Metaphors Psychological Theories Live By: The Case of Inoculation Theory in Misinformation Research

Diego Vasquez-Cubas
https://orcid.org/0000-0002-0333-4618

London School of Economics and Political Science
Email: d.vasquez-cubas@lse.ac.uk

Received: June 22, 2026 / Accepted: August 5, 2026
doi: https://doi.org/10.26439/persona2026.n1.8917

ABSTRACT. This article examines the conceptual metaphors MISINFORMATION IS A VIRUS and INTERVENTIONS ARE VACCINES that underpin inoculation theory in misinformation research. While these metaphors have guided the development of prebunking interventions, it is important to be aware of the limitations of metaphors in science if the aim is to identify what this framing might overlook, and what follows from it in practice. Drawing on Conceptual Metaphor Theory (Lakoff & Johnson, 1980) and Speech Act Theory (Austin, 1962), this article addresses two limitations. First, framing misinformation as "infectious" risks pathologising features of communication, beliefs, and reasonable concerns. This framing may generate defensiveness, polarisation, and reduced trust in academic researchers, particularly in contexts where distrust may be warranted. Second, the viral metaphor could depict audiences as passive and equally vulnerable to "contagion," potentially discouraging researchers from actively engaging with communities during intervention design. This article concludes that the inoculation framework should be supplemented with qualitative approaches, collaborative efforts with the populations targeted by interventions, and awareness of the unintended consequences of framing misinformation as a virus. These considerations have important implications for intervention design, uptake, and scalability in misinformation research.

KEYWORDS: conceptual metaphors / speech acts / prebunking / perlocutionary acts / disinformation

METÁFORAS QUE DAN VIDA A TEORÍAS PSICOLÓGICAS: EL CASO DE LA TEORÍA DE LA INOCULACIÓN EN LA INVESTIGACIÓN DE DESINFORMACIÓN

RESUMEN. Este ensayo examina las metáforas conceptuales LA DESINFORMACIÓN ES UN VIRUS y LAS INTERVENCIONES SON VACUNAS que fundamentan la teoría de la inoculación en la investigación sobre desinformación. Si bien este encuadre ha guiado el desarrollo de intervenciones de *prebunking*, es crucial ser consciente de las limitaciones de las metáforas en la ciencia para identificar los aspectos que podrían pasarse por alto. A partir de la Teoría de las Metáforas Conceptuales (Lakoff & Johnson, 1980) y la Teoría de los Actos de Habla (Austin, 1962), este ensayo identifica dos limitaciones. Primero, comunicar la desinformación como "infecciosa" conlleva el riesgo de patologizar características de la comunicación, creencias y preocupaciones razonables. Esto puede generar actitudes defensivas, polarización y menor confianza en los investigadores, particularmente en contextos donde la desconfianza puede estar justificada. Segundo, la metáfora viral representa a las audiencias como pasivas y vulnerables al "contagio", lo que podría disuadir a los investigadores de interactuar con las comunidades durante el diseño de las intervenciones. El ensayo concluye que el marco de la inoculación debería complementarse con enfoques cualitativos, con el trabajo conjunto con las poblaciones objetivo y con la conciencia de las consecuencias no deseadas de conceptualizar la desinformación como un virus. Estas consideraciones tienen implicaciones para el diseño, la adopción y la escalabilidad de las intervenciones en la investigación sobre desinformación.

PALABRAS CLAVE: metáforas conceptuales / actos de habla / *prebunking* / actos perlocutivos / desinformación

INTRODUCTION

The metaphor of cognitive inoculation has gained popularity as a framework for mitigating the persuasive effects of misinformation (Van der Linden, 2023). Inoculation theory posits that, just as vaccines immunise the body against viruses through exposure to weakened forms of a pathogen, exposure to weakened versions of persuasive messages can help build psychological resistance against them (McGuire, 1964). This theory has become increasingly relevant in misinformation research (Compton, 2025; Van der Linden, 2023), as prebunking strategies, which involve preparing individuals before they encounter false information, have proven efficacious in helping people assess the reliability of information (Simchon et al., 2026).

The metaphors[1] MISINFORMATION IS A VIRUS and INTERVENTIONS ARE VACCINES have proven useful for understanding the principles of inoculation theory and for applying it to misinformation research (Compton, 2025). In medical science, the development of a vaccine requires unpacking the characteristics of a virus; in psychological research, social scientists have sought to unpack the characteristics of misinformation to design the "cognitive vaccine," or the behavioral interventions that seek to boost people's ability to distinguish between reliable and unreliable information (Van der Linden, 2023). The inoculation metaphor, in this sense, plays a central role in the development of the theory and its applications in current psychological research (Banas & Bessarabova, 2026).

However, while a metaphor can shed light on an issue, no metaphor captures the full nature of a complex problem, and each leaves some aspects obscured (Scolari, 2023). It is therefore relevant to examine what the inoculation metaphor might overlook and how such omissions might affect the effectiveness of interventions (Roozenbeek et al., 2024). This essay argues that, while the viral metaphor has proven apt for describing misinformation and its spread (Kauk et al., 2021), it carries significant limitations that should be considered in future directions for misinformation research. Drawing on Conceptual Metaphor Theory (CMT) (Lakoff & Johnson, 1980) and Speech Act Theory (SAT) (Austin, 1962), this article develops this position through two arguments.

First, this article examines the limitations of the virus metaphor by addressing its unintended consequences for audiences and potential participants in interventions. The argument is that the virus metaphor can label ordinary features of communication, such as emotional appeals and institutional distrust, as misinformation when there could be legitimate reasons for these responses. This labeling has the potential to deepen

1 Following common practice in Conceptual Metaphor Theory (CMT), conceptual metaphors are presented in small capitals (e.g., MISINFORMATION IS A VIRUS), while their linguistic realisations are set in italics (e.g., *the spread of misinformation*).

polariation between academics and the populations they study if interventions are not connected to local concerns and beliefs (Madsen et al., 2024; Roozenbeek et al., 2024).

The second argument is that the viral metaphor can undermine the uptake and effectiveness of interventions if the limitations of understanding misinformation as a virus are not addressed. This shapes how the problem is understood and framed and, ultimately, how the solutions are designed (Lakoff & Johnson, 1980). Conceptualising misinformation as a virus carries entailments that may lead researchers to assume that people are passive recipients of misinformation and vulnerable to its "contagion" (Altay et al., 2023). These assumptions could misdirect misinformation research and limit the effectiveness of its outcomes.

This article concludes that the inoculation metaphor, like many metaphors used in science (Scolari, 2023), has been valuable for making sense of misinformation, but researchers should not overlook its limitations and should consider how these might affect the direction of inquiry, the representation of citizens, and the design of solutions. These arguments aim to inform the development of interventions that integrate local concerns, engage their audiences, treat dialogical skills as constitutive elements of misinformation resistance, and are communicated with attention to their perlocutionary effects. This may help with the uptake of interventions and their scalability outside laboratory settings, one of the main challenges in misinformation interventions (Roozenbeek et al., 2024).

BACKGROUND

Misinformation can be defined as "information that can be misleading irrespective of intention or source" (Roozenbeek & Van der Linden, 2024, p. 20). While false or misleading information is sometimes shared with the intention to harm (termed "disinformation"), discerning intentions can be challenging. For this reason, this essay will primarily refer to the first definition, while acknowledging the importance of addressing the latter. Misinformation threatens democracies by undermining institutional trust, public health, and confidence in information itself (Borges do Nascimento et al., 2022; Van der Linden, 2023). Confidence in information is a critical component of an informed citizenry and facilitates better deliberation and decision-making in economic, social, and political life (Ecker et al., 2024; Gil de Zúñiga et al., 2024).

INOCULATION THEORY AND ITS APPLICATION IN MISINFORMATION RESEARCH

The spread of online misinformation during the COVID-19 pandemic popularized the term "infodemic" (Simon & Camargo, 2023), which compares the rapid circulation of misinformation and its potential dangers to the transmission and infection caused by a virus. One

prominent strategy to mitigate its effects has been the use of inoculation interventions (Simchon et al., 2026). Grounded in inoculation theory (McGuire, 1964), these interventions expose individuals to weakened persuasive attempts before they encounter such messages in everyday life, a strategy known as prebunking. The biomedical mapping fits the situation: inoculation theory follows the premise that vaccination provides immunity through exposure to weakened versions of persuasive messages, and the virus metaphor positions misinformation as a dangerous and potentially fatal virus (Van der Linden, 2023).

The theory holds that a position, such as a value or a belief, can become more resistant to change if the person is warned that the position will be challenged, or if a refutation of the challenging argument is provided in advance (Compton, 2025). These two components, conventionally referred to as threat and pre-emptive refutation, constitute the core mechanisms of the theory. The biomedical analogy not only names the theory but also explains it, and the strategies derived from the theory are considered vaccines against various forms of influence, such as misinformation, propaganda, or marketing (Ivanov et al., 2026).

As a measure against misinformation, this theory informs the design of psychological interventions intended to make people more resistant to persuasive techniques in online environments (Roozenbeek & Van der Linden, 2024). These interventions take various forms. Some require participants to assume the role of a fake-news creator in video games such as *Bad News* and *Go Viral*, through which they learn the "six degrees of manipulation" (Van der Linden, 2023): emotional language, discrediting sources, polarizing messages, impersonation, conspiracy theories, and trolling. Others use different communication formats to teach media-literacy concepts, persuasion techniques, and the logical fallacies used in misleading messages (Etesse et al., 2025).

These approaches resemble the principles of "persuasion knowledge" and the aims of media education. Understanding persuasion strategies in advertising and recognising the language used by the media to generate engagement can foster critical evaluation of everyday information (Friestad & Wright, 1994; Mateus, 2025). Contemporary applications of inoculation theory are therefore based not only on threats and pre-emptive refutations but also on learning about online persuasion and the media environment.

CONCEPTUAL METAPHORS: THE VIRUS AND THE VACCINE

According to Conceptual Metaphor Theory (CMT), metaphors are not merely ornamental features of communication but are integral to how abstract concepts are structured, comprehended, and reasoned about (Lakoff, 1993). They allow one domain of experience to be understood and experienced in terms of another (Lakoff & Johnson, 1980):

a projection from a familiar source domain onto a more abstract target domain. The spread of misinformation and its presumed effects, for example, are made intelligible through the conceptual metaphor MISINFORMATION IS A VIRUS (Simon & Camargo, 2023), which is realised in the language of the field:

Symptoms and vulnerability (MISINFORMATION IS A DISEASE)

- *Information disorder syndrome* (Kandel, 2020).
- *Vulnerable populations* (Brashier, 2024).
- *Susceptibility* to misinformation (Maertens et al., 2025).

Transmission and infection (MISINFORMATION IS CONTAGIOUS)

- The *spread* of misinformation on social media (Roozenbeek et al., 2025b).
- Digitally mediated *emotional contagion* (Larson, 2018).
- The *outbreak* of false information (Kandel, 2020).
- *Epidemiological* models of Twitter data (Kauk et al., 2021).

In misinformation research, the biomedical mapping that underpins inoculation theory carries two principal conceptual metaphors: MISINFORMATION IS A VIRUS and INTERVENTIONS ARE VACCINES. As Compton (2025) states, "the technique or fallacy is the virus, and the explanation of how to identify and deconstruct it is how the virus is weakened to be used as an inoculation" (p. 2). The second metaphor is realized through the vocabulary of immunity:

- Psychological *herd immunity* (Basol et al., 2020; Van der Linden, 2023).
- *Weakened doses* of the techniques used in misinformation (Van der Linden et al., 2026)
- The need for psychological *booster shots* (Maertens et al., 2025).

Since these mappings are partial, aspects of the concepts they structure can remain hidden (Lakoff & Johnson, 1980). Exposure to weakened versions of misinformation is not, by itself, sufficient to immunise against it; several additional conditions influence the effectiveness of these interventions, including the need for an immediate post-test, repetition, and feedback on responses (Capewell et al., 2024; Leder et al., 2024; Maertens et al., 2025). The response to a threat to beliefs or to a persuasive attempt requires more cognitive processing than a single immediate reaction, and this is recognised by the researchers themselves (Ivanov et al., 2026).

SPEECH ACTS: DOING THINGS WITH METAPHORS

As shown above, the conceptual metaphors in inoculation theory are central not only to understanding misinformation but also to guiding research and its communication (Compton, 2025; Ivanov et al., 2026). Conceptual Metaphor Theory accounts for how the virus and vaccine metaphors structure reasoning about misinformation. However, they are not solely cognitive structures; they are also utterances issued by particular speakers to particular audiences, with consequences that extend beyond the words spoken.

Austin (1962) distinguished three acts performed in any utterance. First, the locutionary act, which involves what is said — the words used and what they refer to, here the metaphorical vocabulary itself. Second, the illocutionary act, which entails what is accomplished in making the utterance and the social action performed as a result (Marks, 2014). Compton (2025) provides an example of forewarning: "There are people who will try to change your mind" (p. 2), an utterance whose illocutionary force is that of a *warning*. Prebunking interventions perform a similar act, as they assert that manipulative techniques are circulating and may cause harm. Comparing misinformation to a virus may also help establish a shared understanding of a problem among institutional actors (Simon & Camargo, 2023). Third, the perlocutionary act consists of the consequences of an utterance for the beliefs, feelings, and actions of both hearers and speakers, which are difficult to predict because they depend on the entire context of the utterance (Austin, 1962).

Determining perlocutionary effects is difficult because they depend on the identities of the interlocutors and the social structures and power relations that exist between and among them (Franks & Green, 2011). In this respect, utterances in science and research warrant attention because they can enact different kinds of social relationships between social scientists and the public (Marks, 2014). For example, Scolari (2023) shows how the conduit metaphor in communication studies may mislead journalists, students, and even scholars into believing that communication functions like an arrow that hits a target, which presupposes direct effects on the public.

Two audiences can be distinguished here. Within the literature, researchers address other researchers, and the metaphor's illocutionary act is *assertive*; it proposes a model of how misinformation circulates, how susceptibility can be studied, and how resistance to it can be acquired (Madsen et al., 2025; Van der Linden, 2023). In interventions, researchers address the public, and the illocutionary act serves as a *warning* (Compton, 2025). Each utterance carries its own perlocutionary effects, which are examined in the arguments below.

The two frameworks together specify what the metaphor does and to whom it applies. CMT identifies the entailments that play a role in reasoning, while speech act

theory identifies the outcomes produced once those entailments are uttered. This essay argues that the metaphors examined above have perlocutionary effects that may diverge from the illocutions they are intended to serve. The first argument concerns the effects on those who receive prebunking interventions: the viral metaphor may frame concerns and strongly held beliefs as misinformation, thereby risking a rejection of the interventions themselves (Roozenbeek et al., 2025a). The second argument addresses the effects on those who design these interventions: both the viral and the inoculation metaphors may discourage social scientists from engaging directly with local concerns when developing interventions, which has largely been the case in practice (Roozenbeek et al., 2024). These issues not only affect trust in academic researchers, but they also influence the replicability of many efficacious inoculation interventions, and ultimately their effectiveness in the real world.

COMMUNICATING MISINFORMATION AS A VIRUS

In its application, the viral metaphor risks labeling certain features of communication as misinformation, even though these features are not inherently problematic. Emotional appeals, for instance — identified as one of the "six degrees of manipulation" (Van der Linden, 2023) — can be considered an ordinary aspect of communication and a means of generating engagement in today's saturated information environment. News media and storytelling routinely employ emotional language to capture attention and convey urgency (Dahlstrom, 2014). Likewise, institutional distrust can emerge from reasonable perceptions of hypocrisy, incompetence, or inconsistency between what institutional actors say and what they do, and it poses a challenge for maintaining a healthy democracy (Hallsworth, 2025; Madsen et al., 2024). Espinosa et al. (2025), for example, document a context in which corruption across Peruvian political institutions has generated political cynicism and provided reasonable grounds for distrust in the government.

If these features are treated as "infectious", interventions risk failing to distinguish between genuine concerns and manipulative content, which can foster a generalized distrust in information (Modirrousta-Galian & Higham, 2023). The same framing may extend that distrust to researchers, whom people could perceive as aligned with the very institutions under scrutiny (Young et al., 2025). Communicating interventions by labeling certain concerns and strongly held beliefs as a "virus" may produce defensiveness in listeners instead of fostering resistance to misleading messages. This approach risks deepening the polarisation between social scientists and the populations that interventions aim to reach (Feng, 2025; Modirrousta-Galian et al., 2024).

This is not to deny that misinformation poses serious threats to democratic societies, or that harmful content should be flagged and addressed. Evidence shows that

trolls and bots exploit platform features for fraud on social media, affecting elections, serving as propaganda during wartime, and driving campaigns against vaccination during the COVID-19 pandemic (Ecker et al., 2024; Roozenbeek & Van der Linden, 2024). Content deliberately crafted to deceive, polarise, and harm spreads rapidly, and the operational and economic infrastructure behind it constitutes a major problem (Dek et al., 2025). However, individuals may also share misleading information out of genuine concern or conviction, and these cases warrant a different approach. Such an approach would involve dialogical settings and deliberative research, providing communities with the opportunity to engage with experts and fellow citizens with whom they may disagree before interventions are designed and launched (Isaacs, 1993; Madsen et al., 2024). In these settings, social scientists can seek to understand the reasoning and conditions that lead individuals to make such claims and the types of misinformation shared, allowing them to develop solutions informed by that understanding.

UNDERSTANDING INTERVENTIONS AS VACCINES

Inoculation interventions typically function by teaching individuals to recognise the linguistic and rhetorical patterns that characterise misinformation. Tactics such as the "six degrees of manipulation" taught in games like *Bad News*, and the logical fallacies catalogued in *Cranky Uncle*, are presented as foundational patterns in misleading messages (Cook et al., 2023; Van der Linden, 2023). While these patterns do characterise deceptive messages in many contexts and interventions that teach them have proven efficacious in behavioural research, such interventions are not transmitted in a vacuum; each has a communicative format and design that can make it more or less engaging. The challenge is that most interventions have largely been developed to teach persuasion techniques without considering the concerns of the people expected to engage with this content (with some exceptions, see Cook et al., 2024). Addressing this would require a diagnostic stage in which the concerns and beliefs of the participating population are examined, allowing the intervention to be tailored to its context and ideally entering a stage in which those participants are treated as co-designers (Madsen et al., 2024).

One challenge of this approach is that each application requires more time and effort, as a qualitative phase and a co-design phase are needed before the intervention can be tested, and this process would have to be repeated for each cultural context. Nevertheless, this approach recognises that "one-size-fits-all" solutions are unrealistic in behaviour change and education. It also encourages researchers to connect with the publics they aim to work with, which helps reduce the perceived disconnection between academia and the population, thereby countering populist claims against science (Obradovic et al., 2020).

STOPPING THE SPREAD IN INTERACTION

Building upon the previous section, stopping the spread of misleading content is not simply a matter of individual recognition and rejection; individuals can also apply their knowledge in groups and through dialogue to evaluate arguments, fact-check information, and question vague claims. Evidence supports the effectiveness of group reasoning and dialogue in identifying argumentative fallacies and manipulation techniques (Ivanov et al., 2012; Mercier & Sperber, 2011; Xu & Petty, 2025), and demonstrates the capacity of crowds to detect misinformation (Allen et al., 2021; Vu & Saling, 2026). This suggests that dialogue, group reasoning, and crowdsourcing warrant attention as complements to inoculation interventions rather than as substitutes for them. Their effectiveness indicates that the same communicative dynamics can serve protective ends, and reveals a further limitation in the virus metaphor: accurate information can also spread like a virus. Virality is not a unique property of misinformation but rather a characteristic of how information flows in complex systems (Madsen et al., 2025).

This underscores the importance not only of sharing information with others but also of being willing to question different points of view. A reasonable objection is that such an expectation may be unrealistic. The goal, however, is not to engage with every misleading post encountered but to identify the public spheres within one's own environment—family gatherings, friendships, and academic and professional settings—in which a challenging but meaningful dialogue can be attempted safely (Isaacs, 1993).

CONCLUSION

This article examines the conceptual metaphors MISINFORMATION IS A VIRUS and INTERVENTIONS ARE VACCINES as they operate within inoculation theory and misinformation research. Drawing on Conceptual Metaphor Theory and Speech Act Theory, it argues that these metaphors perform perlocutionary acts that may diverge from the illocutions they are intended to serve, and that this divergence is significant for two audiences: those who receive prebunking interventions and those who design them.

First, the communication of misinformation as contagious risks over-generalisation, treating emotional appeals and warranted institutional distrust as symptoms rather than reasonable responses. When distrust is already justified, the warning a prebunking intervention performs may evoke defensiveness rather than vigilance (Espinosa et al., 2025; Feng, 2025). Additionally, conceptualizing audiences as hosts of information rather than as interlocutors provides no model of exchange, which is consistent with the observation that interventions have largely been developed without involving potential participants, with a few exceptions (Roozenbeek et al., 2024). This matters because of the social relations that these utterances can establish between scientists and the public.

As Altay et al. (2023) argue, the virus metaphor can be reminiscent of the outdated hypodermic needle model of communication, which assumes that people are easily swayed by everything they hear or read.

These conclusions drawn suggest propositions that may be tested in future research. First, empirical research may examine whether interventions framed using pathogen vocabulary (specifically, virus-inoculation metaphors) elicit greater participation or reactance compared to equivalent interventions framed in terms of skill acquisition (Herzog & Hertwig, 2025). The difference in response may be more pronounced among participants reporting low trust in academics or social scientists. Second, research might involve the co-design of interventions aimed at fostering greater uptake by integrating local concerns and enhancing participation, given the existing evidence regarding the influence of social identity on misinformation discernment and beliefs (Traberg et al., 2024).

In that sense, advocating for institutional trust in countries with high levels of government corruption and low trust in traditional media, without first understanding what drives that distrust, could amplify wilful rejection (Roozenbeek et al., 2025a), perceptions of source dependency (Young et al., 2025), or distrust in academic researchers. Addressing these challenges requires not abandoning the inoculation framework but supplementing it with qualitative approaches, collaboration with the populations targeted by the interventions, and attention to the effects of framing in addition to its content.

LIMITATIONS

Two qualifications limit the arguments presented. First, a distinction must be drawn between identifying manipulative techniques and classifying any use of emotional language, or any expression of institutional distrust, as misinformation. Inoculation games illustrate patterns that may appear in misleading messages; yet it does not follow that every emotional appeal or institutional criticism is thereby treated as false. The more defensible claim concerns over-generalizations arising when techniques are taught without context.

Second, as mentioned, metaphors are employed as partial models, allowing researchers to recognize their limitations without being bound by them. The concern is more specific: the vocabulary of exposure, susceptibility, and immunity can be naturalized to the extent that it no longer registers as figurative. Consequently, these entailments may enter research design under a media effects model without scrutiny. This tradition comes from an understanding of social influence in which "ideas affect human minds like viruses affect bodies" (Altay et al., 2023, p. 8). Thus, it is important that institutional actors—including not only scientists, but also journalists

and policymakers—acknowledge the limitations of the language and metaphors they choose to adopt (Simon & Camargo, 2023).

REFERENCES

Allen, J., Arechar, A. A., Pennycook, G., & Rand, D. G. (2021). Scaling up fact-checking using the wisdom of crowds. *Science Advances*, *7*(36), Article eabf4393. https://doi.org/10.1126/sciadv.abf4393

Altay, S., Berriche, M., & Acerbi, A. (2023). Misinformation on misinformation: Conceptual and methodological challenges. *Social Media + Society*, *9*(1), 1-13. https://doi.org/10.1177/20563051221150412

Austin, J. L. (1962). *How to do things with words*. Oxford University Press.

Banas, J. A., & Bessarabova, E. (2026). Origins of inoculation theory. In B. Ivanov, K. A. Parker, & J. Compton (Eds.), *The handbook of inoculation theory and practice* (1st ed., pp. 13–27). Wiley. https://doi.org/10.1002/9781394199372.ch1

Basol, M., Roozenbeek, J., & Van der Linden, S. (2020). Good news about bad news: Gamified inoculation boosts confidence and cognitive immunity against fake news. *Journal of Cognition*, *3*(1), Article 2. https://doi.org/10.5334/joc.91

Borges do Nascimento, I. J., Pizarro, A. B., Almeida, J. M., Azzopardi-Muscat, N., Gonçalves, M. A., Björklund, M., & Novillo-Ortiz, D. (2022). Infodemics and health misinformation: A systematic review of reviews. *Bulletin of the World Health Organization*, *100*(9), 544–561. https://doi.org/10.2471/BLT.21.287654

Brashier, N. M. (2024). Fighting misinformation among the most vulnerable users. *Current Opinion in Psychology*, *57*, 101813. https://doi.org/10.1016/j.copsyc.2024.101813

Capewell, G., Maertens, R., Remshard, M., Van der Linden, S., Compton, J., Lewandowsky, S., & Roozenbeek, J. (2024). Misinformation interventions decay rapidly without an immediate posttest. *Journal of Applied Social Psychology*, *54*(8), 441–454. https://doi.org/10.1111/jasp.13049

Compton, J. (2025). Inoculation theory. *Review of Communication*, *25*(1), 1–13. https://doi.org/10.1080/15358593.2024.2370373

Cook, J., Ecker, U. K. H., Trecek-King, M., Schade, G., Jeffers-Tracy, K., Fessmann, J., Kim, S. C., Kinkead, D., Orr, M., Vraga, E., Roberts, K., & McDowell, J. (2023). The Cranky Uncle game — combining humor and gamification to build student resilience against climate misinformation. *Environmental Education Research*, *29*(4), 607–623. https://doi.org/10.1080/13504622.2022.2085671

Cook, J., Lepage, C., Hopkins, K. L., Cook, W., Kolog, E. A., Thomson, A., Iddrisu, I., & Burnette, S. (2024). Co-designing and pilot testing a digital game to improve

vaccine attitudes and misinformation resistance in Ghana. *Human Vaccines & Immunotherapeutics*, *20*(1), 2407204. https://doi.org/10.1080/21645515.2024.2407204

Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences*, *111*(Suppl. 4), 13614–13620. https://doi.org/10.1073/pnas.1320645111

Dek, A., Kyrychenko, Y., Van der Linden, S., & Roozenbeek, J. (2025). Mapping the online manipulation economy. *Science*, *390*(6778), 1112–1114. https://doi.org/10.1126/science.adw8154

Espinosa, A., Chaparro, H., Amaya, L., & Pacheco, M. (2025). Political cynicism and its relationship with the approval of institutions in a context of high salience of corruption in Peru. In H. Çakal, D. Sirlopú & V. Smith-Castro (Eds.), *The political psychology of social unrest in Latin America* (pp. 35-61). Routledge. https://doi.org/10.4324/9781003282174-3

Ecker, U., Roozenbeek, J., Van der Linden, S., Tay, L. Q., Cook, J., Oreskes, N., & Lewandowsky, S. (2024). Misinformation poses a bigger threat to democracy than you might think. *Nature*, *630*(8015), 29–32. https://doi.org/10.1038/d41586-024-01587-3

Etesse, M., Vásquez-Cubas, D., Ballesteros-Aguayo, L., & Mateus, J.-C. (2025). Educational interventions to mitigate misinformation among university students: a scoping review. *Revista Digital de Investigación en Docencia Universitaria*, *19*(2), e2159. https://doi.org/10.19083/ridu.2025.2159

Franks, B., & Green, H. A. (2011). Pragmatic theory and social relations. In D. Hook, B. Franks & M. W. Bauer (Eds.), *The social psychology of communication* (pp. 107–126). Palgrave Macmillan UK. https://doi.org/10.1057/9780230297616_6

Feng, G. C. (2025). Inoculation theory revisited: reinterpretations, extensions, and new directions. *Frontiers in Communication*, *10*, 1576772. https://doi.org/10.3389/fcomm.2025.1576772

Friestad, M., & Wright, P. (1994). The persuasion knowledge model: How people cope with persuasion attempts. *Journal of Consumer Research*, *21*(1), 1–31. https://www.jstor.org/stable/2489738

Gil de Zúñiga, H., Marné, H. M., Goyanes, M., & Scheffauer, R. (2024). *Social media democracy mirage*. Cambridge University Press. https://doi.org/10.1017/9781009053266

Hallsworth, M. (2025). *The hypocrisy trap: How changing what we criticize can improve our lives*. MIT Press.

Herzog, S. M., & Hertwig, R. (2025). Boosting: Empowering citizens with behavioral science. *Annual Review of Psychology, 76*, 851–881. https://doi.org/10.1146/annurev-psych-020924-124753

Isaacs, W. N. (1993). Taking flight: Dialogue, collective thinking, and organizational learning. *Organizational Dynamics*, *22*(2), 24–39. https://doi.org/10.1016/0090-2616(93)90051-2

Ivanov, B., Miller, C. H., Compton, J., Averbeck, J. M., Harrison, K. J., Sims, J. D., Parker, K. A., & Parker, J. L. (2012). Effects of postinoculation talk on resistance to influence. *Journal of Communication*, *62*(4), 701–718. https://doi.org/10.1111/j.1460-2466.2012.01658.x

Ivanov, B., Parker, K. A., & Compton, J. (2026). Introduction to inoculation theory and strategy. In B. Ivanov, K. A. Parker, & J. Compton (Eds.), *The handbook of inoculation theory and practice* (1st edn, pp. 1–12). Wiley. https://doi.org/10.1002/9781394199372.ch0

Kandel, N. (2020). Information Disorder Syndrome and Its Management. *Journal of Nepal Medical Association*, *58*(224), Article 280-5. https://doi.org/10.31729/jnma.4968

Kauk, J., Kreysa, H., & Schweinberger, S. R. (2021). Understanding and countering the spread of conspiracy theories in social networks: Evidence from epidemiological models of Twitter data. *PLOS ONE*, *16*(8), Article e0256179. https://doi.org/10.1371/journal.pone.0256179

Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (pp. 202–251). Cambridge University Press.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. University of Chicago Press.

Larson, H. J. (2018). The biggest pandemic risk? Viral misinformation. *Nature*, *562(309)*. https://doi.org/10.1038/d41586-018-07034-4

Leder, J., Schellinger, L. V., Maertens, R., Van Der Linden, S., Chryst, B., & Roozenbeek, J. (2024). Feedback exercises boost discernment of misinformation for gamified inoculation interventions. *Journal of Experimental Psychology: General*, *153*(8), 2068–2087. https://doi.org/10.1037/xge0001603

Madsen, J. K., De-Wit, L., Ayton, P., Brick, C., De-Moliere, L., & Groom, C. J. (2024). Behavioral science should start by assuming people are reasonable. *Trends in Cognitive Sciences*, *28*(7), 583–585. https://doi.org/10.1016/j.tics.2024.04.010

Madsen, J. K., Bailey, R., De-Wit, L., Roozenbeek, J., Pilditch, T. D., & Young, D. (2025). *The need for 'infodemiology' as a discipline to tackle the challenges of misinformation,*

polarisation, and democratic fragility. OSF Preprints. https://doi.org/10.31219/osf.io/g3vtb_v1

Maertens, R., Roozenbeek, J., Simons, J. S., Lewandowsky, S., Maturo, V., Goldberg, B., Xu, R., & van der Linden, S. (2025). Psychological booster shots targeting memory increase long-term resistance against misinformation. *Nature Communications*, *16*, Article 2062. https://doi.org/10.1038/s41467-025-57205-x

Marks, N. J. (2014). Speech acts and performances of scientific citizenship: Examining how scientists talk about therapeutic cloning. *Public Understanding of Science*, *23*(5), 494–510. https://doi.org/10.1177/0963662512451969

Mateus, J.-C. (2025). Educación mediática y hábitat informacional: Estrategias de resistencia [Media education and informational habitat: Resistance strategies]. In M. Dagatti & M. Mena-Young (Eds.), *La circulación de la información y la verdad: Claves para su abordaje* (pp. 261–279). CLACSO.

McGuire, W. J. (1964). Inducing resistance to persuasion: Some contemporary approaches. In L. Berkowitz (Ed.), *Advances in experimental social psychology*. (vol. 1, pp. 191–229). Academic Press.

Mercier, H., & Sperber, D. (2011). Why do humans reason? Arguments for an argumentative theory. *Behavioral and Brain Sciences*, *34*(2), 57–74. https://doi.org/10.1017/S0140525X10000968

Modirrousta-Galian, A., & Higham, P. A. (2023). Gamified inoculation interventions do not improve discrimination between true and fake news: Reanalyzing existing research with receiver operating characteristic analysis. *Journal of Experimental Psychology*: *General*, *152*(9), 2411–2437. https://doi.org/10.1037/xge0001395

Modirrousta-Galian, A., Higham, P. A & Seabrooke, T. (2024, September 13). Comparing misinformation to a virus is neither accurate nor useful in preventing its spread. *The Skeptic*. https://www.skeptic.org.uk/2024/09/comparing-misinformation-to-a-virus-is-neither-accurate-nor-useful-in-preventing-its-spread/

Obradović, S., Power, S. A., & Sheehy-Skeffington, J. (2020). Understanding the psychological appeal of populism. *Current Opinion in Psychology, Social Change (Rallies, Riots and Revolutions)*, *35*, 125–131. https://doi.org/10.1016/j.copsyc.2020.06.009

Roozenbeek, J., & van der Linden, S. (2024). *The psychology of misinformation*. Cambridge University Press.

Roozenbeek, J., Remshard, M., & Kyrychenko, Y. (2024). Beyond the headlines: On the efficacy and effectiveness of misinformation interventions. *Advances.in/Psychology*, *2*, Article e24569 . https://doi.org/10.56296/aip00019

Roozenbeek, J., Young, D. J., & Madsen, J. K. (2025a). The wilful rejection of psychological and behavioural interventions. *Current Opinion in Psychology*, *66*, Article 102138. https://doi.org/10.1016/j.copsyc.2025.102138

Roozenbeek, J., Lasser, J., Marks, M., Qin, T., Garcia, D., Goldberg, B., Debnath, R., van der Linden, S., & Lewandowsky, S. (2025b). Misinformation interventions and online sharing behaviour: Lessons learned from two pre-registered field studies. *Royal Society Open Science*, *12*(11), Article 251377. https://doi.org/10.1098/rsos.251377

Scolari, C. A. (2023). In media(tization) studies we love metaphors. *Matrizes*, *17*(1), 37–56. https://doi.org/10.11606/issn.1982-8160.v17i1p37-56

Simchon, A., Zipori, T., Teitelbaum, L., Lewandowsky, S., & van der Linden, S. (2026). A signal detection theory meta-analysis of psychological inoculation against misinformation. *Current Opinion in Psychology*, *67*, Article 102194. https://doi.org/10.1016/j.copsyc.2025.102194

Simon, F. M., & Camargo, C. Q. (2023). Autopsy of a metaphor: The origins, use and blind spots of the 'infodemic'. *New Media & Society*, *25*(8), 2219–2240. https://doi.org/10.1177/14614448211031908

Traberg, C. S., Roozenbeek, J., & Van Der Linden, S. (2024). Gamified inoculation reduces susceptibility to misinformation from political ingroups. *Harvard Kennedy School Misinformation Review*. https://doi.org/10.37016/mr-2020-141

Van der Linden, S. (2023). *Foolproof: Why we fall for misinformation and how to build immunity*. Fourth Estate.

Van Der Linden, S., Louison-Lavoy, D., Blazer, N., Noble, N. S., & Roozenbeek, J. (2026, January 22). Prebunking misinformation techniques in social media feeds: Results from an Instagram field study. *Harvard Kennedy School Misinformation Review*. https://doi.org/10.37016/mr-2020-193

Vu, C. P., & Saling, L. L. (2026). Trust the crowd: Crowdsourced fact-checking is as effective at reducing confidence in misinformation as expert fact-checking. *PLOS ONE*, *21*(5), Article e0348291. https://doi.org/10.1371/journal.pone.0348291

Xu, M., & Petty, R. E. (2025). Using two-sided messages to combat misinformation: An overview. *Behavioral Science & Policy*, *11*(2), 1–8. https://doi.org/10.1177/23794607251382992

Young, D. J., Madsen, J. K., & de-Wit, L. H. (2025). Belief polarization can be caused by disagreements over source independence: Computational modelling, experimental evidence, and applicability to real-world politics. *Cognition*, *259,* Article 106126. https://doi.org/10.1016/j.cognition.2025.106126