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Review

On the role of memory in misinformation corrections: Repeated exposure, correction durability, and source credibility

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Abstract

Misinformation can negatively affect cognition, beliefs, and behavior, and thus contribute to societal disruption. Correcting misinformation can counteract these effects by updating memory and beliefs. In this selective review, we highlight recent perspectives on and evidence for the role of memory in the efficacy of correction methods. Two theoretical accounts propose that repeating misinformation can impair or improve correction efficacy to the extent that familiarity or integrative encoding prevails. We summarize evidence that recollection of corrections can counteract potential interference from misinformation repetitions on memory and belief updating. The efficacy of such updating also declines over time, especially when misinformation sources are not remembered. We call for more research on the role of memory in everyday misinformation corrections to better understand interactions among these processes.

Addresses

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Misinformation is a significant societal problem that has exploded in visibility after the 2016 US presidential election [1]. Misinformation, defined as inaccurate information presented as true [2], can affect cognition, beliefs, and behavior, thus negatively impacting the well-being of people and societies [3]. For example, COVID-19 misinformation beliefs and

sharing were associated with less hand washing and social distancing [4] and lower intentions to vaccinate [5]. Exposure to misinformation is difficult to prevent because it can spread more quickly than accurate information [6]. However, corrections can mitigate misinformation effects (for a review, see [7]) to varying degrees (for reviews, see [8,9]). Here, we review recent work on three issues regarding misinformation correction effects, emphasizing the role of memory in correction efficacy.

We first discuss work showing that repeating misinformation during corrections can increase misperceptions of accuracy or establish associations between conflicting information. We then discuss work examining the durability of corrections effects over time. Finally, we discuss work examining whether perceptions of misinformation and correction sources influence correction efficacy, especially when the sources and information consumers share worldviews. We conclude with research directions, focusing on the relationship between memory and beliefs in misinformation and corrections.

Repeating misinformation: familiarity backfire, integrative encoding, or both?

You may have learned that the coronavirus vaccine is linked to monkeypox, then but later learned that there is no evidence for this relationship. Misinformation corrections like this that remind people of misinformation when correcting can reduce inaccurate beliefs [10], but can sometimes backfire by make misinformation seem more true [11–13]. One account of this backfire is that repeating misinformation makes it more familiar, and that fluent feeling is mistaken for truth [14] (Figure 1, left). This aligns with the dual process view that familiarity influences expressions of memory more when people cannot recollect peripheral details, such as from whom or where information was learned [15]. It is also compatible with work showing that repeated falsehoods are more believable than less familiar statements [16,17]. This has created controversy about whether repeating misinformation with corrections causes familiarity to backfire (for a review, see [8]).

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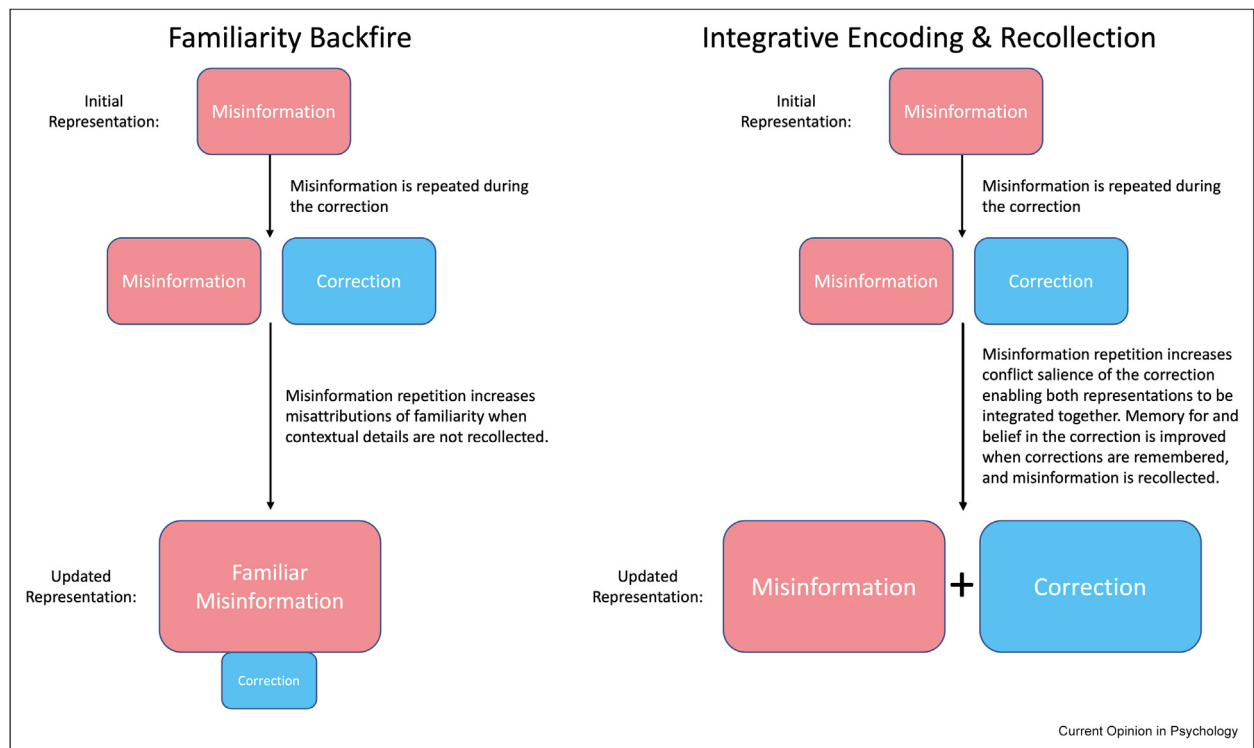
For complete overview about the section, refer [Generation COVID: Coming of Age Amid the Pandemic \(2024\)](#)

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Figure 1



The Familiarity Backfire account (left) proposes that when misinformation details are repeated during the correction this increases the familiarity of the misinformation. When peripheral details, such as from whom or where information was learned, are not later recollected people then believe the misinformation more because it feels familiar. Conversely, the Integrative Encoding account (right) proposes that by reiterating misinformation details during the correction, it increases the salience of the conflict between the misinformation and correction details. This process helps people form integrated memory representations that incorporate details of true and false information and their veracity. When integrated memories are later recollected, people can use these details to better report correct information and more accurately rate the veracity of retrieved details.

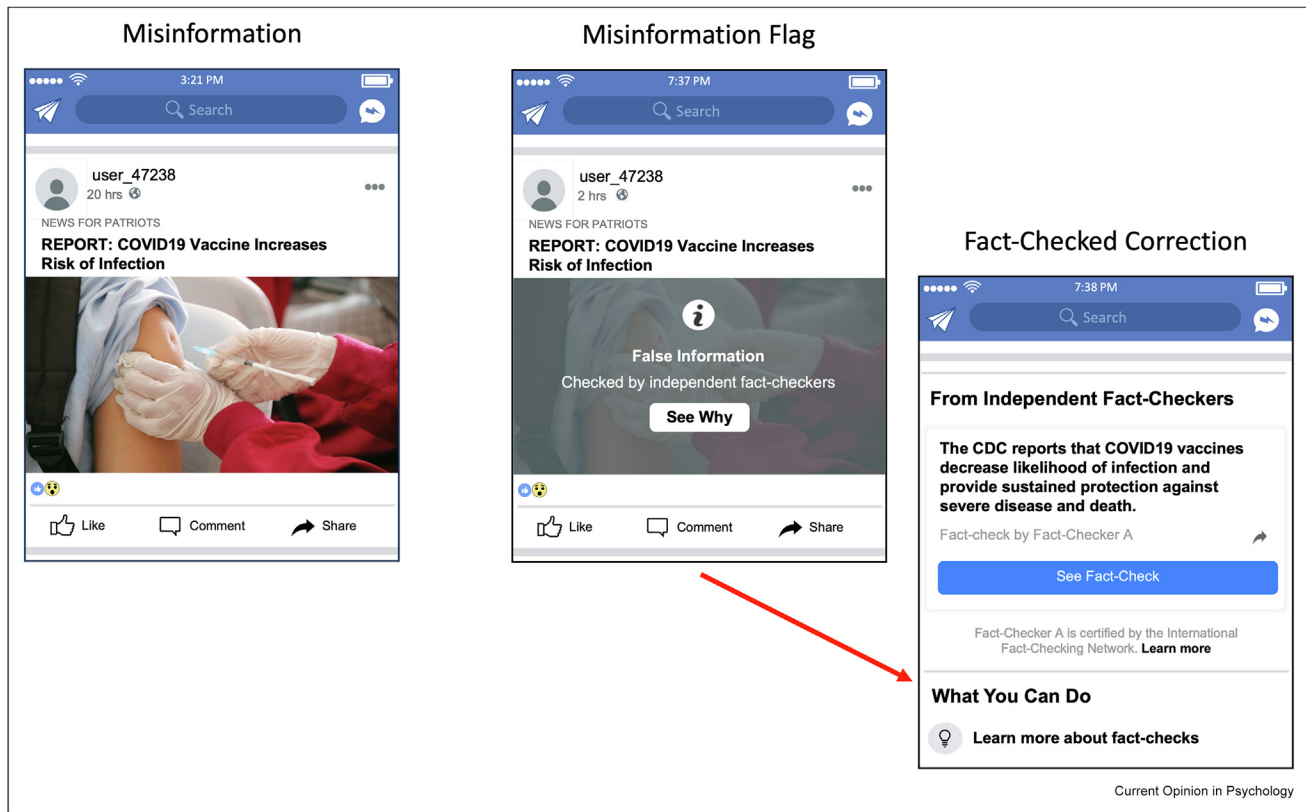
Familiarity backfire was initially shown in a study of flu vaccine flyer efficacy [11]. Presenting myths before facts on a flyer led to myths being immediately identified as false, but after a 30 min delay, participants misremembered myths as being facts. Similar effects were more recently observed when debunking the autism-vaccine link [12,13] and negating fictional health-related statements [18]. However, evidence indicates that backfire is rare [19–21]. Backfire following corrected misinformation was not observed when recollected details were reduced by a three-week delay [22] and cognitive load during encoding [23]. Backfire may actually be an artifact of some inappropriate designs, as when baseline beliefs are not measured or when only one item is used (for a review, see [21]). Backfire is also more likely for unreliable items [24]. These findings suggest that backfire has often been inappropriately assessed and could reflect measurement error. This limits concerns about the risk of backfire in everyday settings.

An opposing account proposes that repeating misinformation can enhance correction efficacy. The

argument is that making the conflict between false and true details more salient by repeating misinformation helps people encode, integrate, and remember those details better (Figure 1, right). Corrections are therefore less effective when people do not notice that details conflict. Support for this view was shown when telling people about earlier read misinformation while correcting it reduced inaccurate inferences about narrative story details [25]. Similarly, when texts refuted previously read misinformation, people understood correct information better and processed it more quickly [26]. This could be because having misinformation and its correction in mind helps people detect conflict and form memories including all the details and information about their veracity (i.e., integrative encoding).

Several recent studies on fake news corrections from the internet show support for the integrative encoding proposal. Reminder-based corrections often repeat headline details and imagery from fake news before presenting real news details. Figure 2 shows examples

Figure 2



The images above represent how people could be exposed to misinformation and later received reminder-based corrections on social media sites, such as Facebook. The fake news headline (left) could include a statement with misinformation and a related image. That misinformation could later be corrected with a flag (middle), which serves as a reminder, and also indicates that fact checkers deemed the headline to be false. After flagging the misinformation reminder, an explanation including true information could then be provided to explain why the prior headline is false (right).

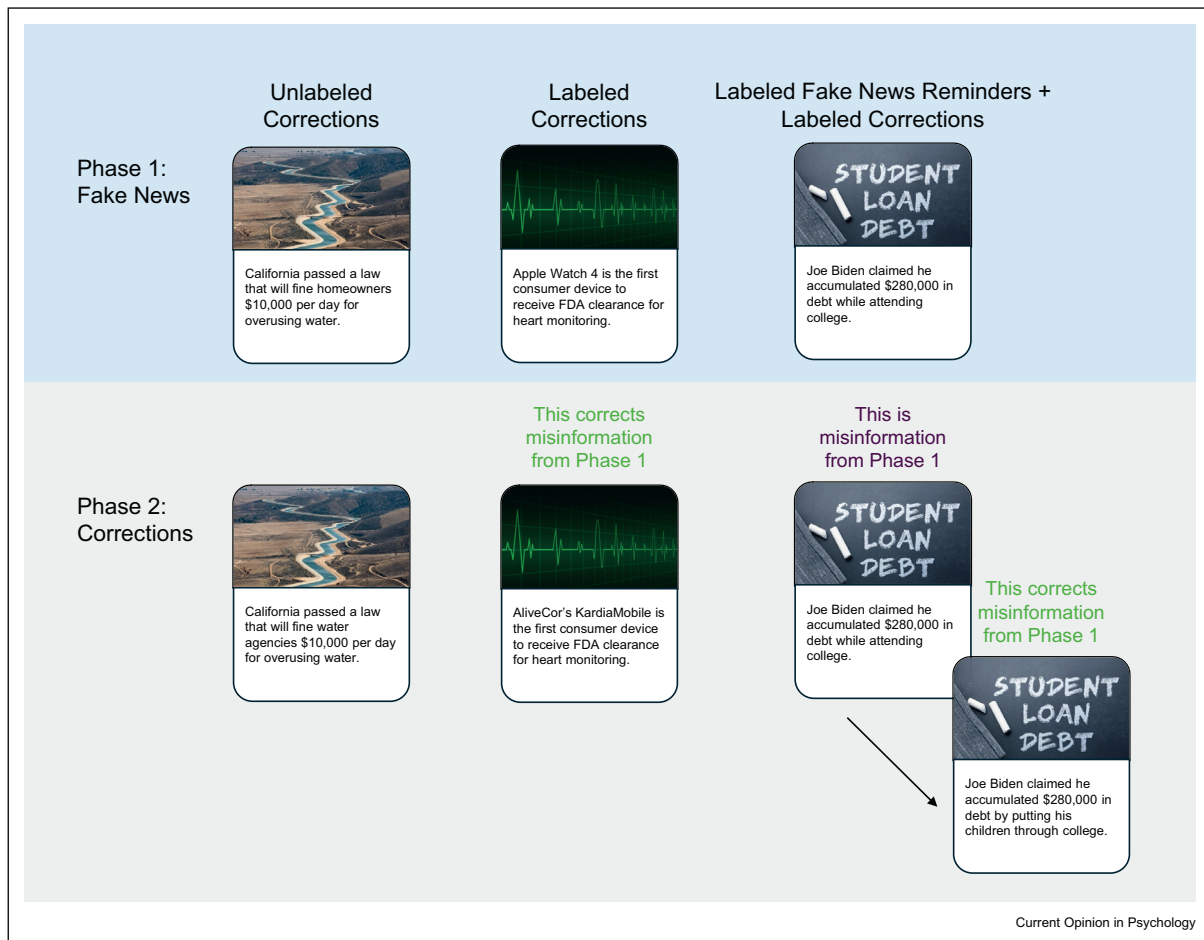
like those on the social media site Facebook. Studies evaluated this technique using actual fake news statements from the internet. Reminders of fake news statements before corrections including real news statements enhanced memory and belief accuracy [27]. Such accuracy after reminders was highest when participants could remember that an earlier headline corrected misinformation, suggesting that participants encoded fake and real news details together. When participants did not recollect corrections, memory and belief accuracy was reduced because fake news familiarity was able to exert its unwanted influence. The importance of recollecting corrections for memory and belief accuracy was also shown when participants attempted to recall fake news while reading real news corrections [28].

A further study of this sort showed that conflict saliency and integrative encoding separately contribute to memory and belief accuracy [29]. To disentangle these contributions, two conditions included real news corrections with labels indicating that the details were true (Figure 3). One condition included labels with real

news corrections to increase conflict saliency. Another condition included labeled fake news reminders before labeled real news corrections to increase conflict saliency and the potential for integrative encoding. A third condition included unlabeled real news corrections that presumably had the least salient conflict. Memory accuracy for headline details was greater when fake news reminders appeared before labeled real news and intermediate when only labeled real news appeared. This suggested that reminders promoted conflict saliency and integrative encoding. Memory accuracy was also lowest when real news appeared without labels, suggesting that labels improved memory by enhancing conflict saliency. Moreover, differences in overall memory accuracy across conditions correlated with differences in recalling real and fake news details together, implicating a critical role of integrative encoding in all conditions that was promoted most by fake news reminders.

The work above shows how repeating misinformation can improve memory and belief accuracy by highlighting conflict, enabling integrative encoding of true

Figure 3



The headlines above illustrate the three types of fake news correction conditions varying in the labeling methods and inclusion of real and fake news from [29]. In this experiment, fake and real news headlines of unclear veracity appeared in Phase 1 (only fake news is depicted above). In Phase 2, the Unlabeled Corrections condition (left) included real news headlines of unclear veracity, the Labeled Corrections condition (middle) included real news headlines with labels indicating that they corrected fake news from Phase 1, and the Labeled Fake News Reminders + Labeled Corrections condition (right) include fake news headlines from Phase 1 labeled as such immediately followed by real news headlines labeled as corrections of that fake news.

and false details, and promoting recollection of corrections. Importantly, repeating misinformation also led to more errors based on misinformation familiarity when participants did not remember corrections. This approach to evaluating accounts of misinformation correction unifies the views by showing that the key processes can all contribute to varying extents within the same task. The balance of these contributions depends on how well the learning circumstances allowed participants to recollect that misinformation was corrected. These findings suggest that to mitigate the pernicious effects of fake news and guide accurate beliefs, interventions should aim to promote memory for corrections. This may be achieved using reminders, including veracity labels, highlighting the details that conflict, and minimizing the delay between misinformation exposure and correction.

Correction durability depends on memory

The issue of whether to repeat misinformation during corrections has mainly been tested in the short-term (in single sessions). This is perhaps not surprising given the low cost of single-session studies. However, it is difficult to generalize those findings to daily circumstances that require remembering over extended time periods. Research has shown that corrections can immediately reduce belief in misinformation, but those beliefs regress towards baseline over time [22,30–32]. This belief regression pattern holds across various tasks [33,34] and content types, including neuromyths [35], news stories [36] and political misperceptions [20]; it also replicates across countries [37].

Recent work on belief change following reminder-based corrections showed that the more people

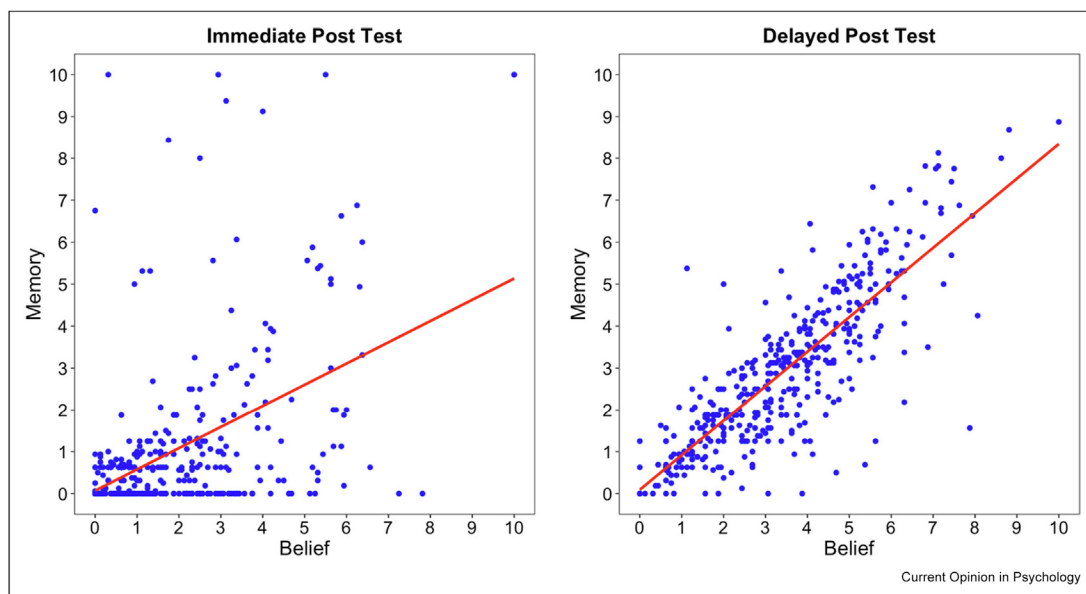
remembered misinformation statements appearing as correct, the more they believed that misinformation (Figure 4; [34]). That study also showed that belief regression was mitigated to the extent that participants remembered corrections. These findings align with the idea that repeated engagement with corrections strengthens their lasting impact [38], possibly by improving their memorability. A recent unpublished study using the fake news headline correction task described above supports this possibility [39]. In that study, participants rated the accuracy of real and fake news headlines, received three correction types including only fake news, only real news, and fake before real news, akin to a social media format. Reminder-based corrections with fake before real news led to the greatest reduction in fake news beliefs and most sustained belief change over a week and a month. The findings also supported a memory-based explanation for belief change: Reminder-based corrections led to the best recollection of corrections and such recollection was associated with sustained belief change. That study showed relationships between memory and beliefs similar to those from the fake news correction studies above [27–29]. However, the consistency of the relationship between memory and belief regression has been shown to vary across delays (i.e., two days [33]); and outcome variables (e.g., beliefs vs. inferential reasoning). Future research is needed to clarify the moderators of this relationship.

Source credibility

Similar to the real-world relevance of correction durability, information sources also affect beliefs and behaviors. For instance, people who perceived COVID-19 media sources as lacking credibility underestimated health risks [40]. When misinformation sources appeared legitimate, people tended to disregard corrections [41] (for a meta-analysis see, [42]). However, corrections have been shown to reduce misinformation reliance when sources appeared trustworthy ([43,44]; Experiment 1); but source trustworthiness did not aide corrections when people thought the corrections themselves were false ([44]; Experiment 2).

The impact of source credibility on misinformation beliefs also depends on how much the source aligns with consumers' worldviews [45]. Political partisans are more likely to believe misinformation when it comes from politically aligned sources than neutral or oppositional sources [42,46,47]. Misinformation corrections are often effective regardless of source, except when the source is from an outgroup [42,46] and wane over time as partisans show belief regression [47]. Further, even when corrections immediately reduce false beliefs, they have little influence on attitudes towards initial misinformation sources: Partisans have been shown to support politically aligned persons and groups even after learning the sources were inaccurate [48,51]. These findings suggest that although credible sources can enhance

Figure 4



The image above shows scatterplots depicting the relationships between memory for corrections and misinformation belief from [34]. In the experimental procedure, participants 1) rated their beliefs in fact and misinformation statements of unclear veracity, 2) read affirmations of facts and corrections of misinformation, then 3) rated their beliefs in the original statements and indicated if they remembered being given veracity information about those statements immediately and after a one-month delay. The strong positive linear relationship increased from the immediate test ($\rho = .51$) to delayed test ($\rho = .82$).

correction efficacy, this does not always happen, especially in politically charged environments [49].

To better understand the moderating role of political congruence in correction efficacy, the underlying mechanisms must be considered. Currently, little is known about the role of memory processes in source/consumer worldview effects on correction efficacy. Only one study has examined consumers' memory for sources and corrections [50]. This research showed that perceived misinformation accuracy depended on observer perceptions of source credibility and motives, but only when people remembered the misinformation source. This research gap emphasizes the need to integrate insights from the literature on correction methods, belief regression, and source credibility. A synthesis of this sort could reveal the extent to which remembering corrections is sufficient for lasting belief change and when worldview attitudes can outweigh memory in guiding consumer perceptions of information accuracy.

Limitations and future directions

The select studies above point to mechanisms and moderators of misinformation correction efficacy, but issues remain. First, studies have shown clear evidence for familiarity-based influences on memory and beliefs following corrections in the absence of recollecting corrections. However, the relationships between correction recollection and changes in both memory and beliefs are imperfect. More work is needed to identify how memory and other variables support such changes. Second, correction efficacy has most often been examined immediately following corrections. Corrected beliefs regress over time, but we have only a limited understanding of the role of memory for corrections in such regression. Third, source credibility can moderate correction efficacy. But it is unclear how simultaneous variations in misinformation and correction source credibility influence memory processes that determine the extent of integration and risk of familiarity-based errors. Finally, correction effects have been examined across task, information, and measurement types, but a unifying framework requires within-study comparisons of the variables discussed here. A more ecologically valid account that informs interventions deployed at scale will require designing studies to include naturalistic content to which large portions of the population have been exposed, such as COVID-19 claims, and diverse international samples (e.g., [37]).

Conclusion

This review summarized studies of three central issues regarding the role of memory in correction effects. Repeating misinformation during corrections can lead to familiarity-based misattributions or promote conflict awareness and integration. Corrections are effective

immediately, but beliefs regress over time partly because people forget the corrections. The efficacy of corrections is better when sources are credible, but it can be undermined when misinformation source and consumer worldviews align. Future research should adopt a dual process perspective to understand the conditions under which corrections will be durable and/or susceptible to source influences depending on how conditions promote recollective memories. It would be valuable to investigate correction effects using representative samples, while simultaneously measuring memory, reasoning, and beliefs. This could help identify the best ways to use memory-based interventions to mitigate the influence of misinformation at scale.

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Declaration of competing interest

The authors have no competing interests to declare.

Data availability

No data was used for the research described in the article.

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- * of special interest
- ** of outstanding interest

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These findings suggest that our ability to sustain post-correction belief change is moderated by how well veracity information is remembered.

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