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## Review

# Antecedents and consequences of science-related conspiracy beliefs

Karen M. Douglas

Many social, political, and psychological factors influence the extent to which people put their trust in science. The current article examines recent evidence for the role of conspiracy beliefs about science. The article examines the consequences of such beliefs, focusing on the domains of health (e.g., vaccinations) and the environment (e.g., climate change). Using the COVID-19 context as an example, the article focuses on the epistemic, existential, and social motives that underpin science-related conspiracy beliefs. Finally, the article considers whether science-related conspiracy beliefs satisfy these psychological motives, and what implications there are for future trust in science.

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**Introduction**

Many factors can influence the extent to which people put their trust in scientific processes, findings, and establishments. These include worldviews and political ideologies, vested interests, personal identity expression, fears and phobias, social identity concerns, and science literacy [1,2]. Several of these factors are examined in detail in this special issue. Another phenomenon that has gained interest in recent years is the extent to which people believe in *conspiracy theories*, which are beliefs that two or more actors have coordinated in secret to achieve an outcome, and that their conspiracy is of public interest but not public knowledge [3,4]. There are many conspiracy theories related to science, such as the idea that climate change is a hoax, or

that vaccines cause autism, but this fact is covered up. This article explores the consequences of such beliefs, the psychological motives that underpin them, and whether conspiracy theories about science satisfy those psychological motives.

**Conspiracy theories about science, and their consequences**

Science is generally respected, held to high standards amongst citizens, and is viewed as a benchmark of truth [5]. Across the world, trust in science is high [6]. However, people often feel psychologically distant from science, perceiving it as elitist, corrupt, and dependent on corporations and their interests [5]. Along this vein, science-related conspiracy beliefs assume that scientists and scientific establishments have the competence, power and means to manipulate their findings for their own personal gain [7]. They also imply that scientists act immorally to achieve those ends [8]. In short, science-related conspiracy theories imply that science and scientists cannot be trusted. There are many examples of science-related conspiracy theories. For example, one theory questions the veracity of climate science research, proposing that climate change is a hoax orchestrated by scientists to win research funding [9]. Another well-known example proposes that pharmaceutical companies cover up evidence that childhood vaccines do more harm than good and can cause problems such as autism [10].

Conspiracist beliefs about science can have potentially serious consequences. Several studies have linked belief in conspiracy theories to risky health choices. For example, the belief that birth control is deliberately designed to wipe out Africans and African Americans has been found to be associated with reluctance to use contraception in the United States [11] and South Africa [12]. Beliefs in some conspiracy theories—such as the deliberately concealed link between mobile phones and cancer—have been linked to support for alternative medicines [13]. Exposure to anti-vaccine conspiracy theories has been shown to significantly decrease people's vaccination intentions [14] and research exploring people's vaccination choices has revealed that conspiracy theories play a significant deciding role [15,16]. In a large multinational sample, the most significant predictor of anti-vaccination attitudes was belief in anti-vaccine conspiracy theories [17].

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The potential health-related consequences of science-related conspiracy theories became even more prominent during the COVID-19 pandemic. Belief in some COVID-19 conspiracy theories (e.g., that the virus was a hoax) was associated with lower intentions to comply with government recommendations to reduce the spread of the virus [18], whereas belief in others (e.g., that the virus was a deliberately engineered bioweapon), was associated with more self-centred behaviours such as hoarding and preparing for one's own personal safety [19]. Furthermore, it has been found that people with an individualist (versus collectivist) mindset were less likely to engage in COVID-19 preventive behaviours, a relationship mediated by belief in COVID-19 conspiracy theories [20]. Other consequences of COVID-19 conspiracy theories include support for the idea of vandalising 5G phone masts that were supposedly spreading the virus [21] and pseudoscientific health practices such as using homeopathy or essential oils [22].

Climate change is another domain in which science-related conspiracy theories have the potential to do harm. Some of these conspiracy theories (e.g., that climate change is a hoax) can negatively influence people's intentions to become more energy efficient and reduce their carbon footprint. In one study [23], people who read about climate change conspiracy theories were less inclined to take climate action. Another study found that climate change conspiracy theories reduced intentions to sign a petition to help reduce the impact of global warming [24].

However, not all climate change conspiracy theories have these negative consequences. Research has recently distinguished between those that are 'denialist' (e.g., that climate change is a hoax) and 'warmist' (e.g., that climate change research is being suppressed by oil companies), and these two types of conspiracy theories seem to have different types of consequences. While the more commonly known and studied denialist conspiracy theories are associated with low support for climate mitigating initiatives, warmist conspiracy theories are associated with greater support [25]. Whereas denialist conspiracy theories reject climate science and its findings, warmist conspiracy theories embrace them and shift the conspiracist focus away from scientists and towards corporate and political actors. Research also suggests that denialist conspiracy beliefs about climate change are associated with science denial more generally [9,26]. It is therefore plausible, given the positive associations between warmist conspiracy beliefs and support for science-based strategies to mitigate climate change [25] that warmist conspiracy beliefs could be associated with science *acceptance* more generally.

Several other conspiracy theories express mistrust in science and rejection of scientific findings. Conspiracy

beliefs have been linked to negative attitudes about genetically modified foods, forensic evidence about the 9/11 attacks, vaccination, and the origins of the AIDS virus [27]. Conspiracy theories about science overwhelmingly involve an active rejection of science, scientific findings, and scientific establishments. According to these ideas, scientists are untrustworthy, and in turn their work cannot be trusted. Conspiracy theories about science also seem to be associated with attitudes beyond science such as towards industries and political actors. In turn, conspiracy beliefs that are disconnected from science (e.g., about politics), and more general notions of conspiracy such as a "conspiracy mentality" [28] are also associated with anti-science attitudes and rejection of science in a range of domains such as food production [29] and installation of wind farms [30]. Therefore, even the most general forms of conspiracy theorising seem to predict science-related attitudes and consequences.

### Why do people believe in science-related conspiracy theories?

Scholars have proposed that one reason why people believe in conspiracy theories is because such theories promise to satisfy three important types of psychological motives [31] [see 32 for a meta-analysis] (Table 1). First, *epistemic* motives include cognitive factors such as intolerance to uncertainty and need for closure [33,34]. There are clear reasons why these motives are associated with conspiracy beliefs about science. Science is inherently complex and associated with uncertainty [27]. Taking the COVID-19 pandemic as an example, scientific findings were unravelling almost daily, leaving people confused and uncertain about the future. Guidelines changed regularly when new information

**Table 1**

**Psychological motives associated with belief in conspiracy theories [31,32].**

Motive	Definition of motive	Examples
Epistemic	To achieve knowledge and certainty	Cognitive styles (e.g., need for closure, epistemic uncertainty) and abilities (e.g., poor reasoning ability, low education)
Existential	To have safety and security	Internal (e.g., anxiety, low personal control) and external threats (e.g., political alienation, dangerous worldview)
Social	To achieve or maintain individual and group esteem	Individual (e.g., narcissism, for uniqueness), relational (e.g., social exclusion), and collective self-motives (e.g., defensive ingroup identity, ingroup victimhood)

emerged leaving people with a lack of closure. Conspiracy theories might promise to offer relief from these uncomfortable cognitive states. Epistemic factors also include poor reasoning skills and low levels of education [35,36]. Science-related conspiracy theories might therefore appeal to people who lack scientific knowledge and skills to be able to deal with the complexity and changing nature of science. People can feel threatened by things they do not know, and conspiracy theories might offer to restore some of that missing knowledge.

The second set of motives—*existential*—refer to people's needs to feel safe, secure, and in control. These can be related to internal (e.g., anxiety, low personal control) [37,14,23] or external threats (e.g., political alienation, dangerous worldview) [28,38]. In the context of science, conspiracy theories might be adopted to try to manage both types of threats. Again, taking the COVID-19 pandemic as an example, people were anxious and had little control over something as fundamental as their own personal safety. The world seemed a dangerous place and there was often competing advice from different political sources about what people needed to do to mitigate the spread of the virus. For people struggling with these existential threats, conspiracy beliefs (e.g., that downplay the extent of the problem), might promise to offer some relief.

Finally, people have *social* motives to achieve and maintain individual and group esteem. These motives fall into three categories and research suggests that threats to all three types of motives are associated with belief in conspiracy theories. Specifically, these are individual motives such as narcissism and the need to express personal uniqueness [39,40], relational motives such as to avoid social exclusion [41] and collective motives such as to defend one's group image or present one's group as a morally superior victim [42,43]. Social motives are associated with conspiracy beliefs about science. Continuing with the example of the COVID-19 pandemic, conspiracy theories might offer the promise of unique scientific knowledge that others lack or to help people come to terms with the social exclusion experienced by repeated lockdowns. Conspiracy beliefs that citizens are being deceived by scientists might promise to justify people's feelings of superiority over others and maintain the feeling that one's group is morally superior to the group (in this case scientists) who is deliberately deceiving them.

### Do science-related conspiracy theories satisfy psychological motives?

When people believe conspiracy theories about science, this seems to be a response—at least in part—to psychological motives that are threatened by specific events and circumstances. People feel threatened by things

they do not know, or about situations that make them feel unsafe, and when they feel that their personal or group-related image is under attack. But do science-related conspiracy theories diminish those threats? The available evidence to date suggests not and if anything, science-related conspiracy theories further aggravate those threats. For example, people who read about denialist climate change conspiracy theories not only believed the conspiracy theories more, but felt more powerless, uncertain, and disillusioned, and were in turn less inclined to take climate action [23]. The same applied to conspiracy theories concerning vaccination [14]. Longitudinal research suggests that at least for general conspiracy beliefs, increases in such beliefs are associated with further frustrated, rather than satisfied, motives over time (e.g., uncertainty, control, belonging) [44] have no effect on them at all [44], or have only a very small positive effect (e.g., meaning in life) [45]. Conspiracy theories therefore seem to do little to make people feel better. They also seem to further damage people's trust in science. One science-related conspiracy theory can easily become a “gateway” to others, and people can fall down an endless rabbit hole of other science-related conspiracy theories that becomes difficult to escape [46]. Having said this, it is important to acknowledge the small positive effect of conspiracy beliefs on meaning in life [45]. For some people, conspiracy beliefs might offer a sense of meaning or at least this effect might explain why people can continue to believe in conspiracy theories when other psychological motives are unmet.

Conspiracy theories themselves might also allow people to justify their anti-science positions. Some research found evidence that anti-vaccine conspiracy beliefs predicted resistance to vaccination [47] which supports previous research [14]. However, there was also evidence for the opposite directional relationship—that is, that the decision not to vaccinate predicted the extent to which people endorsed anti-vaccine conspiracy theories. Conspiracy theories might therefore appeal to people who have not taken up vaccines as a post decisional justification of their choice. Two possible mechanisms could therefore explain the link between science-related conspiracy beliefs and science acceptance or rejection. Mechanism 1, for which there is ample evidence already, suggests that conspiracy beliefs predict rejection of science. We can call this mechanism *facilitation*. Mechanism 2, for which there is less evidence, suggests that people are attracted to conspiracy theories when such theories support their decision to reject science. We can call this mechanism *maintenance*. The maintenance mechanism is likely to provide anti-science communities with a shared language that they can use in their internal and external communications. It is therefore also possible that belief in conspiracy theories can further distance people from science and strengthen their resistance to science and scientific

institutions over time. More experimental and longitudinal research will uncover the extent to which the relationships between anti-science beliefs, behaviours, and conspiracy beliefs are bi-directional, and in what contexts.

## Conclusions

Conspiracy theories about science are abundant and can have serious consequences for how individuals engage with scientific findings and institutions. Belief in science-related conspiracy theories stems—at least in part—from unsatisfied psychological motives for knowledge, safety, and self-esteem. Although trust in science is generally high, conspiracy theories can undermine that trust and lead people to reject important scientific advances. They might also enable people to justify their decisions to reject science.

## CRedit author statement

Karen Douglas: Conceptualization, Writing — Original Draft, Writing — Reviewing & Editing, Funding Acquisition.

## Declaration of competing interest

The author declares no conflict of interest.

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## 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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## Further information on references of particular interest

3. This article identifies the definitional features of conspiracy theories and provides a comprehensive overview of the antecedents and consequences of conspiracy beliefs.
5. This chapter provides an overview of research on the psychology of science rejection, focusing specifically on the role of (a) ideologies, worldviews, identities and fears, and (b) people's perception that science is detached from both the self, and the here and now.
32. This article presents a wide-ranging systematic review and meta-analysis of the research on the antecedents of conspiracy theories. It focuses on the epistemic, existential, and social motives associated with conspiracy theories that are covered in the present contribution.
45. This research examined the relationships between conspiracy beliefs and psychological needs (i.e., for belonging, control, meaning in life, and self-esteem) in a four-wave longitudinal study. Although the lagged associations both control and belonging had with conspiracy belief were negative (as predicted), meaning in life had a positive lagged association with conspiracy belief. These results suggest that both lower and higher need satisfaction can predict increases in conspiracy belief over time.
47. This article uncovers a bi-directional relationship between anti-vaccine conspiracy beliefs and vaccine hesitancy. It suggests that conspiracy beliefs might enable people to rationalise their anti-science positions and behaviours.