism might help correction recipients realign their understanding of the situation with

reality (for example, to realize they have underestimated the real threat) ^{113,140}. Likewise, countering disinformation that seeks to fuel fear or anger can benefit from a downward adjustment of emotional arousal; for example, refutations of vaccine misinformation can reduce anti-vaccination attitudes by mitigating misinformation-induced anger ¹⁴¹.

[H1] Interventions to Combat Misinformation

As discussed in the preceding section, interventions to combat misinformation must overcome a variety of cognitive, social, and affective barriers. The most common type of correction is a fact-based correction that directly addresses inaccuracies in the misinformation and provides accurate information ^{90,102,112,142} (Fig. 3). A second approach is to address the logical fallacies common in some types of disinformation—for example, corrections that highlight inherently contradictory claims such as ‘global temperature cannot be measured accurately’ and ‘temperature records show it has been cooling’ (Fig. 4). Such logic-based corrections might offer broader protection against different types of misinformation that use the same fallacies and misleading tactics ^{21,143}. A third approach is to undermine the plausibility of the misinformation or the credibility of its source ¹⁴⁴. Multiple approaches can be combined in a single correction—for example, highlighting both the factual and logical inaccuracies in the misinformation, or undermining source credibility and underscoring factual errors ^{94,95,145}. However, most research to date has considered each approach separately and more research is required to test synergies between these strategies.

More generally, two strategies that can be distinguished are pre-emptive intervention (prebunking) and reactive intervention (debunking). Prebunking seeks to help people recognize and resist subsequently-encountered misinformation, even if it is novel. Debunking emphasizes responding to specific misinformation after exposure to demonstrate why it is false. The

effectiveness of these corrections is influenced by a range of factors, and there are mixed results regarding their relative efficacy. For example, in the case of anti-vaccination conspiracy theories, prebunking has been found to be more effective than debunking¹⁴⁶. However, other studies have found debunking to outperform prebunking^{87,95,142}. Reconciling these findings might require considering both the specific type of correction and its placement in time. For example, when refuting climate misinformation, one study found that fact-based debunking outperformed fact-based prebunking, whereas logic-based prebunking and debunking were equally effective¹⁴⁷.

Some interventions, particularly those in online contexts, are hybrid or borderline cases. For example, if a misleading social-media post is tagged with ‘false’¹⁴⁸ and appears alongside a corrective explanation, this might count as both prebunking (due to the tag, likely processed before the post) and debunking (due to the comment, likely processed after the post).

[H3] *Prebunking interventions*

The simplest prebunking interventions involve presenting factually correct information^{149,150}, a pre-emptive correction^{142,151}, or a generic misinformation warning^{99,148,152,153} before the misinformation. More sophisticated interventions draw on inoculation theory, a framework for pre-emptive interventions^{154,155,156}. This theory applies the principle of vaccination to knowledge, positing that ‘inoculating’ people with a weakened form of persuasion can build immunity against subsequent persuasive arguments by engaging people’s critical-thinking skills (Fig. 5).

An inoculation intervention combines two elements. The first element is warning recipients of the threat of misleading persuasion. For example, a person could be warned that many claims about climate change are false and intentionally misleading. The second element is identifying the techniques used to mislead or the fallacies that underlie the false arguments to

refute forthcoming misinformation^{157,158}. For example, a person might be taught that techniques used to mislead include selective use (‘cherry-picking’) of data (for example, only showing temperatures from outlier years to create the illusion that global temperatures have dropped) or the use of fake experts (for example, scientists with no expertise in climate science). Understanding how those misleading persuasive techniques are applied equips a person with the cognitive tools to ward off analogous persuasion attempts in the future.

Because one element of inoculation is highlighting misleading argumentation techniques, its effects can generalize across topics, providing an ‘umbrella’ of protection^{159,160}. For example, an inoculation against a misleading persuasive technique used to cast doubt on science demonstrating harm from tobacco was found to convey resistance against the same technique when used to cast doubt on climate science¹⁴³. Moreover, inoculated people are more likely to talk about the target issue than non-inoculated people, an outcome referred to as post-inoculation talk¹⁶¹. Post-inoculation talk is more likely to be negative than talk among non-inoculated people, which promotes misinformation resistance both within and between individuals because people’s evaluations tend to weight negative information more strongly than positive information¹⁶².

Inoculation theory has also been used to explain how strategies designed to increase information literacy and media literacy could reduce the effects of misinformation. Information literacy—the ability to effectively find, understand, evaluate, and use information—has been linked to the ability to detect misleading news¹⁶³ and reduced sharing of misinformation¹⁶⁴. Generally, information literacy and media literacy (which focuses on knowledge and skills for the reception and dissemination of information through the media) interventions are designed to

improve critical thinking¹⁶⁵ and the application of such interventions to spaces containing many different types of information might help people identify misinformation¹⁶⁶.

One successful intervention focused on lateral reading—consulting external sources to examine the origins and plausibility of a piece of information, or the credibility of an information source^{115,167,168}. A separate non-peer-reviewed preprint suggests that focusing on tell-tale signs of online misinformation (including lexical cues, message simplicity, and blatant use of emotion) can help people identify fake news¹⁶⁹. However, research to date suggests that literacy interventions do not always mitigate the effects of misinformation^{170,171,172,173}. Whereas most work has used relatively passive inoculation and literacy interventions, applications that engage people more actively have shown promise—specifically app-based or web-based games^{174,175,176,177}. More work is needed to consider what types of literacy interventions are most effective for conferring resistance to different types of misinformation in the contemporary media and information landscape¹⁷⁸.

In sum, the prebunking approach provides a great tool to act pre-emptively and help people build resistance to misinformation in a relatively general manner. However, the advantage of generalizability can also be a weakness, because it is often specific pieces of misinformation that cause concern, which call for more specific responses.

[H3] *Debunking Interventions*

Whereas pre-emptive interventions can equip people to recognize and resist misinformation, reactive interventions retrospectively target concrete instances of misinformation. For example, if a novel falsehood that a vaccine can lead to life-threatening side effects in pregnant women begins to spread, then this misinformation must be addressed using specific counterevidence. Research broadly finds that direct corrections are effective in

reducing—though frequently not eliminating—reliance on the misinformation in a person’s reasoning^{86,87}. The beneficial effects of debunking can last several weeks^{92,100,179}, although the effects can wear off quicker¹⁴⁵. There is also evidence that corrections that reduce misinformation belief can have downstream effects on behaviours or intentions^{94,95,180,181}—such as a person’s inclination to share a social-media post or their voting intentions—but not always^{91,96,182}.

A number of best practices for debunking have emerged^{90,145,183}. First, the most important element of a debunking correction is to provide a factual account that ideally includes an alternative explanation for why something happened^{85,86,99,102,184}. For example, if a fire was thought to have been caused by negligence, then providing a causal alternative (‘there is evidence for arson’) is more effective than a retraction (‘there was no negligence’). In general, more detailed refutations work better than plain retractions that do not provide any detail on why the misinformation is incorrect^{92,100,112,113}. It can be beneficial to lead with the correction rather than repeat the misinformation to prioritize the correct information and set a factual frame for the issue. However, a preprint that has not been peer-reviewed suggests that leading with the misinformation can be just as or even more effective if no pithy fact is available¹⁵⁰.

Second, the misinformation should be repeated to demonstrate how it is incorrect and to make the correction salient. However, the misinformation should be prefaced with a warning^{99,148} and repeated only once in order not to boost its familiarity unnecessarily¹⁰⁴. It is also good to conclude by repeating and emphasizing the accurate information to reinforce the correction¹⁸⁵.

Third, even though credibility matters less for correction sources compared with misinformation sources⁸⁸, corrections are ideally delivered by or associated with high-credibility

sources^{116,117,118,119,120,186}. There is also emerging evidence that corrections are more impactful when they come from a socially-connected source (for example, a connection on social media) rather than a stranger¹⁸⁷.

Fourth, corrections should be paired with relevant social norms, including injunctive norms ('protecting the vulnerable by getting vaccinated is the right thing to do') and descriptive norms ('over 90% of parents are vaccinating their children')¹⁸⁸, as well as expert consensus ('doctors and medical societies around the world agree that vaccinations are important and safe')^{189,190,191,192}. One study found a benefit to knowledge revision if corrective evidence was endorsed by many others on social media, thus giving the impression of normative backing¹⁹³.

Fifth, the language used in a correction is important. Simple language and informative graphics can facilitate knowledge revision, especially if fact comprehension might be otherwise difficult or if the person receiving the correction has a strong tendency to counter-argue^{194,195,196,197}. When speaking directly to misinformed individuals, empathic communication should be used rather than wielding expertise to argue directives^{198,199}.

Finally, it has been suggested that worldview-threatening corrections can be made more palatable by concurrently providing an identity affirmation^{145,200,201}. Identity affirmations involve a message or task (for example, writing a brief essay about one's strengths and values) that highlights important sources of self-worth. These exercises are assumed to protect and strengthen the correction recipient's self-esteem and the value of their identity, thereby reducing the threat associated with the correction and associated processing biases. However, evidence for the utility of identity affirmations in the context of misinformation corrections is mixed¹⁹⁴, so firm recommendations cannot yet be made.

In sum, debunking is a valuable tool to address specific pieces of misinformation and largely reduces misinformation belief. However, debunking will not eliminate the influence of misinformation on people's reasoning at a group level. Furthermore, even well-designed debunking interventions might not have long-lasting effects, thus requiring repeated intervention.

[H3] *Corrections on social media*

Misinformation corrections might be especially important in social media contexts because they can reduce false beliefs not just in the target of the correction but among everyone that sees the correction—a process termed observational correction¹¹⁹. Best practices for corrections on social media echo many best practices offline¹¹², but also include linking to expert sources and correcting quickly and early²⁰². There is emerging evidence that online corrections can work both pre-emptively and reactively, although this might depend on the type of correction¹⁴⁷.

Notably, social media corrections are more effective when they are specific to an individual piece of content rather than a generalized warning¹⁴⁸. Social media corrections are effective when they come from algorithmic sources²⁰³, from expert organizations such as a government health agency^{119,204,205}, or from multiple other users on social media²⁰⁶. However, particular care must be taken to avoid ostracizing people when correcting them online. To prevent potential adverse effects on people's online behaviour, such as sharing of misleading content, gentle accuracy nudges that prompt people to consider the accuracy of the information they encounter or highlight the importance of sharing only true information might be preferable to public corrections that might be experienced as embarrassing or confrontational^{181,207}.

In sum, social media users should be aware that corrections can be effective in this arena and have the potential to reduce false beliefs in people they are connected with as well as

bystanders. By contrast, confronting strangers is less likely to be effective. Given the effectiveness of algorithmic corrections, social media companies and regulators should promote implementation and evaluation of technical solutions to misinformation on social media.

[H1] Practical Implications

Even if optimal prebunking or debunking interventions are deployed, no intervention can be fully effective or reach everyone with the false belief. The contemporary information landscape brings particular challenges: The internet and social media have enabled an exponential increase in misinformation spread and targeting to precise audiences^{14,16,208,209}. Against this backdrop, the psychological factors discussed in this Review have implications for practitioners in various fields—journalists, legislators, public-health officials and healthcare workers—as well as information consumers.

[H3] *Implications for practitioners*

Combatting misinformation involves a range of decisions regarding the optimal approach (Fig. 6). When preparing to counter misinformation, it is important to identify likely sources. Although social media is an important misinformation vector²¹⁰, traditional news organizations can promote misinformation via opinion pieces²¹¹, sponsored content²¹², or uncritical repetition of politician statements²¹³. Practitioners must anticipate the misinformation themes and ensure suitable fact-based alternative accounts are available for either prebunking or a quick debunking response. Organizations such as the [International Fact-Checking Network](#) or the [World Health Organization](#) often form coalitions in the pursuit of this endeavour²¹⁴.

Practitioners must be aware that simple retractions will be insufficient to mitigate the impact of misinformation, and that the effects of interventions tend to wear off over time^{92,145,152}. If possible, practitioners must therefore be prepared to act repeatedly¹⁷⁹. Creating

engaging, fact-based narratives can provide a foundation for effective correction ^{215,216}. However, a narrative format is not a necessary ingredient ^{140,217} and anecdotes and stories can also be misleading ²¹⁸.

Practitioners can also help audiences discriminate between facts and opinion, which is a teachable skill ^{170,219}. Whereas most news consumers do not notice or understand content labels forewarning that an article is news, opinion, or advertising ^{220,221}, more prominent labelling can nudge readers to adjust their comprehension and interpretation accordingly. For example, labelling can lead readers to be more skeptical of promoted content ²²⁰. However, even when forewarnings are understood, they do not reliably eliminate the content's influence ^{99,153}.

If pre-emptive correction is not possible or ineffective, practitioners should take a reactive approach. However, not every piece of misinformation needs to be a target for correction. Due to resource limitations and opportunity costs, corrections should focus on misinformation that circulates among a substantive portion of the population and carries potential for harm ¹⁸³. Corrections do not generally increase false beliefs among individuals who were previously unfamiliar with the misinformation ²²². However, if the risk of harm is minimal, there is no need to debunk misinformation that few people are aware of, which could potentially raise the profile of its source.

[H3] *Implications for information consumers*

Information consumers also have a role to play in combatting misinformation by avoiding contributing to its spread. For instance, people must be aware that they might encounter not only relatively harmless misinformation such as reporting errors, outdated information, and satire, but also disinformation campaigns designed to instill fear or doubt, discredit individuals, and sow division ^{2,26,223,224}. People must also recognize that disinformation can be psychologically

targeted through profit-driven exploitation of personal data and social-media algorithms ¹².

Thoughtless sharing can amplify misinformation that might confuse and deceive others. Sharing misinformation can also contribute to the financial rewards sought by misinformation producers, and deepen ideological divides that disenfranchise voters, encourage violence, and ultimately harm democratic processes ^{2,170,223,225,226}.

Thus, while engaged with content, individuals should slow down, think about why they are engaging and interrogate their visceral response. People who thoughtfully seek accurate information are more likely to successfully avoid misinformation compared with people who are motivated to find evidence to confirm their pre-existing beliefs ^{50,227,228}. Attending to the source and considering its credibility and motivation, along with lateral reading strategies also increase the likelihood of identifying misinformation ^{115,167,171}. Given the benefits of persuading on-lookers through observational correction, everyone should be encouraged to civilly, carefully, and thoughtfully correct online misinformation where they encounter it (unless they deem it a harmless fringe view) ^{119,206}. All of these recommendations are also fundamental principles of media literacy ¹⁶⁶. Indeed, a theoretical underpinning of media literacy is that understanding the aims of media protects individuals from some adverse effects of being exposed to information through the media, including the pressure to adopt particular beliefs or behaviours ¹⁷⁰.

[H3] *Implications for policymakers*

Ultimately, even if practitioners and information consumers apply all of these strategies to reduce the impact of misinformation, their efforts will be stymied if media platforms continue to amplify misinformation ^{14,16,208,209,210,211,212,213}. These platforms include social media platforms such as YouTube, which are geared towards maximizing engagement even if it means promoting misinformation ²²⁹, and traditional media outlets such as TV news channels, where

misinformation can negatively impact audiences. For example, two non-peer-reviewed preprints have found that COVID-19 misinformation on Fox News was causally associated with reduced adherence to public health measures and a larger number of COVID-19 cases and deaths^{230,231}. It is therefore important to scrutinize whether the practices and algorithms of media platforms are optimized to promote misinformation or truth.

In this space, policymakers should consider enhanced regulation. These regulations might include penalties for creating and disseminating disinformation where intentionality and harm can be established, and mandating platforms to be more proactive, transparent, and effective in their dealings with misinformation. With regards to social media specifically, companies should be encouraged to ban repeat offenders from their platforms, and to generally make engagement with and sharing of low-quality content more difficult^{12,232,233,234,235}. Regulation must not result in censorship, and proponents of freedom of speech might disagree with attempts to regulate content. However, freedom of speech does not include the right to amplification of that speech. Furthermore, being unknowingly subjected to disinformation can be seen as a manipulative attack on freedom of choice and the right to be well informed²³⁶. These concerns must be balanced. A detailed summary of potential regulatory interventions can be found elsewhere^{237,238}.

Other strategies have the potential to reduce the impact of misinformation without regulation of media content. Undue concentration of ownership and control of both social and traditional media facilitates the dissemination of misinformation²³⁹. Thus, policymakers are advised to support a diverse media landscape and adequately fund independent public broadcasters. Perhaps the most important approach to slowing the spread of misinformation is substantial investments in education, particularly to build information literacy skills in schools

and beyond^{240,241,242,243}. Another tool in the policymaker's arsenal is interventions targeted more directly at behaviour, such as nudging policies and public pledges to honour the truth (also known as self-nudging) for policymakers and consumers alike^{12,244,245}.

Overall, solutions to misinformation spread must be multi-pronged and target both the supply (for example, more efficient fact-checking and changes to platform algorithms and policies) and the consumption (for example, accuracy nudges and enhanced media literacy) of misinformation. Individually, each intervention might only incrementally reduce the spread of misinformation, but one preprint that has not been peer-reviewed suggests that combinations of interventions can have a substantial impact²⁴⁶.

More broadly speaking, any intervention to strengthen public trust in science, journalism, and democratic institutions is an intervention against the impacts of misinformation^{247,248}. Such interventions might include enhancing transparency in science^{249,250} and journalism²⁵¹, more rigorous fact-checking of political advertisements²⁵², and reducing the social inequality that breeds distrust in experts and contributes to vulnerability to misinformation^{253,254}.

[H1] Summary and Future Directions

Psychological research has built solid foundational knowledge of how people decide what is true and false, form beliefs, process corrections, and might continue to be influenced by misinformation even after it has been corrected. However, much work remains to fully understand the psychology of misinformation.

First, in line with general trends in psychology and elsewhere, research methods in the field of misinformation should be improved. Researchers should rely less on small-scale studies conducted in the laboratory or a small number of online platforms, often on non-representative (and primarily U.S.-based) participants²⁵⁵. Researchers should also avoid relying on one-item

questions with relatively low reliability²⁵⁶. Given the well-known attitude-behaviour gap—that attitude change does not readily translate into behavioural effects—researchers should also attempt to use more behavioural measures, such as information-sharing measures, rather than relying exclusively on self-report questionnaires^{93,94,95}. Although existing research has yielded valuable insights into how people generally process misinformation (many of which will translate across different contexts and cultures), an increased focus on diversification of samples and more robust methods will likely provide a better appreciation of important contextual factors and nuanced cultural differences^{7,82,205,257,258,259,260,261,262,263}.

Second, most existing work has focused on explicit misinformation and text-based materials. Thus, the cognitive impacts of other types of misinformation, including subtler types of misdirection such as paltering (misleading while technically saying the truth)^{95,264,265,266}, doctored images²⁶⁷, deepfake videos²⁶⁸, and extreme patterns of misinformation bombardment²²³, are currently not well understood. Non-text based corrections, such as videos or cartoons also deserve more exploration^{269,270}.

Third, additional translational research is needed to explore questions about causality, including the causal impacts of misinformation and corrections on beliefs and behaviours. This research should employ non-experimental methods^{230,231,271}, such as observational causal inference (research aiming to establish causality in observed real-world data)²⁷², and test the impact of interventions in the real world^{145,174,181,207}. These studies are especially needed over the long term—weeks to months or even years—and should test a range of outcome measures, for example those that relate to health and political behaviours, in a range of contexts. Ultimately, the success of psychological research into misinformation should be linked not only to theoretical progress, but also to societal impact²⁷³.

Finally, even though the field has a reasonable understanding of the cognitive mechanisms and social determinants of misinformation processing, knowledge of the complex interplay between cognitive and social dynamics is still limited, as is insight into the role of emotion. Future empirical and theoretical work would benefit from development of an overarching theoretical model that aims to integrate cognitive, social, and affective factors, for example by utilizing agent-based modelling approaches. This approach might also offer opportunities for more interdisciplinary work ²⁵⁷ at the intersection of psychology, political science ²⁷⁴, and social network analysis ²⁷⁵, and the development of a more sophisticated psychology of misinformation.

Figure 1. *Drivers of False Beliefs*

Some of the main cognitive (green) and socio-affective (orange) factors that can facilitate the formation of false beliefs when exposed to misinformation. Not all factors will always be relevant, but multiple factors often contribute to false beliefs.

Figure 2. *Integration and Retrieval Accounts of Continued Influence*

A) Integration account of continued influence. The correction had the representational strength to compete with or even dominate the misinformation ('myth') but was not integrated into the relevant mental model. Depending on the available retrieval cues, this lack of integration can lead to unchecked misinformation retrieval and reliance. B) Retrieval account of continued influence. Integration has taken place but the myth is represented in memory more strongly and thus dominates the corrective information in the competition for activation and retrieval. Note that the two situations are not mutually exclusive: Avoiding continued influence might require both successful integration and retrieval of the corrective information.

Figure 3. *Barriers to Belief Updating and Strategies to Overcome Them (Part 1)*

A depiction of how various barriers to belief updating can be overcome by specific communication strategies applied during correction, using event and health misinformation as examples.

Figure 4. *Barriers to Belief Updating and Strategies to Overcome Them (Part 2)*

A depiction of how various barriers to belief updating can be overcome by specific communication strategies applied during correction, using climate-change misinformation as an example.

Figure 5. *Inoculation Theory Applied to Misinformation*

An 'inoculation' treatment can help people prepare for subsequent misinformation exposure. The treatment typically highlights the risks of being misled, alongside a pre-emptive refutation. The refutation can be fact-based, logic-based, or source-based. Inoculation has been shown to increase misinformation detection and facilitate counterarguing and dismissal of false claims, effectively neutralizing misinformation. Additionally, inoculation can build immunity across topics and increase the likelihood of people talking about the issue targeted by the refutation (post-inoculation talk).

Figure 6. *Strategies to Counter Misinformation*

Different strategies for countering misinformation are available to practitioners at different time-points. If no misinformation is circulating but there is potential for it to emerge in the future, practitioners can consider possible misinformation sources and anticipate the misinformation

themes. Based on this assessment, practitioners can prepare fact-based alternative accounts, and either continue monitoring the situation while preparing for a quick response, or deploy preemptive (prebunking) or reactive (debunking) interventions, depending on the traction of the misinformation. Prebunking can take various forms, from simple warnings to more involved literacy interventions. Debunking can start either with a pithy counterfact that recipients ought to remember or with dismissal of the core ‘myth.’ Debunking should provide a plausible alternative cause for an event or factual details, preface the misinformation with a warning, and explain any logical fallacies or persuasive techniques used to promote the misinformation. Debunking should end with a factual statement.

Box 1: Why People Share Misinformation

Online misinformation transmission involves both a receiver (the person encountering the misinformation) and a sender (the person making or sharing the misinformation). Thus, it is crucial to consider why people share misinformation with others. On social media, sharing is often dictated by what captures attention. Moral-emotional words such as ‘fight,’ ‘greed,’ ‘evil,’ and ‘punish’ are prioritized in early visual attention over other arousing words²⁷⁶ and also lead to increased sharing. For example, adding a single moral-emotional word to tweets about contentious political issues like gun control increases retweets by 20%²⁷⁷. An angry mood can also boost misinformation sharing⁸². Because social-media algorithms promote content that is likely to be shared, the interplay of psychological tendencies and technological optimization can thus easily lead to viral spread of misinformation online.

‘Lazy’ or intuitive thinking can also lead people to share content that they might recognize as false if they thought about it more. Accordingly, asking people to explain how they know that news headlines are true or false reduces sharing of false political headlines²⁷⁸, and brief accuracy nudges—simple interventions that prompt people to consider the accuracy of the information they encounter or share—can reduce sharing of false news about politics²⁰⁷ and COVID-19²⁷⁹. These studies suggest that to the extent that people pay attention to accuracy, they likely share things they genuinely believe. Most people report that they would need to be paid to share false news; even when stories favour their political views, they worry about possible reputation costs from sharing false news⁶⁵. Those reputation costs are real—over half of social media users report that they have stopped following someone who posted ‘made-up news and information’²⁸⁰.

If a person’s focus is not on information veracity, they might share misinformation for other reasons²⁰¹. Indeed, fourteen percent of respondents in a 2016 U.S. survey admitted to knowingly sharing false news²⁸¹. There are some innocuous reasons to intentionally spread falsehoods; for example, it is tempting to share information that would be ‘interesting (or consequential) if true’²⁸². Likewise, findings from a preprint that has not been peer-reviewed suggest that people might share positive but questionable claims that could make others feel better, like ‘A cat saved a woman’s life by scaring off a bear trying to attack her’⁷¹. There are also self-serving motives for sharing, such as to signal group membership²⁸³ or for self-promotion²⁶⁰. Finally, some people share misinformation to fuel moral outrage in others^{277,284}. One non-peer reviewed preprint suggests that some people share hostile political rumours and conspiracy theories to incite chaos; this desire to ‘watch the world burn’ is even stronger following social exclusion²⁸⁵. With these alternative goals in mind, the viral nature of misinformation does not occur despite its low veracity, but because of its ability to fulfill other psychological needs¹¹.

Box 2: The Elusive Backfire Effects

There have been concerns that corrective interventions might cause harm by inadvertently strengthening misconceptions and ironically enhancing reliance on the very misinformation that is being corrected. However, these concerns are largely overstated. Specifically, three types of ostensible ‘backfire effects’ have been discussed: The overkill backfire effect, the familiarity backfire effect, and the worldview backfire effect ⁸⁹.

Only one study has investigated the potential overkill backfire effect, thought to result from a correction using too many counterarguments. This study found that corrections of dubious claims were more (rather than less) potent when more counterarguments were used, as long as those counterarguments were relevant ²⁸⁶. Thus, the overkill backfire effect does not have empirical support.

The familiarity backfire effect is thought to result from a correction that unintentionally boosts the familiarity of the misinformation being corrected. This effect is characterized as an increase in misinformation belief following a correction, relative to a pre-correction baseline or no-exposure control condition. There are some findings that repeating corrections might lead to a tendency to recall false claims as true, especially after a three-day delay or in older (70+) adults ²⁸⁷. Likewise, it has been argued that presenting ‘myths versus facts’ flyers that repeat to-be-debunked misinformation when correcting it could lead to familiarity backfire effects after a mere 30 minutes ²⁸⁸. However, these findings have not replicated ^{107,289} or remain unpublished. Other putative familiarity backfire effects did not compare the backfire condition to a proper baseline (for reviews see ^{92,256}). Strong evidence against familiarity backfire comes from findings that explicit reminders of misinformation enhance the effect of corrections ^{104,290}. Although some researchers have argued that familiarity backfire might occur when a correction spreads novel misinformation to new audiences ¹⁸⁵, only one study has found support for this claim (and only in one of two experiments) ²⁹¹, with other studies finding no evidence ^{112,151,222}. Other demonstrations of familiarity backfire effects in the context of vaccine misinformation might be driven by worldview rather than familiarity ²⁹². In sum, misinformation familiarity contributes to the CIE but does not typically produce backfire effects.

The backfire effect of greatest concern is arguably the worldview backfire effect, thought to arise when people dismiss and counter-argue against corrections of false beliefs that are central to their identity ^{126,293}. Early demonstrations of worldview backfire effects ^{124,294,295} drew much attention from the academy and beyond, but have proven difficult to replicate ^{81,128,130}, partially due to unreliable methods ^{256,296}. Although findings of worldview backfire effects continue to be reported occasionally ^{25,297}, overall the potential threat of worldview backfire effects seems limited and should not generally discourage debunking.

References

1. DePaulo, B. M., Kashy, D. A., Kirkendol, S. E., Wyer, M. M. & Epstein, J. A. Lying in everyday life. *Journal of Personality and Social Psychology* **70**, 979–995 (1996).
2. Lewandowsky, S., Ecker, U. K. H. & Cook, J. Beyond misinformation: Understanding and coping with the post-truth era. *Journal of Applied Research in Memory and Cognition* **6**, 353–369 (2017).
3. Zarocostas, J. How to fight an infodemic. *Lancet* **395**, 676 (2020).
4. Lazer, D. M. J. *et al.* The science of fake news. *Science* **359**, 1094–1096 (2018).
5. Bennett, W. L. & Livingston, S. The disinformation order: Disruptive communication and the decline of democratic institutions. *European Journal of Communication* **33**, 122–139 (2018).
6. Whitten-Woodring, J., Kleinberg, M. S., Thawngmung, A. & Thitsar, M. T. Poison if you don't know how to use it: Facebook, democracy, and human rights in Myanmar. *International Journal of Press/Politics* **25**, 407–425 (2020).
7. Roozenbeek, J. *et al.* Susceptibility to misinformation about COVID-19 around the world. *Royal Society Open Science* **7**, 201199 (2020).
8. Rich, J. Deception, lies, and economy with the truth: Augustus and the establishment of the principate. In *Private and Public Lies. The Discourse of Despotism and Deceit in the Graeco-Roman World (Impact of Empire II)* (eds. Turner, A. J., Kim On Chong-Cossard, J. H. & Vervaet, F. J.) vol. 11 167–191 (Brill Academic Publishers, 2010).
9. Hekster, O. Coins and messages: Audience targeting on coins of different denominations? In *The Representation and Perception of Roman Imperial Power* 20–35 (2019). doi:10.1163/9789004401631_007
10. Herf, J. The Jewish War: Goebbels and the antisemitic campaigns of the Nazi propaganda ministry. *Holocaust and Genocide Studies* **19**, 51–80 (2005).
11. Acerbi, A. Cognitive attraction and online misinformation. *Palgrave Communications* **5**, 15 (2019).
12. Kozyreva, A., Lewandowsky, S. & Hertwig, R. Citizens versus the internet: Confronting digital challenges with cognitive tools. *Psychological Science in the Public Interest* **21**, 103–156 (2020).
13. Barberá, P., Jost, J. T., Nagler, J., Tucker, J. A. & Bonneau, R. Tweeting from left to right: Is online political communication more than an echo chamber? *Psychological Science* **26**, 1531–1542 (2015).
14. Del Vicario, M. *et al.* The spreading of misinformation online. *Proceedings of the National Academy of Sciences of the United States of America* **113**, 554–559 (2016).
15. Garrett, R. K. The echo chamber distraction: Disinformation campaigns are the problem not audience fragmentation. *Journal of Applied Research in Memory and Cognition* **6**, 370–376 (2017).
16. Vosoughi, S., Roy, D. & Aral, S. The spread of true and false news online. *Science* **359**, 1146–1151 (2018).
17. Simis, M. J., Madden, H., Cacciatore, M. A. & Yeo, S. K. The lure of rationality: Why does the deficit model persist in science communication?. *Public Understanding of Science* **25**, 400–414 (2016).
18. Fazio, L. K., Brashier, N. M., Payne, B. K. & Marsh, E. J. Knowledge does not protect against illusory truth. *Journal of Experimental Psychology: General* **144**, 993–1002 (2015)
19. Hornsey, M. J. & Fielding, K. S. Attitude roots and jiu jitsu persuasion: Understanding and overcoming the motivated rejection of science. *American Psychologist* **72**, 459 (2017).
20. Nisbet, E. C., Cooper, K. E. & Garrett, R. K. The partisan brain: How dissonant science messages lead conservatives and liberals to (dis)trust science. *Annals of the American Academy of Political and Social Science* **658**, 36–66 (2015).
21. Schmid, P. & Betsch, C. Effective strategies for rebutting science denialism in public discussions. *Nature Human Behaviour* **3**, 931–939 (2019).
22. Hansson, S. O. Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science Part A* **63**, 39–47 (2017).
23. Amin, A. B. *et al.* Association of moral values with vaccine hesitancy. *Nature Human Behaviour* **1**, 873–880 (2017).
24. Lewandowsky, S. & Oberauer, K. Motivated rejection of science. *Current Directions in Psychological Science* **25**, 217–222 (2016).
25. Trevors, G. & Duffy, M. C. Correcting COVID-19 misconceptions requires caution. *Educational Researcher* **49**, 538–542 (2020).

26. Lewandowsky, S. Conspiracist cognition: Chaos convenience, and cause for concern. *Journal for Cultural Research* **25**, 12–35 (2021).
27. Lewandowsky, S., Stritzke, W. G. K., Freund, A. M., Oberauer, K. & Krueger, J. I. Misinformation, disinformation, and violent conflict: From Iraq and the war on terror to future threats to peace. *American Psychologist* **68**, 487–501 (2013).
28. Marsh, E. J., Cantor, A. D. & Brashier, N. M. Believing that humans swallow spiders in their sleep. *Psychology of Learning and Motivation* **64**, 93–132 (2016).
29. Rapp, D. N. The consequences of reading inaccurate information. *Current Directions in Psychological Science* **25**, 281–285 (2016).
30. Pantazi, M., Kissine, M. & Klein, O. The power of the truth bias: False information affects memory and judgment even in the absence of distraction. *Social Cognition* **36**, 167–198 (2018).
31. Brashier, N. M. & Marsh, E. J. Judging truth. *Annual Review of Psychology* **71**, 499–515 (2020).
32. Prike, T., Arnold, M. M. & Williamson, P. The relationship between anomalistic belief misperception of chance and the base rate fallacy. *Thinking & Reasoning* **26**, 447–477 (2020).
33. Uscinski, J. E. *et al.* Why do people believe COVID-19 conspiracy theories? *Harvard Kennedy School Misinformation Review* (2020). doi:10.37016/mr-2020-015
34. Dechêne, A., Stahl, C., Hansen, J. & Wänke, M. The truth about the truth: A meta-analytic review of the truth effect. *Personality and Social Psychology Review* **14**, 238–257 (2010).
35. Unkelbach, C., Koch, A., Silva, R. R. & Garcia-Marques, T. Truth by repetition: Explanations and implications. *Current Directions in Psychological Science* **28**, 247–253 (2019).
36. Begg, I. M., Anas, A. & Farinacci, S. Dissociation of processes in belief: Source recollection, statement familiarity, and the illusion of truth. *Journal of Experimental Psychology: General* **121**, 446–458 (1992).
37. Unkelbach, C. Reversing the truth effect: Learning the interpretation of processing fluency in judgments of truth. *Journal of Experimental Psychology: Learning, Memory, and Cognition* **33**, 219–230 (2007).
38. Wang, W. C., Brashier, N. M., Wing, E. A., Marsh, E. J. & Cabeza, R. On known unknowns: Fluency and the neural mechanisms of illusory truth. *Journal of Cognitive Neuroscience* **28**, 739–746 (2016).
39. Unkelbach, C. & Rom, S. C. A referential theory of the repetition-induced truth effect. *Cognition* **160**, 110–126 (2017).
40. Pennycook, G., Cannon, T. D. & Rand, D. G. Prior exposure increases perceived accuracy of fake news. *Journal of Experimental Psychology: General* **147**, 1865–1880 (2018).
41. Unkelbach, C. & Speckmann, F. Mere repetition increases belief in factually true COVID-19-related information. *Journal of Applied Research in Memory and Cognition* **10**, 241–247 (2021).
42. Nadarevic, L., Reber, R., Helmecke, A. J. & Köse, D. Perceived truth of statements and simulated social media postings: An experimental investigation of source credibility, repeated exposure, and presentation format. *Cognitive Research: Principles and Implications* **5**, 56 (2020).
43. Fazio, L. K., Rand, D. G. & Pennycook, G. Repetition increases perceived truth equally for plausible and implausible statements. *Psychonomic Bulletin & Review* **26**, 1705–1710 (2019).
44. Brown, A. S. & Nix, L. A. Turning lies into truths: Referential validation of falsehoods. *Journal of Experimental Psychology: Learning Memory, and Cognition* **22**, 1088–1100 (1996).
45. De keersmaecker, J. *et al.* Investigating the robustness of the illusory truth effect across individual differences in cognitive ability, need for cognitive closure, and cognitive style. *Personality and Social Psychology Bulletin* **46**, 204–215 (2020).
46. Unkelbach, C. & Greifeneder, R. Experiential fluency and declarative advice jointly inform judgments of truth. *Journal of Experimental Social Psychology* **79**, 78–86 (2018).
47. Fazio, L. K. Repetition increases perceived truth even for known falsehoods. *Collabra: Psychology* **6**, 38 (2020).
48. Pennycook, G. & Rand, D. G. The psychology of fake news. *Trends in Cognitive Sciences* **25**, 388–402 (2021).
49. Murphy, G., Loftus, E. F., Grady, R. H., Levine, L. J. & Greene, C. M. False memories for fake news during Ireland’s abortion referendum. *Psychological Science* **30**, 1449–1459 (2019).
50. Pennycook, G. & Rand, D. G. Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition* **188**, 39–50 (2019).

51. Stanley, M. L., Barr, N., Peters, K. & Seli, P. Analytic-thinking predicts hoax beliefs and helping behaviors in response to the COVID-19 pandemic. *Thinking & Reasoning* **27**, 464–477 (2020).
52. Bago, B., Rand, D. G. & Pennycook, G. Fake news, fast and slow: Deliberation reduces belief in false (but not true) news headlines. *Journal of Experimental Psychology: General* **149**, 1608–1613 (2020).
53. Brashier, N. M., Eliseev, E. D. & Marsh, E. J. An initial accuracy focus prevents illusory truth. *Cognition* **194**, 104054 (2020).
54. Briñol, P. & Petty, R. E. Source factors in persuasion: A self-validation approach. *European Review of Social Psychology* **20**, 49–96 (2009).
55. Mackie, D. M., Worth, L. T. & Asuncion, A. G. Processing of persuasive in-group messages. *Journal of Personality and Social Psychology* **58**, 812–822 (1990).
56. Mahmoodi, A. *et al.* Equality bias impairs collective decision-making across cultures. *Proceedings of the National Academy of Sciences of the United States of America* **112**, 3835–3840 (2015).
57. Marks, G. & Miller, N. Ten years of research on the false-consensus effect: An empirical and theoretical review. *Psychological Bulletin* **102**, 72–90 (1987).
58. Brulle, R. J., Carmichael, J. & Jenkins, J. C. Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the U.S. 2002–2010. *Climatic Change* **114**, 169–188 (2012).
59. Lachapelle, E., Montpetit, É. & Gauvin, J.-P. Public perceptions of expert credibility on policy issues: The role of expert framing and political worldviews. *Policy Studies Journal* **42**, 674–697 (2014).
60. Dada, S., Ashworth, H. C., Bewa, M. J. & Dhatt, R. Words matter: Political and gender analysis of speeches made by heads of government during the COVID-19 pandemic. *BMJ Global Health* **6**, e003910 (2021).
61. Chung, M. & Jones-Jang, S. M. Red media, blue media, Trump briefings, and COVID-19: Examining how information sources predict risk preventive behaviors via threat and efficacy. *Health Communication* (2021). doi:10.1080/10410236.2021.1914386
62. Mitchell, K. J. & Johnson, M. K. Source monitoring 15 years later: What have we learned from fMRI about the neural mechanisms of source memory? *Psychological Bulletin* **135**, 638–677 (2009).
63. Dias, N., Pennycook, G. & Rand, D. G. Emphasizing publishers does not effectively reduce susceptibility to misinformation on social media. *Harvard Kennedy School Misinformation Review* (2020). doi:10.37016/mr-2020-001
64. Pennycook, G. & Rand, D. G. Fighting misinformation on social media using crowdsourced judgments of news source quality. *Proceedings of the National Academy of Sciences of the United States of America* **116**, 2521–2526 (2019).
65. Altay, S., Hacquin, A.-S. & Mercier, H. Why do so few people share fake news? It hurts their reputation. *New Media & Society* (2020). <https://doi.org/10.1177/1461444820969893>
66. Rahhal, T. A., May, C. P. & Hasher, L. Truth and character: Sources that older adults can remember. *Psychological Science* **13**, 101–105 (2002).
67. Grinberg, N., Joseph, K., Friedland, L., Swire-Thompson, B. & Lazer, D. Fake news on Twitter during the 2016 U.S. presidential election. *Science* **363**, 374–378 (2019).
68. Center for an Informed Public, Digital Forensic Research Lab, Graphika, & Stanford Internet Observatory. *The Long Fuse: Misinformation and the 2020 Election*. <https://purl.stanford.edu/tr171zs0069> (2021).
69. Jones, M. O. Disinformation superspreaders: The weaponisation of COVID-19 fake news in the Persian Gulf and beyond. *Global Discourse* **10**, 431–437 (2020).
70. Tannenbaum, M. B. *et al.* Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychological Bulletin* **141**, 1178–1204 (2015).
71. Altay, S. & Mercier, H. Happy thoughts: The role of communion in accepting and sharing epistemically suspect beliefs. Preprint at: <https://psyarxiv.com/3s4nr/> (2020).
72. Rocklage, M. D., Rucker, D. D. & Nordgren, L. F. Persuasion, emotion, and language: The intent to persuade transforms language via emotionality. *Psychological Science* **29**, 749–760 (2018).
73. Chou, W.-Y. S. & Budenz, A. Considering emotion in COVID-19 vaccine communication: Addressing vaccine hesitancy and fostering vaccine confidence. *Health Communication* **35**, 1718–1722 (2020).
74. Baum, J. & Abdel, R. R. Emotional news affects social judgments independent of perceived media credibility. *Social Cognitive and Affective Neuroscience* **16**, 280–291 (2021).

75. Kim, H., Park, K. & Schwarz, N. Will this trip really be exciting? The role of incidental emotions in product evaluation. *Journal of Consumer Research* **36**, 983–991 (2010).
76. Forgas, J. P. Happy believers and sad skeptics? Affective influences on gullibility. *Current Directions in Psychological Science* **28**, 306–313 (2019).
77. Martel, C., Pennycook, G. & Rand, D. G. Reliance on emotion promotes belief in fake news. *Cognitive Research: Principles and Implications* **5**, 47 (2020).
78. Forgas, J. P. & East, R. On being happy and gullible: Mood effects on skepticism and the detection of deception. *Journal of Experimental Social Psychology* **44**, 1362–1367 (2008).
79. Koch, A. S. & Forgas, J. P. Feeling good and feeling truth: The interactive effects of mood and processing fluency on truth judgments. *Journal of Experimental Social Psychology* **48**, 481–485 (2012).
80. Forgas, J. P. Don't worry be sad! On the cognitive, motivational, and interpersonal benefits of negative mood. *Current Directions in Psychological Science* **22**, 225–232 (2013).
81. Weeks, B. E. Emotions, partisanship, and misperceptions: How anger and anxiety moderate the effect of partisan bias on susceptibility to political misinformation. *Journal of Communication* **65**, 699–719 (2015).
82. Han, J., Cha, M. & Lee, W. Anger contributes to the spread of COVID-19 misinformation. *Harvard Kennedy School Misinformation Review* (2020). doi:10.37016/mr-2020-39
83. Graeupner, D. & Coman, A. The dark side of meaning-making: How social exclusion leads to superstitious thinking. *Journal of Experimental Social Psychology* **69**, 218–222 (2017).
84. Poon, K.-T., Chen, Z. & Wong, W.-Y. Beliefs in conspiracy theories following ostracism. *Personality and Social Psychology Bulletin* **46**, 1234–1246 (2020).
85. Johnson, H. M. & Seifert, C. M. Sources of the continued influence effect: When misinformation in memory affects later inferences. *Journal of Experimental Psychology: Learning, Memory, and Cognition* **20**, 1420–1436 (1994).
86. Chan, M.-P. S., Jones, C. R., Jamieson, K. H. & Albarracín, D. Debunking: A meta-analysis of the psychological efficacy of messages countering misinformation. *Psychological Science* **28**, 1531–1546 (2017).
87. Walter, N. & Murphy, S. T. How to unring the bell: A meta-analytic approach to correction of misinformation. *Communication Monographs* **85**, 423–441 (2018).
88. Walter, N. & Tukachinsky, R. A meta-analytic examination of the continued influence of misinformation in the face of correction: How powerful is it, why does it happen, and how to stop it? *Communication Research* **47**, 155–177 (2020).
89. Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N. & Cook, J. Misinformation and its correction: Continued influence and successful debiasing. *Psychological Science in the Public Interest* **13**, 106–131 (2012).
90. Barrera, O., Guriev, S., Henry, E. & Zhuravskaya, E. Facts, alternative facts, and fact checking in times of post-truth politics. *Journal of Public Economics* **182**, 104123 (2020).
91. Swire, B., Berinsky, A. J., Lewandowsky, S. & Ecker, U. K. H. Processing political misinformation: comprehending the Trump phenomenon. *Royal Society Open Science* **4**, 160802 (2017).
92. Swire, B., Ecker, U. K. H. & Lewandowsky, S. The role of familiarity in correcting inaccurate information. *Journal of Experimental Psychology: Learning Memory, and Cognition* **43**, 1948–1961 (2017).
93. Hamby, A., Ecker, U. K. H. & Brinberg, D. How stories in memory perpetuate the continued influence of false information. *Journal of Consumer Psychology* **30**, 240–259 (2019).
94. MacFarlane, D., Tay, L. Q., Hurlstone, M. J. & Ecker, U. K. H. Refuting spurious COVID-19 treatment claims reduces demand and misinformation sharing. *Journal of Applied Research in Memory and Cognition* **10**, 248–258 (2021).
95. Tay, L. Q., Hurlstone, M. J., Kurz, T. & Ecker, U. K. H. A comparison of prebunking and debunking interventions for implied versus explicit misinformation. *British Journal of Psychology* (2021).
96. Nyhan, B., Reifler, J., Richey, S. & Freed, G. L. Effective messages in vaccine promotion: A randomized trial. *Pediatrics* **133**, e835–e842 (2014).
97. Poland, G. A. & Spier, R. Fear misinformation, and innumerates: How the Wakefield paper, the press, and advocacy groups damaged the public health. *Vaccine* **28**, 2361–2362 (2010).
98. Lewandowsky, S., Stritzke, W. G. K., Oberauer, K. & Morales, M. Memory for fact, fiction, and misinformation. *Psychological Science* **16**, 190–195 (2005).

99. Ecker, U. K. H., Lewandowsky, S. & Tang, D. T. W. Explicit warnings reduce but do not eliminate the continued influence of misinformation. *Memory & Cognition* **38**, 1087–1100 (2010).
100. Kendeou, P., Walsh, E. K., Smith, E. R. & O'Brien, E. J. Knowledge revision processes in refutation texts. *Discourse Processes* **51**, 374–397 (2014).
101. Shtulman, A. & Valcarcel, J. Scientific knowledge suppresses but does not supplant earlier intuitions. *Cognition* **124**, 209–215 (2012).
102. Kendeou, P., Butterfuss, R., Kim, J. & Boekel, M. V. Knowledge revision through the lenses of the three-pronged approach. *Memory & Cognition* **47**, 33–46 (2019).
103. Ithisuphalap, J., Rich, P. R. & Zaragoza, M. S. Does evaluating belief prior to its retraction influence the efficacy of later corrections? *Memory* **28**, 617–631 (2020).
104. Ecker, U. K. H., Hogan, J. L. & Lewandowsky, S. Reminders and repetition of misinformation: Helping or hindering its retraction? *Journal of Applied Research in Memory and Cognition* **6**, 185–192 (2017).
105. Brydges, C. R., Gignac, G. E. & Ecker, U. K. H. Working memory capacity, short-term memory capacity, and the continued influence effect: A latent-variable analysis. *Intelligence* **69**, 117–122 (2018).
106. Sanderson, J. A., Gignac, G. E. & Ecker, U. K. H. Working memory capacity, removal efficiency and event specific memory as predictors of misinformation reliance. *Journal of Cognitive Psychology* **33**, 518–532 (2021).
107. Ecker, U. K. H., Lewandowsky, S., Swire, B. & Chang, D. Correcting false information in memory: Manipulating the strength of misinformation encoding and its retraction. *Psychonomic Bulletin & Review* **18**, 570–578 (2011).
108. Yonelinas, A. P. The nature of recollection and familiarity: A review of 30 years of research. *Journal of Memory and Language* **46**, 441–517 (2002).
109. Butterfuss, R. & Kendeou, P. Reducing interference from misconceptions: The role of inhibition in knowledge revision. *Journal of Educational Psychology* **112**, 782–794 (2020).
110. Brydges, C. R., Gordon, A. & Ecker, U. K. H. Electrophysiological correlates of the continued influence effect of misinformation: An exploratory study. *Journal of Cognitive Psychology* **32**, 771–784 (2020).
111. Gordon, A., Quadflieg, S., Brooks, J. C. W., Ecker, U. K. H. & Lewandowsky, S. Keeping track of 'alternative facts': The neural correlates of processing misinformation corrections. *NeuroImage* **193**, 46–56 (2019).
112. Ecker, U. K. H., O'Reilly, Z., Reid, J. S. & Chang, E. P. The effectiveness of short-format refutational fact-checks. *British Journal of Psychology* **111**, 36–54 (2020).
113. van der Meer, T. G. L. A. & Jin, Y. Seeking formula for misinformation treatment in public health crises: The effects of corrective information type and source. *Health Communication* **35**, 560–575 (2020).
114. Wintersieck, A., Fridkin, K. & Kenney, P. The message matters: The influence of fact-checking on evaluations of political messages. *Journal of Political Marketing* **20**, 93–120 (2021).
115. Amazeen, M. & Krishna, A. Correcting vaccine misinformation: Recognition and effects of source type on misinformation via perceived motivations and credibility. Preprint at: <http://dx.doi.org/10.2139/ssrn.3698102> (2020)
116. Vraga, E. K. & Bode, L. I do not believe you: How providing a source corrects health misperceptions across social media platforms. *Information Communication & Society* **21**, 1337–1353 (2018).
117. Ecker, U. K. H. & Antonio, L. M. Can you believe it? An investigation into the impact of retraction source credibility on the continued influence effect. *Memory & Cognition* **49**, 631–644 (2021).
118. Guillory, J. J. & Geraci, L. Correcting erroneous inferences in memory: The role of source credibility. *Journal of Applied Research in Memory and Cognition* **2**, 201–209 (2013).
119. Vraga, E. K. & Bode, L. Using expert sources to correct health misinformation in social media. *Science Communication* **39**, 621–645 (2017).
120. Zhang, J., Featherstone, J. D., Calabrese, C. & Wojcieszak, M. Effects of fact-checking social media vaccine misinformation on attitudes toward vaccines. *Preventive Medicine* **145**, 106408 (2021).
121. Connor Desai, S. A., Pilditch, T. D. & Madsen, J. K. The rational continued influence of misinformation. *Cognition* **205**, 104453 (2020).
122. O'Rear, A. E. & Radvansky, G. A. Failure to accept retractions: A contribution to the continued influence effect. *Memory & Cognition* **48**, 127–144 (2020).

123. Ecker, U. K. H. & Ang, L. C. Political attitudes and the processing of misinformation corrections. *Political Psychology* **40**, 241–260 (2019).
124. Nyhan, B. & Reifler, J. When corrections fail: The persistence of political misperceptions. *Political Behavior* **32**, 303–330 (2010).
125. Trevors, G. The roles of identity conflict, emotion, and threat in learning from refutation texts on vaccination and immigration. *Discourse Processes* (2021). <https://doi.org/10.1080/0163853X.2021.1917950>
126. Prasad, M. *et al.* There must be a reason: Osama, Saddam, and inferred justification. *Sociological Inquiry* **79**, 142–162 (2009).
127. Amazeen, M. A., Thorson, E., Muddiman, A. & Graves, L. Correcting political and consumer misperceptions: The effectiveness and effects of rating scale versus contextual correction formats. *Journalism & Mass Communication Quarterly* **95**, 28–48 (2016).
128. Ecker, U. K. H., Sze, B. K. N. & Andreotta, M. Corrections of political misinformation: no evidence for an effect of partisan worldview in a US convenience sample. *Philosophical Transactions of the Royal Society B: Biological Sciences* **376**, 20200145 (2021).
129. Nyhan, B., Porter, E., Reifler, J. & Wood, T. J. Taking fact-checks literally but not seriously? The effects of journalistic fact-checking on factual beliefs and candidate favorability. *Political Behavior* **42**, 939–960 (2019).
130. Wood, T. & Porter, E. The elusive backfire effect: Mass attitudes' steadfast factual adherence. *Political Behavior* **41**, 135–163 (2018).
131. Yang, Q., Qureshi, K. & Zaman, T. Mitigating the backfire effect using pacing and leading. Preprint at: <https://arxiv.org/abs/2008.00049> (2020).
132. Susmann, M. W., & Wegener, D. T. The role of discomfort in the continued influence effect of misinformation. *Memory & Cognition* (2021).
133. Cobb, M. D., Nyhan, B. & Reifler, J. Beliefs don't always persevere: How political figures are punished when positive information about them is discredited. *Political Psychology* **34**, 307–326 (2013).
134. Thorson, E. Belief echoes: The persistent effects of corrected misinformation. *Political Communication* **33**, 460–480 (2016).
135. Jaffé, M. E. & Greifeneder, R. Negative is true here and now but not so much there and then. *Experimental Psychology* **67**, 314–326 (2020).
136. Ecker, U. K. H. & Rodricks, A. E. Do false allegations persist? Retracted misinformation does not continue to influence explicit person impressions. *Journal of Applied Research in Memory and Cognition* **9**, 587–601 (2020).
137. Ecker, U. K. H., Lewandowsky, S. & Apai, J. Terrorists brought down the plane! No actually it was a technical fault: Processing corrections of emotive information. *Quarterly Journal of Experimental Psychology* **64**, 283–310 (2011).
138. Trevors, G., Bohn-Gettler, C. & Kendeou, P. The effects of experimentally induced emotions on revising common vaccine misconceptions. *Quarterly Journal of Experimental Psychology* (2021). doi:10.1177/17470218211017840
139. Chang, E. P., Ecker, U. K. H. & Page, A. C. Not wallowing in misery—Retractions of negative misinformation are effective in depressive rumination. *Cognition and Emotion* **33**, 991–1005 (2019).
140. Sangalang, A., Ophir, Y. & Cappella, J. N. The potential for narrative correctives to combat misinformation. *Journal of Communication* **69**, 298–319 (2019).
141. Featherstone, J. D. & Zhang, J. Feeling angry: The effects of vaccine misinformation and refutational messages on negative emotions and vaccination attitude. *Journal of Health Communication* **25**, 692–702 (2020).
142. Brashier, N. M., Pennycook, G., Berinsky, A. J. & Rand, D. G. Timing matters when correcting fake news. *Proceedings of the National Academy of Sciences of the United States of America* **118**, e2020043118 (2021).
143. Cook, J., Lewandowsky, S. & Ecker, U. K. H. Neutralizing misinformation through inoculation: Exposing misleading argumentation techniques reduces their influence. *PLOS ONE* **12**, e0175799 (2017).
144. Hughes, M. G. *et al.* Discrediting in a message board forum: The effects of social support and attacks on expertise and trustworthiness. *Journal of Computer-Mediated Communication* **19**, 325–341 (2014).
145. Paynter, J. *et al.* Evaluation of a template for countering misinformation—Real-world autism treatment myth debunking. *PLOS ONE* **14**, e0210746 (2019).

146. Jolley, D. & Douglas, K. M. Prevention is better than cure: Addressing anti-vaccine conspiracy theories. *Journal of Applied Social Psychology* **47**, 459–469 (2017).
147. Vraga, E. K., Kim, S. C., Cook, J. & Bode, L. Testing the effectiveness of correction placement and type on Instagram. *The International Journal of Press/Politics* **25**, 632–652 (2020).
148. Clayton, K. *et al.* Real solutions for fake news? Measuring the effectiveness of general warnings and fact-check tags in reducing belief in false stories on social media. *Political Behavior* **42**, 1073–1095 (2019).
149. Dai, Y., Yu, W. & Shen, F. The effects of message order and debiasing information in misinformation correction. *International Journal of Communication* **15**, 21 (2021).
150. Swire-Thompson, B. *et al.* Evidence for a limited role of correction format when debunking misinformation. Preprint at: <https://osf.io/udny9/> (2021).
151. Gordon, A., Ecker, U. K. H. & Lewandowsky, S. Polarity and attitude effects in the continued-influence paradigm. *Journal of Memory and Language* **108**, 104028 (2019).
152. Grady, R. H., Ditto, P. H. & Loftus, E. F. Nevertheless partisanship persisted: Fake news warnings help briefly, but bias returns with time. *Cognitive Research: Principles and Implications* **6**, 52 (2021).
153. Schmid, P., Schwarzer, M. & Betsch, C. Weight-of-evidence strategies to mitigate the influence of messages of science denialism in public discussions. *Journal of Cognition* **3**, 36 (2020).
154. Compton, J., van der Linden, S., Cook, J. & Basol, M. Inoculation theory in the post-truth era: Extant findings and new frontiers for contested science misinformation, and conspiracy theories. *Social and Personality Psychology Compass* **15**, e12602 (2021).
155. Lewandowsky, S. & van der Linden, S. Countering misinformation and fake news through inoculation and prebunking. *European Review of Social Psychology* (2021). doi:10.1080/10463283.2021.1876983
156. Roozenbeek, J., van der Linden, S. & Nygren, T. Prebunking interventions based on the psychological theory of inoculation can reduce susceptibility to misinformation across cultures. *Harvard Kennedy School Misinformation Review* (2020). doi:10.37016//mr-2020-008
157. Maertens, R., Roozenbeek, J., Basol, M. & van der Linden, S. Long-term effectiveness of inoculation against misinformation: Three longitudinal experiments. *Journal of Experimental Psychology: Applied* **27**, 1–16 (2020).
158. van der Linden, S., Leiserowitz, A., Rosenthal, S. & Maibach, E. Inoculating the public against misinformation about climate change. *Global Challenges* **1**, 1600008 (2017).
159. Parker, K. A., Ivanov, B. & Compton, J. Inoculation's efficacy with young adults' risky behaviors: Can inoculation confer cross-protection over related but untreated issues? *Health Communication* **27**, 223–233 (2012).
160. Lewandowsky, S. & Yesilada, M. (2021). Inoculating against the spread of Islamophobic and radical-Islamist disinformation. *Cognitive Research: Principles and Implications* **6**, 57 (2021).
161. Ivanov, B. *et al.* The general content of postinoculation talk: Recalled issue-specific conversations following inoculation treatments. *Western Journal of Communication* **79**, 218–238 (2015).
162. Amazeen, M. A. & Vargo, C. J. Sharing native advertising on Twitter: Content analyses examining disclosure practices and their inoculating influence. *Journalism Studies* **22**, 916–933 (2021).
163. Jones-Jang, S. M., Mortensen, T. & Liu, J. Does media literacy help identification of fake news? Information literacy helps but other literacies don't. *American Behavioral Scientist* **65**, 371–388 (2019).
164. Khan, M. L. & Idris, I. K. Recognise misinformation and verify before sharing: A reasoned action and information literacy perspective. *Behaviour & Information Technology* **38**, 1194–1212 (2019).
165. Machete, P. & Turpin, M. The use of critical thinking to identify fake news: A systematic literature review. *Lecture Notes in Computer Science* **12067**, 235–246 (2020).
166. Vraga, E. K., Tully, M., Maksl, A., Craft, S. & Ashley, S. Theorizing news literacy behaviors. *Communication Theory* **31**, 1–21 (2020).
167. Wineburg, S., McGrew, S., Breakstone, J., & Ortega, T. Evaluating information: The cornerstone of civic online reasoning. *Stanford Digital Repository* (2016). <https://purl.stanford.edu/fv751yt5934>
168. Breakstone, J. *et al.* Lateral reading: College students learn to critically evaluate internet sources in an online course. *Harvard Kennedy School Misinformation Review* (2021). doi:10.37016//mr-2020-56
169. Choy, M. & Chong, M. Seeing through misinformation: A framework for identifying fake online news. Preprint at: <https://arxiv.org/abs/1804.03508> (2018).

170. Amazeen, M. A. & Bucy, E. P. Conferring resistance to digital disinformation: The inoculating influence of procedural news knowledge. *Journal of Broadcasting & Electronic Media* **63**, 415–432 (2019).
171. Guess, A. M. *et al.* A digital media literacy intervention increases discernment between mainstream and false news in the United States and India. *Proceedings of the National Academy of Sciences of the United States of America* **117**, 15536–15545 (2020).
172. Hameleers, M. Separating truth from lies: Comparing the effects of news media literacy interventions and fact-checkers in response to political misinformation in the US and Netherlands. *Information Communication & Society* (2020). doi:10.1080/1369118x.2020.1764603
173. Tully, M., Vraga, E. K. & Bode, L. Designing and testing news literacy messages for social media. *Mass Communication and Society* **23**, 22–46 (2019).
174. Roozenbeek, J. & van der Linden, S. Fake news game confers psychological resistance against online misinformation. *Palgrave Communications* **5**, 65 (2019).
175. Roozenbeek, J. & van der Linden, S. Breaking Harmony Square: A game that inoculates against political misinformation. *Harvard Kennedy School Misinformation Review* (2020). doi:10.37016/mr-2020-47
176. Micallef, N., Avram, M., Menczer, F. & Patil, S. Fakey. *Proceedings of the ACM on Human-Computer Interaction* **5**, 1–27 (2021).
177. Katsaounidou, A., Vrysis, L., Kotsakis, R., Dimoulas, C. & Veglis, A. MATHe the game: A serious game for education and training in news verification. *Education Sciences* **9**, 155 (2019).
178. Mihailidis, P. & Viotty, S. Spreadable spectacle in digital culture: Civic expression, fake news, and the role of media literacies in post-fact society. *American Behavioral Scientist* **61**, 441–454 (2017).
179. Carnahan, D., Bergan, D. E. & Lee, S. Do corrective effects last? Results from a longitudinal experiment on beliefs toward immigration in the U.S. *Political Behavior* **43**, 1227–1246 (2021).
180. Wintersieck, A. L. Debating the truth. *American Politics Research* **45**, 304–331 (2017).
181. Mosleh, M., Martel, C., Eckles, D. & Rand, D. Perverse downstream consequences of debunking: Being corrected by another user for posting false political news increases subsequent sharing of low quality partisan and toxic content in a Twitter field experiment. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (ACM, 2021). doi:10.1145/3411764.3445642
182. Swire-Thompson, B., Ecker, U. K. H., Lewandowsky, S. & Berinsky, A. J. They might be a liar but they're liar: Source evaluation and the prevalence of misinformation. *Political Psychology* **41**, 21–34 (2019).
183. Lewandowsky, S. *et al.* The Debunking Handbook 2020. (2020). <http://doi.org/10.17910/b7.1182>
184. Kendeou, P., Smith, E. R. & O'Brien, E. J. Updating during reading comprehension: Why causality matters. *Journal of Experimental Psychology: Learning Memory, and Cognition* **39**, 854–865 (2013).
185. Schwarz, N., Newman, E. & Leach, W. Making the truth stick & the myths fade: Lessons from cognitive psychology. *Behavioral Science & Policy* **2**, 85–95 (2016).
186. Van Boekel, M., Lassonde, K. A., O'Brien, E. J. & Kendeou, P. Source credibility and the processing of refutation texts. *Memory & Cognition* **45**, 168–181 (2017).
187. Margolin, D. B., Hannak, A. & Weber, I. Political fact-checking on Twitter: When do corrections have an effect? *Political Communication* **35**, 196–219 (2017).
188. Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J. & Griskevicius, V. The constructive, destructive, and reconstructive power of social norms. *Psychological Science* **18**, 429–434 (2007).
189. Chinn, S., Lane, D. S. & Hart, P. S. In consensus we trust? Persuasive effects of scientific consensus communication. *Public Understanding of Science* **27**, 807–823 (2018).
190. Lewandowsky, S., Gignac, G. E. & Vaughan, S. The pivotal role of perceived scientific consensus in acceptance of science. *Nature Climate Change* **3**, 399–404 (2013).
191. van der Linden, S. L., Clarke, C. E. & Maibach, E. W. Highlighting consensus among medical scientists increases public support for vaccines: Evidence from a randomized experiment. *BMC Public Health* **15**, 1207 (2015).
192. van der Linden, S., Leiserowitz, A. & Maibach, E. Scientific agreement can neutralize politicization of facts. *Nature Human Behaviour* **2**, 2–3 (2017).
193. Vlasceanu, M. & Coman, A. The impact of social norms on health-related belief update. *Applied Psychology: Health and Well-Being* (2021).

194. Nyhan, B. & Reifler, J. The roles of information deficits and identity threat in the prevalence of misperceptions. *Journal of Elections, Public Opinion and Parties* **29**, 222–244 (2018).
195. Danielson, R. W., Sinatra, G. M. & Kendeou, P. Augmenting the refutation text effect with analogies and graphics. *Discourse Processes* **53**, 392–414 (2016).
196. Dixon, G. N., McKeever, B. W., Holton, A. E., Clarke, C. & Eosco, G. The power of a picture: Overcoming scientific misinformation by communicating weight-of-evidence information with visual exemplars. *Journal of Communication* **65**, 639–659 (2015).
197. van der Linden, S. L., Leiserowitz, A. A., Feinberg, G. D. & Maibach, E. W. How to communicate the scientific consensus on climate change: Plain facts, pie charts or metaphors? *Climatic Change* **126**, 255–262 (2014).
198. Steffens, M. S., Dunn, A. G., Wiley, K. E. & Leask, J. How organisations promoting vaccination respond to misinformation on social media: a qualitative investigation. *BMC Public Health* **19**, 1348 (2019).
199. Hyland-Wood, B., Gardner, J., Leask, J. & Ecker, U. K. H. Toward effective government communication strategies in the era of COVID-19. *Humanities and Social Sciences Communications* **8**, 30 (2021).
200. Sherman, D. K. & Cohen, G. L. Accepting threatening information: Self-affirmation and the reduction of defensive biases. *Current Directions in Psychological Science* **11**, 119–123 (2002).
201. Carnahan, D., Hao, Q., Jiang, X. & Lee, H. Feeling fine about being wrong: The influence of self-affirmation on the effectiveness of corrective information. *Human Communication Research* **44**, 274–298 (2018).
202. Vraga, E. K. & Bode, L. Correction as a solution for health misinformation on social media. *American Journal of Public Health* **110**, S278–S280 (2020).
203. Bode, L. & Vraga, E. K. In related news, that was wrong: The correction of misinformation through related stories functionality in social media. *Journal of Communication* **65**, 619–638 (2015).
204. Vraga, E. K. & Bode, L. Addressing COVID-19 misinformation on social media preemptively and responsively. *Emerging Infectious Diseases* **27**, 396–403 (2021).
205. Vijaykumar, S. *et al.* How shades of truth and age affect responses to COVID-19 (mis)information: Randomized survey experiment among WhatsApp users in UK and Brazil. *Humanities and Social Sciences Communications* **8**, (2021).
206. Bode, L. & Vraga, E. K. See something say something: Correction of global health misinformation on social media. *Health Communication* **33**, 1131–1140 (2017).
207. Pennycook, G. *et al.* Shifting attention to accuracy can reduce misinformation online. *Nature* **592**, 590–595 (2021).
208. Matz, S. C., Kosinski, M., Nave, G. & Stillwell, D. J. Psychological targeting as an effective approach to digital mass persuasion. *Proceedings of the National Academy of Sciences of the United States of America* **114**, 12714–12719 (2017).
209. Vargo, C. J., Guo, L. & Amazeen, M. A. The agenda-setting power of fake news: A big data analysis of the online media landscape from 2014 to 2016. *New Media & Society* **20**, 2028–2049 (2018).
210. Allington, D., Duffy, B., Wessely, S., Dhavan, N. & Rubin, J. Health-protective behavior, social media usage and conspiracy belief during the COVID-19 public health emergency. *Psychological Medicine* **51**, 1763–1769 (2020).
211. Cook, J., Bedford, D. & Mandia, S. Raising climate literacy through addressing misinformation: Case studies in agnotology-based learning. *Journal of Geoscience Education* **62**, 296–306 (2014).
212. Amazeen, M. A. News in an era of content confusion: Effects of news use motivations and context on native advertising and digital news perceptions. *Journalism & Mass Communication Quarterly* **97**, 161–187 (2020).
213. Lawrence, R. G. & Boydston, A. E. What we should really be asking about media attention to Trump. *Political Communication* **34**, 150–153 (2016).
214. Schmid, P., MacDonald, N. E., Habersaat, K. & Butler, R. Commentary to: How to respond to vocal vaccine deniers in public. *Vaccine* **36**, 196–198 (2018).
215. Shelby, A. & Ernst, K. Story and science. *Human Vaccines & Immunotherapeutics* **9**, 1795–1801 (2013).
216. Lazić, A. & Žeželj, I. A systematic review of narrative interventions: Lessons for countering anti-vaccination conspiracy theories and misinformation. *Public Understanding of Science* **30**, 644–670 (2021).

217. Ecker, U. K. H., Butler, L. H. & Hamby, A. You don't have to tell a story! A registered report testing the effectiveness of narrative versus non-narrative misinformation corrections. *Cognitive Research: Principles and Implications* **5**, 64 (2020).
218. Van Bavel, J. J., Reinero, D. A., Spring, V., Harris, E. A. & Duke, A. Speaking my truth: Why personal experiences can bridge divides but mislead. *Proceedings of the National Academy of Sciences of the United States of America* **118**, e2100280118 (2021).
219. Merpert, A., Furman, M., Anauati, M. V., Zommer, L. & Taylor, I. Is that even checkable? An experimental study in identifying checkable statements in political discourse. *Communication Research Reports* **35**, 48–57 (2017).
220. Amazeen, M. A. & Wojdyski, B. W. Reducing native advertising deception: Revisiting the antecedents and consequences of persuasion knowledge in digital news contexts. *Mass Communication and Society* **22**, 222–247 (2019).
221. Peacock, C., Masullo, G. M. & Stroud, N. J. What's in a label? The effect of news labels on perceived credibility. *Journalism* (2020). doi:10.1177/1464884920971522
222. Ecker, U. K. H., Lewandowsky, S. & Chadwick, M. Can corrections spread misinformation to new audiences? Testing for the elusive familiarity backfire effect. *Cognitive Research: Principles and Implications* **5**, 41 (2020).
223. McCright, A. M. & Dunlap, R. E. Combatting misinformation requires recognizing its types and the factors that facilitate its spread and resonance. *Journal of Applied Research in Memory and Cognition* **6**, 389–396 (2017).
224. Oreskes, N. & Conway, E. M. Defeating the merchants of doubt. *Nature* **465**, 686–687 (2010).
225. Golovchenko, Y., Hartmann, M. & Adler-Nissen, R. State media and civil society in the information warfare over Ukraine: Citizen curators of digital disinformation. *International Affairs* **94**, 975–994 (2018).
226. Tandoc, E. C., Lim, Z. W. & Ling, R. Defining fake news. *Digital Journalism* **6**, 137–153 (2017).
227. Mosleh, M., Pennycook, G., Arechar, A. A. & Rand, D. G. Cognitive reflection correlates with behavior on Twitter. *Nature Communications* **12**, 921 (2021).
228. Scheufele, D. A. & Krause, N. M. Science audiences misinformation, and fake news. *Proceedings of the National Academy of Sciences of the United States of America* **116**, 7662–7669 (2019).
229. Yesilada, M. & Lewandowsky, S. A systematic review: The YouTube recommender system and pathways to problematic content. Preprint at: <https://psyarxiv.com/6pv5c/> (2021).
230. Bursztyjn, L., Rao, A., Roth, C. & Yanagizawa-Drott, D. Misinformation during a pandemic. Preprint at: <https://www.nber.org/papers/w27417> (2020).
231. Simonov, A., Sacher, S., Dubé, J.-P. & Biswas, S. The persuasive effect of Fox News: Non-compliance with social distancing during the Covid-19 pandemic. Preprint at: <https://www.nber.org/papers/w27237> (2020).
232. Bechmann, A. Tackling disinformation and infodemics demands media policy changes. *Digital Journalism* **8**, 855–863 (2020).
233. Marsden, C., Meyer, T. & Brown, I. Platform values and democratic elections: How can the law regulate digital disinformation? *Computer Law & Security Review* **36**, 105373 (2020).
234. Saurwein, F. & Spencer-Smith, C. Combating disinformation on social media: Multilevel governance and distributed accountability in Europe. *Digital Journalism* **8**, 820–841 (2020).
235. Tenove, C. Protecting democracy from disinformation: Normative threats and policy responses. *The International Journal of Press/Politics* **25**, 517–537 (2020).
236. Reisach, U. The responsibility of social media in times of societal and political manipulation. *European Journal of Operational Research* **291**, 906–917 (2021).
237. Lewandowsky, S. *et al.* Technology and democracy: Understanding the influence of online technologies on political behaviour and decision-making. *Publications Office of the European Union, Luxembourg* (2020). doi:10.2760/593478, JRC122023
238. Blasio, E. D. & Selva, D. Who is responsible for disinformation? European approaches to social platforms' accountability in the post-truth era. *American Behavioral Scientist* **65**, 825–846 (2021).
239. Pickard, V. Restructuring democratic infrastructures: A policy approach to the journalism crisis. *Digital Journalism* **8**, 704–719 (2020).

240. Barzilai, S. & Chinn, C. A. A review of educational responses to the post-truth condition: Four lenses on post-truth problems. *Educational Psychologist* **55**, 107–119 (2020).
241. Lee, N. M. Fake news, phishing, and fraud: A call for research on digital media literacy education beyond the classroom. *Communication Education* **67**, 460–466 (2018).
242. Sinatra, G. M. & Lombardi, D. Evaluating sources of scientific evidence and claims in the post-truth era may require reappraising plausibility judgments. *Educational Psychologist* **55**, 120–131 (2020).
243. Vraga, E. K. & Bode, L. Leveraging institutions, educators, and networks to correct misinformation: A commentary on Lewandowsky, Ecker, and Cook. *Journal of Applied Research in Memory and Cognition* **6**, 382–388 (2017).
244. Lorenz-Spreen, P., Lewandowsky, S., Sunstein, C. R. & Hertwig, R. How behavioural sciences can promote truth, autonomy and democratic discourse online. *Nature Human Behaviour* **4**, 1102–1109 (2020).
245. Tsipursky, G., Votta, F. & Mulick, J. A. A psychological approach to promoting truth in politics: The pro-truth pledge. *Journal of Social and Political Psychology* **6**, 271–290 (2018).
246. Bak-Coleman, J. B. *et al.* Combining interventions to reduce the spread of viral misinformation. Preprint at: <https://osf.io/preprints/socarxiv/4jtvn/> (2021).
247. Ognyanova, K., Lazer, D., Robertson, R. E. & Wilson, C. Misinformation in action: Fake news exposure is linked to lower trust in media, higher trust in government when your side is in power. *Harvard Kennedy School Misinformation Review* (2020). doi:10.37016/mr-2020-024
248. Swire-Thompson, B. & Lazer, D. Public health and online misinformation: Challenges and recommendations. *Annual Review of Public Health* **41**, 433–451 (2020).
249. Boele-Woelki, K., Francisco, J. S., Hahn, U. & Herz, J. How we can rebuild trust in science and why we must. *Angewandte Chemie International Edition* **57**, 13696–13697 (2018).
250. Klein, O. *et al.* A practical guide for transparency in psychological science. *Collabra: Psychology* **4**, 20 (2018).
251. Masullo, G. M., Curry, A. L., Whipple, K. N. & Murray, C. The story behind the story: Examining transparency about the journalistic process and news outlet credibility. *Journalism Practice* (2021) doi:10.1080/17512786.2020.1870529.
252. Amazeen, M. A. Checking the fact-checkers in 2008: Predicting political ad scrutiny and assessing consistency. *Journal of Political Marketing* **15**, 433–464 (2014).
253. Hahl, O., Kim, M. & Sivan, E. W. Z. The authentic appeal of the lying demagogue: Proclaiming the deeper truth about political illegitimacy. *American Sociological Review* **83**, 1–33 (2018).
254. Jaiswal, J., LoSchiavo, C. & Perlman, D. C. Disinformation, misinformation and inequality-driven mistrust in the time of COVID-19: Lessons unlearned from AIDS denialism. *AIDS and Behavior* **24**, 2776–2780 (2020).
255. Cheon, B. K., Melani, I. & Hong, Y. How USA-centric is psychology? An archival study of implicit assumptions of generalizability of findings to human nature based on origins of study samples. *Social Psychological and Personality Science* **11**, 928–937 (2020).
256. Swire-Thompson, B., DeGutis, J. & Lazer, D. Searching for the backfire effect: Measurement and design considerations. *Journal of Applied Research in Memory and Cognition* **9**, 286–299 (2020).
257. Wang, Y., McKee, M., Torbica, A. & Stuckler, D. Systematic literature review on the spread of health-related misinformation on social media. *Social Science & Medicine* **240**, 112552 (2019).
258. Bastani, P. & Bahrami, M. A. COVID-19 related misinformation on social media: A qualitative study from Iran. *Journal of Medical Internet Research* (2020). doi:10.2196/18932
259. Arata, N. B., Torneo, A. R. & Contreras, A. P. Partisanship, political support, and information processing among President Rodrigo Duterte's supporters and non-supporters. *Philippine Political Science Journal* **41**, 73–105 (2020).
260. Islam, A. K. M. N., Laato, S., Talukder, S. & Sutinen, E. Misinformation sharing and social media fatigue during COVID-19: An affordance and cognitive load perspective. *Technological Forecasting and Social Change* **159**, 120201 (2020).
261. Xu, Y., Wong, R., He, S., Veldre, A. & Andrews, S. Is it smart to read on your phone? The impact of reading format and culture on the continued influence of misinformation. *Memory & Cognition* **48**, 1112–1127 (2020).
262. Lyons, B., Mérola, V., Reifler, J. & Stoeckel, F. How politics shape views toward fact-checking: Evidence from six European countries. *The International Journal of Press/Politics* **25**, 469–492 (2020).

263. Porter, E. & Wood, T. J. The global effectiveness of fact-checking: Evidence from simultaneous experiments in Argentina, Nigeria, South Africa, and the United Kingdom. *Proceedings of the National Academy of Sciences of the United States of America* **118**, e2104235118 (2021).
264. Ecker, U. K. H., Lewandowsky, S., Chang, E. P. & Pillai, R. The effects of subtle misinformation in news headlines. *Journal of Experimental Psychology: Applied* **20**, 323–335 (2014).
265. Powell, D., Bian, L. & Markman, E. M. When intents to educate can misinform: Inadvertent paltering through violations of communicative norms. *PLOS ONE* **15**, e0230360 (2020).
266. Rich, P. R. & Zaragoza, M. S. The continued influence of implied and explicitly stated misinformation in news reports. *Journal of Experimental Psychology: Learning Memory, and Cognition* **42**, 62–74 (2016).
267. Shen, C. *et al.* Fake images: The effects of source intermediary and digital media literacy on contextual assessment of image credibility online. *New Media & Society* **21**, 438–463 (2018).
268. Barari, S., Lucas, C. & Munger, K. Political deepfakes are as credible as other fake media and (sometimes) real media. Preprint at: <https://osf.io/cdfh3/> (2021).
269. Young, D. G., Jamieson, K. H., Poulsen, S. & Goldring, A. Fact-checking effectiveness as a function of format and tone: Evaluating FactCheck.org and FlackCheck.org. *Journalism & Mass Communication Quarterly* **95**, 49–75 (2017).
270. Vraga, E. K., Kim, S. C. & Cook, J. Testing logic-based and humor-based corrections for science health, and political misinformation on social media. *Journal of Broadcasting & Electronic Media* **63**, 393–414 (2019).
271. Dunn, A. G. *et al.* Mapping information exposure on social media to explain differences in HPV vaccine coverage in the United States. *Vaccine* **35**, 3033–3040 (2017).
272. Marinescu, I. E., Lawlor, P. N. & Kording, K. P. Quasi-experimental causality in neuroscience and behavioural research. *Nature Human Behaviour* **2**, 891–898 (2018).
273. Van Bavel, J. J. *et al.* Political psychology in the digital (mis)information age: A model of news belief and sharing. *Social Issues and Policy Review* **15**, 84–113 (2021).
274. Kuklinski, J. H., Quirk, P. J., Jerit, J., Schwieder, D. & Rich, R. F. Misinformation and the currency of democratic citizenship. *The Journal of Politics* **62**, 790–816 (2000).
275. Shelke, S. & Attar, V. Source detection of rumor in social network: A review. *Online Social Networks and Media* **9**, 30–42 (2019).
276. Brady, W. J., Gantman, A. P. & Van Bavel, J. J. Attentional capture helps explain why moral and emotional content go viral. *Journal of Experimental Psychology: General* **149**, 746–756 (2020).
277. Brady, W. J., Wills, J. A., Jost, J. T., Tucker, J. A. & Van Bavel, J. J. Emotion shapes the diffusion of moralized content in social networks. *Proceedings of the National Academy of Sciences of the United States of America* **114**, 7313–7318 (2017).
278. Fazio, L. Pausing to consider why a headline is true or false can help reduce the sharing of false news. *Harvard Kennedy School Misinformation Review* (2020). doi:10.37016/mr-2020-009
279. Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G. & Rand, D. G. Fighting COVID-19 misinformation on social media: Experimental evidence for a scalable accuracy-nudge intervention. *Psychological Science* **31**, 770–780 (2020).
280. Pew Research Center. Many Americans say made-up news is a critical problem that needs to be fixed. (2019). https://www.journalism.org/wp-content/uploads/sites/8/2019/06/PJ_2019.06.05_Misinformation_FINAL-1.pdf
281. Pew Research Center. *Many Americans believe fake news is sowing confusion.* (2016). https://www.journalism.org/wp-content/uploads/sites/8/2016/12/PJ_2016.12.15_fake-news_FINAL.pdf
282. Altay, S., Araujo, E. de & Mercier, H. If this account is true, it is most enormously wonderful: Interestingness-if-true and the sharing of true and false news. *Digital Journalism* (2021). <https://doi.org/10.1080/21670811.2021.1941163>
283. Brady, W. J., Crockett, M. J. & Van Bavel, J. J. The MAD model of moral contagion: The role of motivation, attention, and design in the spread of moralized content online. *Perspectives on Psychological Science* **15**, 978–1010 (2020).
284. Crockett, M. J. Moral outrage in the digital age. *Nature Human Behaviour* **1**, 769–771 (2017).
285. Petersen, M. B., Osmundsen, M. & Arceneaux, K. The “need for chaos” and motivations to share hostile political rumors. Preprint at: <https://psyarxiv.com/6m4ts/> (2020).

286. Ecker, U. K. H., Lewandowsky, S., Jayawardana, K. & Mladenovic, A. Refutations of equivocal claims: No evidence for an ironic effect of counterargument number. *Journal of Applied Research in Memory and Cognition* **8**, 98–107 (2019).
287. Skurnik, I., Yoon, C., Park, D. C. & Schwarz, N. How warnings about false claims become recommendations. *Journal of Consumer Research* **31**, 713–724 (2005).
288. Schwarz, N., Sanna, L. J., Skurnik, I. & Yoon, C. Metacognitive experiences and the intricacies of setting people straight: Implications for debiasing and public information campaigns. *Advances in Experimental Social Psychology* **39**, 127–161 (2007).
289. Cameron, K. A. *et al.* Patient knowledge and recall of health information following exposure to facts and myths message format variations. *Patient Education and Counseling* **92**, 381–387 (2013).
290. Wahlheim, C. N., Alexander, T. R. & Peske, C. D. Reminders of everyday misinformation statements can enhance memory for and belief in corrections of those statements in the short term. *Psychological Science* **31**, 1325–1339 (2020).
291. Autry, K. S. & Duarte, S. E. Correcting the unknown: Negated corrections may increase belief in misinformation. *Applied Cognitive Psychology* **35**, 960–975 (2021).
292. Pluviano, S., Watt, C. & Della Sala, S. Misinformation lingers in memory: Failure of three pro-vaccination strategies. *PLOS ONE* **12**, e0181640 (2017).
293. Taber, C. S. & Lodge, M. Motivated skepticism in the evaluation of political beliefs. *American Journal of Political Science* **50**, 755–769 (2006).
294. Nyhan, B., Reifler, J. & Ubel, P. A. The hazards of correcting myths about health care reform. *Medical Care* **51**, 127–132 (2013).
295. Hart, P. S. & Nisbet, E. C. Boomerang effects in science communication. *Communication Research* **39**, 701–723 (2011).
296. Swire-Thompson, B., Miklaucic, N., Wihbey, J., Lazer, D. & DeGutis, J. Backfire effects after correcting misinformation are strongly associated with reliability. *Journal of Experimental Psychology: General* (2021).
297. Zhou, J. Boomerangs versus javelins: How polarization constrains communication on climate change. *Environmental Politics* **25**, 788–811 (2016).