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Commentary

Inoculating against COVID-19 vaccine misinformation

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The recent authorization by regulatory agencies across the world to distribute and administer COVID-19 vaccines marks an important turning point in the pandemic. The unprecedented attempt to achieve widescale vaccine coverage, however, has been met with an onslaught of false and misleading information [1]. Misinformation has the potential to adversely affect vaccine uptake. For example, almost 40% of Americans now say they would not get the vaccine and a recent study found that belief in COVID-19 misinformation significantly reduced willingness to get the vaccine [2,3]. Accordingly, it is critical to ramp up defenses against the on-going wave of COVID-19 vaccine misinformation and utilize effective strategies aimed at curbing its influence.

A common method to combat vaccine misinformation involves debunking false claims. Though seemingly intuitive, research has found that this approach can exacerbate, rather than correct, the negative effects of misinformation. This is because corrections directly refuting misinformation can trigger the "continued influence effect," whereby people continue to retrieve misinformation from memory even when acknowledging the correction [4]. Furthermore, corrections can trigger psychological resistance, especially when corrections are perceived as attacking salient values and ideologies with which misinformation can resonate. For example, with public attitudes toward a COVID-19 vaccine becoming politically polarized, particularly in the U.S., misinformation corrections might be ineffective or potentially backfire among hesitant audiences, thus making vaccine misinformation even more influential in decision-making.

Therefore, confronting COVID-19 vaccine misinformation necessitates pre-emptive action to "immunize the public against misinformation"—a process that draws on the concept of psychological inoculation. Psychological inoculation closely follows the biomedical analogy: just as exposure to a weakened dose of a virus helps the body immunologically resist future infection, so too can preemptively exposing people to a weakened dose of misinformation help people psychologically "resist" that misinformation should it be encountered in the future [5]. Inoculation works by warning people in advance and by cultivating the "cognitive antibodies" they need to withstand misinformation through a process known as refutational preemption (or *pre-bunking*). Research has found that such inoculation methods make people less susceptible to—and better able to identify and discern—misinformation [6]. Of course, like some medical vaccines, inoculation effects can wane over time, necessitating regular "booster shots" (e.g., message repetition).

Research has used inoculation theory to combat misinformation on a range of polarizing topics including anti-vaccination conspiracies [5,7,8]. Furthermore, recent research has focused on "broad-spectrum" inoculation strategies that more generally target the rhetorical and manipulation techniques that underpin misinformation. For example, the novel fake news game *GoViral!,* which was released in collaboration with the UK Government in 2020 (with support from the WHO and United Nations), offers a social media simulation that preemptively exposes and warns people about common COVID-19 misinformation tactics such as the use of fearmongering, fake experts, and conspiracy theories.

These tactics often mischaracterize the evidence base affirming the safety and effectiveness of COVID-19 vaccines, including claims of insufficient evidence or expert consensus due to the unprecedented speed with which they were developed. Whether promoted by vaccine skeptics wishing to baselessly undermine public confidence in the vaccine or journalists aiming to maintain objectivity and impartiality by highlighting "both sides" of the issue (so-called "false balance"), such claims can undermine confidence in vaccines. Indeed, research suggests that claims highlighting the long-discredited autism-vaccine link can create the false impression that the medical community is divided on the issue while also producing greater public uncertainty related to vaccine safety [9].

Fortunately, emphasizing the medical consensus about vaccine safety has been found to decrease safety concerns and increase public support for vaccines [10]. Therefore, as COVID-19 vaccines are distributed globally, continuing to inoculate against misinformation via messages that emphasize the medical consensus on vaccine safety and efficacy is a crucial step to bolstering public confidence and uptake. Like any effective public health campaign, these inoculation messages should be conveyed through diverse mediums (ads, videos, games), in a variety of settings, and by a variety of trusted sources, from media coverage of vaccine rollout to physicians discussing vaccination with their patients to public health officials urging the

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broader public to be vaccinated. The latter two are especially valuable as they are trusted sources of health information.

In short, there is an urgent need to counter the growing wave of COVID-19 vaccine misinformation by a) taking more pre-emptive action via inoculation messages—especially around the medical consensus on safety and efficacy—and b) by unveiling and defanging the manipulation techniques used to dupe people with vaccine-related misinformation. Fortunately, research in other contexts shows that although the continued influence of misinformation worsens the longer it goes unchallenged, "therapeutic" inoculation can still offer protection even when people have already been exposed to a myth [5-7]. We believe that these efforts, conveyed on a national scale through trusted information sources can help build societal resilience against vaccine misinformation.

Declaration of Interests

SVL reports and consults on how to counter COVID-19 misinformation for the UK government, including one of the interventions (GoViral) mentioned in the article. GD, CC, and JC have no competing interests to disclose.

Contributors

SVL and GD wrote the original manuscript. CC and JC reviewed and edited the manuscript.

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