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The role of cognitive biases in conspiracy beliefs: A literature review

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Abstract

In recent years, several studies have found that conspiracy believers tend to be more susceptible to cognitive biases (e.g., conjunction fallacy, proportionality bias, agency detection bias, etc.). The aim of this work is to review such literature, systematizing these concepts in a unifying framework of conspiracy mentality as a set of biased cognitive processes, which categorizes cognitive biases in two classes: those that contribute to belief formation and those that contribute to belief updating. Drawing on several empirical results, this paper summarizes the role of cognitive biases in conspiratorial thinking, offering some insights for future research and raising questions about the possible weaknesses of this approach.

KEYWORDS

behavioral economics, cognitive biases, conspiracy theories, decision-making

1 | INTRODUCTION

Conspiracy theories (CTs) can be defined as attempts "to explain the ultimate cause of an event as a secret plot by a covert alliance of powerful individuals or organizations, rather than as an overt activity or natural occurrence" (Douglas & Sutton, 2008). Conspiracy beliefs are not mere allegations of conspiracies: they are usually epistemically weak, since they are unfalsifiable—

any attempt to prove them wrong is considered as evidence supporting the theory (cascade logic, Goertzel, 2010)—and relatively implausible, as they usually involve "preternaturally powerful and sinister groups of individuals" (Brotherton & French, 2014).

Over the years, a growing number of studies have investigated conspiracism from several different perspectives, constituting what we may call "conspiracy studies" (Hayward, 2022): a strongly interdisciplinary field, which gathers efforts from psychologists, political scientists, historians, philosophers, information scientists, computer scientists, and so on. For the purpose of this study, however, we will mostly focus on advances coming from social and cognitive psychology, which has found that conspiracy beliefs correlate with a wide range of constructs.

One stream of studies focused on lack of trust in institutions (e.g., Šrol et al., 2021) and lack of interpersonal trust (Green & Douglas, 2018). Other researchers focused instead on the perception of control loss, which in turn derives from feeling helpless and overwhelmed by significant events (e.g., Stojanov & Halberstadt, 2020). Consequently, minorities that are alienated from mainstream society, such as members of racial and ethnic stigmatized minorities (e.g., Thorburn & Bogart, 2005), of low-income groups (e.g., Mao et al., 2020) and ostracized people (Graeupner & Coman, 2017), show a higher endorsement of CTs. Finally, other social psychologists and political scientists (e.g., Uscinski et al., 2021) focused on ideological attitudes that correlate with conspiracy beliefs. For example, Nera et al. (2021) found that conspiracism involving powerful elites correlates with political extremism, while conspiracism involving relatively powerless minorities correlates with political conservatism.

Besides, several cognitive and social psychologists have looked into the cognitive dimensions of CTs, investigating how styles of thinking, reasoning errors, and cognitive biases are related to conspiracy beliefs (e.g., Brotherton & French, 2015; Douglas et al., 2016). In general, it has been found that those who are more prone to such errors, are also more likely to believe CTs. I argue this approach is an important step forward for conspiracy studies, as cognitive biases can provide a common ground for scientists who come from different fields of knowledge, fostering interdisciplinary research on such a multifaceted phenomenon.

So far, cognitive biases have been investigated in several judgment and decision domains, including economic ones such as market forecasts (Camerer, 1987; Fisher & Statman, 2000), financial decisions (Hirshleifer, 2015), entrepreneurship (Thomas, 2018), and so on. Within these contexts, behavioral economics models incorporate cognitive biases to explain how errors of different nature affect behaviors and decisions in these settings. For example, availability bias predicts that investors who recently experienced low performances in stock returns tend to be more risk-averse when investing (Malmendier & Nagel, 2011). Similarly, in conspiracy studies, cognitive biases have been used to explain reasoning errors. For example, availability bias predicts that over-exposure to a certain narrative can lead to over-estimation of its validity (Myers, 2019). Nevertheless, despite the clear link between the behavioral economics approach to cognitive biases and the cognitive psychological approach to CTs, behavioral economists have not investigated conspiracism yet.

On the one hand, the integration between the fields of conspiracy studies and behavioral economics might shed light on the cognitive mechanisms involved in conspiracy beliefs, while on the other hand, it will enrich behavioral models with new insights, broadening their field of application to social phenomena where CTs play a role, such as populism, vaccine hesitancy, and so on. Moreover, this approach can benefit conspiracy studies as well, since it may provide a conceptual solution to a methodological problem. In fact, social scientists working on conspiracy beliefs have been blamed of "pathologizing" believers (Basham, 2018), "creating a hostile intellectual climate where different research projects seem to be talking past each other" (Napolitano, 2021,

p. 85) and portraying believers as "in need of a cure" (Basham & Dentith, 2016, p. 13). A number of studies have reported negative traits correlated with conspiracy beliefs, such as the dark triad (e.g., Ahadzadeh et al., 2021), paranoia (e.g., Imhoff & Lamberty, 2018), or machiavellianism (Douglas & Sutton, 2011). While such traits are never considered as truly clinical, and believing that there is an actual agenda in conspiracy studies to depict believers as diseased is simply unreasonable, it cannot be ignored that these lines of research have found very distinctive and unique traits of conspiracism that might further polarize political discourse on the topic. Focusing on cognitive biases and framing this subject in terms of universal errors of human judgment, instead, may help in building a more inclusive and respectful environment, creating a common ground for believers and nonbelievers.[1]

The aim of this paper is two-fold. On the one hand, it will provide a complete review of the available experimental evidence on the role of cognitive biases in conspiracy beliefs, derived mainly from social and cognitive psychology. On the other hand, this work aims to provide researchers from other fields, especially behavioral economists, with a tool that makes such insights easily accessible.

To my knowledge, this is the first review that specifically attempts to survey available experimental evidence on the role of cognitive biases in conspiracy beliefs, proposing a unifying framework to systematize and classifies this broad range of phenomena. This classification is motivated by the large variety of notions related to this research program; in fact, the locution "cognitive bias" is used as an umbrella term for gathering a large set of phenomena that significantly vary in nature (Curley et al., 2020). Thus, I classified cognitive biases by making a conceptual distinction between those which contribute to the formation process of conspiracy beliefs and those that contribute to the updating process. This classification is not necessarily a faithful representation of how conspiracy endorsement naturally occurs, but it serves as a practical way to systematize and organize the different concepts in this paper.

First of all, some basic definitions are required to develop such distinction. For the purpose of this review, I will refer to belief formation as the process of exploiting already acquired information to predict the unfolding of a new event, in order to build a personal representation of its likelihood and its possible consequences. Among all the possible heuristics contributing to the formation process, previous literature has identified the representativeness heuristic (e.g., Kahneman & Tversky, 1972; Brotherton & French, 2014) as the one that might be involved in the process of formulating rapid judgments in order to detect patterns and agency. Such mental shortcut produces quick judgments based on the resemblance between the essential features of an object (e.g., an event) to its parent population. Despite the average accuracy of such judgments, the representativeness heuristic can yield systematic mistakes. In such cases, the features on which judgments are based may include: (1) co-occurrence of two events which are unrelated, but they are regarded as causally connected (causal conjunction fallacy—Brotherton & French, 2014); (2) the "size" (in terms of public relevance and media resonance) of the effects, which must be proportional to the "size" of the causes (e.g., Leman & Cinnirella, 2007); (3) the presence of agents whose intentional behavior is a more representative explanation of the course of the events (e.g., Brotherton & French, 2015).

Second, I will refer to belief updating as the process of taking into account new pieces of belief relevant information and incorporating it into previously held beliefs. This process implies that a belief had been already formed and needs to be revised when new evidence (in favor or against it) is encountered. According to previous literature, belief updating can be biased by three cognitive errors: (1) confirmation bias can lead individuals to seek only for corroborating evidence, that is, pieces of information which are consistent with previous beliefs, while neglecting or

misinterpreting contradictory evidence (e.g., Lord et al., 1979); (2) availability bias can lead individuals to base their revision process on the salience of new evidence (e.g., Tyler & Cook, 1984), as repetition and/or emotional vividness may increase the ease by which someone recalls certain explanations of events (e.g., unofficial accounts that blame an unknown pyromaniac for the fire, reported several times by different news sources); (3) overconfidence may lead individuals to overestimate the accuracy of their own judgments, inducing them to pay less attention to experts' opinions or other accounts, and to overestimate the explanatory power of their beliefs (e.g., Vitriol & Marsh, 2018).

This work is organized as follows: Section 2 summarizes how literature has faced a paradigm shift from generic belief systems to cognitive styles to explain conspiracy beliefs; Section 3 reviews the cognitive biases involved in conspiracy beliefs formation; Section 4 reviews how conspiracy believers update their beliefs in a biased way; finally, Section 5 looks into the limitations of the heuristics and biases approach to conspiracy beliefs and provides suggestions for future research.

2 | THE EVOLUTION OF THE THEORETICAL APPROACHES TO CONSPIRACY BELIEFS

Throughout the years, conspiracy studies have faced a paradigm shift in the way conspiracy beliefs have been conceptualized and studied. Specifically, they were first investigated as being part of a belief system: from this perspective, CTs are regarded as beliefs which are deeply ingrained in interrelated systems of other similar beliefs that mutually reinforce one another (i.e., the monological belief systems). Several scholars (e.g., Brotherton et al., 2013; Imhoff & Bruder, 2014) argued that behind this system of connected beliefs, there is a generalized attitude towards society as a whole, a "conspiracy mentality"—although there is a large variability in how this single construct is conceived.

However, the theoretical approach that is the most relevant for the purpose of this review is the one that conceptualizes conspiracy mentality as the consequence of a cognitive style, rather than a set of beliefs (van Prooijen et al., 2020). In the following subsections, I will discuss the evolution of the notion of conspiracy mentality, from the single construct approach to the cognitive biases approach.

2.1 | The single construct approach to conspiracy beliefs

Before going into details on how cognitive biases influence conspiracy beliefs, we should first focus on how and why scholars resorted to judgment and decision-making to explain this phenomenon. The strongest finding in conspiracy studies is that believing one CT usually predicts endorsement of many others, even uncorrelated ones (e.g., van Prooijen et al., 2015). Just to mention a couple of examples, Goertzel (1994) found that on average people who believe that AIDS was deliberately created in a government laboratory are more likely to believe that the FBI was involved in Martin Luther King's assassination. Recently, Miller (2020) found that Covid-19-related CTs have a similar pattern of interrelations: people who believe that the virus is a biological weapon created by China are also more likely to believe that the virus was accidentally released by the United States.

A lot of scientific speculations in conspiracy studies stemmed from these widely replicated and robust results, most of them contributing to the so-called "single construct approach," which

views CTs as a relatively homogeneous phenomenon. First, many scholars argued that there is an underlying generic belief system that could explain this network of beliefs.[2] Probably, the first generic belief system account was offered by Goertzel (1994) himself, who deemed it as a "monological belief system," in which each conspiracy belief reinforces the others. Monological believers do not need factual evidence to back up each new CT they are about to endorse; instead, they rely on their previous support for other CTs as a proof for the new ones. In other words, believing one CT lowers the threshold for acceptability of other CTs.

One problem with the generic belief system accounts is that quite often, for a single event, there exists a number of CTs that are mutually exclusive. Nevertheless, scholars found evidence that individuals endorse different theories even when they contradict each other. For example, Wood et al. (2012) found that individuals who believe that Princess Diana was killed by the business enemies of Dodi Al-Fayed also believe that Diana faked her own death. A similar pattern of results in contradictory Covid-19-related conspiracy beliefs was recently found by Petrović and Zezelj (2022).[3]

This contradiction has led scholars to believe that the generic belief system is not based on the cohesiveness of the CTs, but rather on some more profound individuals' assumptions on society as a whole. Following this line of reasoning, if an individual endorses two contradicting CTs, they are not paying much attention to the content of such beliefs, but rather they support them because they have an underlying distrust in institutions (Wood et al., 2012). This account of conspiracy belief systems is consistent with Popper's conspiracy theory of history (2002), which represents a generic belief that historical events are determined by the will of few powerful groups of people. This single construct approach has led other scholars to treat CTs endorsement as a generic attitude towards reality, resulting in the construction of validated questionnaires, such as the Generic Conspiracist Beliefs scale (Brotherton et al., 2013).

Finally, other scholars define the generic belief system as a mindset or a mentality; however, there is a large variability in terms of definitions of such concepts. For example, Bruder et al. (2013) defines "conspiracy mentality" as a one-dimensional construct that represents a "generic susceptibility to explanations based on a conspiracy," likening this sensitivity to CTs to an individual difference. In another study, Imhoff and Bruder (2014) define "conspiracy mentality" as a generalized political attitude, similar to social-dominance orientation or right-wing authoritarianism. This inconsistency in defining the construct of conspiracy mentality may be a problem for the field, as researchers often employ the same validated measures to investigate very different phenomenon. But beside the variability that muddles the notion of conspiracy mentality, there is quite often a problem of circular thinking, as observed by Sutton and Douglas (2020): a conspiracy mindset, defined as a general proneness to CTs, cannot be the cause itself of conspiracy beliefs. According to this view, conspiracy mentality cannot represent a causal account of conspiracy beliefs, but merely an individual characterization with limited explanatory utility.[4]

However, for the purpose of this study, the most useful conceptualization of "conspiracy mindset" is probably the one offered by van Prooijen (2018). He observes that conspiracy mindset or mentality should be considered as a general mental architecture, rather than a system of beliefs. He motivates such argument by leveraging on several results (e.g., Aarnio & Lindeman, 2005; Gligorić et al., 2021; Stoica & Umbres, 2021; van Prooijen & Acker, 2015) that have found a link between conspiracy beliefs and other anomalistic beliefs, such as paranormal, superstition, alternative medicine, and so forth.

The basic idea is that there is one or more underlying cognitive processes that can account for all such beliefs which defy conventional understanding of reality, and that must be rooted in an intuitive rather than analytic style of thinking (van Prooijen et al., 2020). From this perspective,

the construct of "conspiracy mentality" is essentially a consequence of System 1 processes. Indeed, several scholars (e.g., Badino, 2022; Denovan et al., 2020; Swami et al., 2014) refer to the famous dual-system framework by Kahneman (2011), which postulates that individuals employ two different cognitive styles when making judgments: System 1, which is the automatic, heuristic-driven style of thinking, and System 2, which is a more deliberate, slower and more analytical style of thinking. Scholars argue that conspiracy believers, but also other anomalistic believers (paranormal, alternative medicine, superstition, etc.) employ System 1 thinking for making judgments on the likelihood of unlikely, if not impossible or supernatural, events. As Wagner-Egger (2022) notes, the act of attributing significance to errant data as part of a larger plot—which is the core reasoning behind conspiracism—is an act of intuition: for example, climate change deniers mock scientists and activists during cold days, because occasional low temperatures are considered as a proof that global warming does not exist. Back in January 2019, Donald Trump gave a perfect example of this line of reasoning, by ironically begging global warming to "come back" to mitigate the coldest days of winter in the Midwest (Paul, 2019). Researchers have directly investigated the link between conspiracy beliefs and lack of sophistication in reasoning. First of all, several studies have found that conspiracism consistently negatively correlate with measures of analytical thinking (System 2) (e.g., Gligorić et al., 2021; Swami et al., 2014) and positively correlate with measures of intuitive thinking (System 1) (e.g., Denovan et al., 2020; Pytlik et al., 2020). Moreover, by priming System 2 thinking by the means of a verbal fluency task, Swami et al. (2014) succeeded in lowering CTs beliefs.

So far, we have discussed that there has been a paradigm shift in conspiracy studies: conspiracy beliefs are not simply a generic belief system, but, more broadly, they should be considered as the consequence of a specific cognitive style. Of course, while cognition plays a fundamental part in shaping conspiracy beliefs, social and attitudinal dimensions should not be neglected. We argue that all of the cognitive mistakes reviewed in this paper are noncommittal with the social or attitudinal motives behind such beliefs. Cognitive biases should be regarded in this context as playing an activating role in conspiracy beliefs, but they are not the ultimate causes.[5]

2.2 | Heuristics: Where do biases come from?

By linking conspiracy beliefs to cognitive biases, researchers usually imply that conspiracy mentality is a distorted consequence of System 1 processes. In fact, in the field of conspiracy studies, an important stream of literature has focused on the link between dual process theory and conspiracy beliefs. Specifically, in several correlational studies, it has been shown that deliberation and analytical thinking decrease conspiracy beliefs (e.g., Pennycook et al. 2015 , Rizeq et al. 2020). The basic idea is that by increasing deliberation or by priming rationality, individuals are expected to deliberate more, to be more aware of their logical fallacies, and thus to avoid intuitions that might ultimately lead them to unwarranted beliefs (Swami et al., 2014).[6]

In turn, System 1 is based on heuristics, which are commonly defined as approximate cognitive strategies or rules of thumb for problem solving and decision-making that do not guarantee an accurate solution, but that typically yields reasonable and quick solution (Hertwig & Todd, 2002). Heuristics are usually effective mental shortcuts, but can result in cognitive biases, which are systematic deviations from rationality or normative standards and systematic errors in decision-making and judgment (Haselton et al., 2005). Therefore, extending this line of reasoning, relying too much on an intuitive style of thinking (System 1), and thus on heuristics, entails the risk of committing cognitive biases, which ultimately leads to conspiracy beliefs.

As of now, there are several studies which investigate the link between cognitive biases and conspiracism, but before reviewing that literature, it might be useful to investigate from which heuristics biases might stem from. According to van Prooijen and van Vugt (2018), there are two key cognitive processes that underlie conspiratorial thinking: pattern perception and agency detection. Pattern perception refers to human's ability to find cause-and-effect relationships between stimuli: it is inherently adaptive and a necessary feature for our learning abilities. If one individual, for example, is not able to learn that eating rotten food leads to poisoning, then she might not be able to survive. Agency detection, instead, refers to human's ability to attribute intentions and motives to others' behavior. Agency detection is a fundamental part of our social life: humans are able to empathize with others thanks to this cognitive mechanism. However, both these processes can have distortive effects on beliefs whenever an over-perception of patterns or an over-detection of agency occurs. These distorted processes have been studied in terms of cognitive biases, which will be reviewed in the following section. But first, I propose an interpretation of these two key processes in light of one heuristic, which can systematically produce errors.

I argue that both these key features of human cognition can be framed in terms of representativeness heuristic, which is a mental shortcut aimed to assess the likelihood of an event based on "the degree to which (i) it is similar in essential characteristics to its parent population, and (ii) reflects the salient features of the process by which it is generated" (Kahneman & Tversky, 1972, p. 431). In other words, when we assess the likelihood of an event, we do not base our judgment on probabilistic data, but rather on stereotypes. For example: if we were introduced to two new people, Mark and John, and we were told that one is an accountant and the other is a rock star, we would look for stereotypical cues that might be revealing of their occupation. If one is wearing glasses and a shirt, we might consider it more likely that he is the accountant, rather than the rockstar, and that is because we compare his look to the stereotypical accountant's look versus the stereotypical rockstar's look.

One should note that it might well be possible that a member of an occupational group does resemble their group stereotype (e.g., rockstars may have a tendency to dress unconventionally), but that is not necessarily true (Gilovich & Savitsky, 2002). Similarly, in their classic experiment, Kahneman and Tversky (1974) asked participants to rate the likelihood that a fictional person called Steve was a librarian or a farmer, after having described him as "very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality [. . .], a meek and tidy soul, he has a need for order and structure, and a passion for detail". Again, based on the (alleged) stereotype of a librarian, subjects overrated the likelihood that Steve was a librarian.

Stereotypes can also be derived from basic concepts of reality, such as the notion of randomness. Experiments in which individuals were asked to simulate the sequence of outcomes produced by tossing a fair coin for several times (e.g., Rapoport & Budescu, 1997) or to guess the outcome of tossing an imaginary coin in sequence (e.g., Kareev, 1992) provided evidence of intuitive, non-normative judgment making, as subjects showed biases such as the law of small numbers (i.e., erroneously considering small samples as representative of the whole population from which they are drawn—Rabin, 2002) or gambler's fallacy (i.e., tendency to believe that there are systematic reversals in random sequences—Rabin & Vayanos, 2010). Both these phenomena are related to the concept of local representativeness (Bar-Hillel & Wagenaar, 1991), whereby individuals have low expectations of long streaks in random sequences (e.g., four consecutive heads in a sequence of outcomes produced by tossing a fair coin five times).

Judgments of similarity or resemblance, however, not only influences assessments of frequency and classification problems, but it can also have an effect on judgments on cause-and-effect relationships. In fact, the basic principle behind this heuristic can be translated into the motto "like

causes like" or "like goes with like," which is often referred to law of similarity (Rozin & Nemeroff, 2002). This principle states that the causes of an event should resemble its consequences. For example, in Ahn and Bailenson's (1996) study, subjects attributed the main cause of an accident to a driver who was short-sighted and not wearing lenses, even when she had never had an accident before. Also, the co-occurrence of two events can be considered as a proof of causal relationship (MacDonald, 2000). For example, if a person has itchy eyes when petting a dog (two co-occurring events), it might be rational to think that she has an allergy (itchy eyes is a common symptom for allergies to animals), but these cues might well be unrelated.

It is worth noting that different authors have argued that representativeness heuristic contributes to several erroneous beliefs. For example, Gilovich and Savitsky (2002) argued that representativeness heuristic is connected to erroneous beliefs in the medical domains; in fact, homeopathic remedies are literally built on the law of similarity. Homeopathic theory postulates that diseases must be cured by administering the very same substances that caused them, but in highly diluted quantities. Other authors refer to this as the "homeopathic heuristic" (Kanwisher, 1989), arguing that such erroneous beliefs can actually be dangerous for people health, as antidotes often do not resemble their effects, making homeopathic remedies mere placebos and leading people to not seek for proper cures. Other examples of distorted beliefs produced by representativeness heuristic can be found in astrology, where zodiac signs are supposedly associated with personality traits, and there is a surprising concordance between the sign's symbol and the alleged features (Zusne & Jones, 1989). For example, a Libra is supposed to be well balanced, a Lion is supposed to be fierce, and a Virgo is supposed to be shy and modest. Finally, even Freudian theory has been criticized for employing representativeness shortcuts (Nisbett & Ross, 1985), as the interpretation of symbols in psychoanalytic theory (for example, dream interpretations) often rely on some resemblance judgments: for example, a man dreaming about a snake is thought to be concerned with his penis (or his sexuality).

All of these above-mentioned systems of beliefs are driven by representativeness judgments, but they are all somewhat fallacious. Homeopathic remedies have been shown to be ineffective in several double-blind randomized clinical trials (see Mathie et al., 2014), zodiac signs are not correlated with personality traits in any way (see Carlson, 1985) and Freud's dream interpretation is simply impossible to test experimentally (Ruby, 2011)—one dream might yield dozens of meanings, depending on the analyst. We can argue that representativeness-driven reasoning can produce erroneous beliefs. But how does it systematically produce errors? In Section 3, we are going to review which representativeness-induced biases are relevant for conspiracy beliefs, but before looking into experimental results on each cognitive bias, it is useful to review what previous literature has argued, on a general level, about the role of these phenomena in conspiracy beliefs.

2.3 | Perspectives on the role of cognitive biases

Generally speaking, several authors have offered different perspectives on how cognitive biases contribute to conspiracy beliefs. One proposed link between cognitive biases and conspiracism lies in styles of thinking and it has a meta-cognitive nature. For instance, Swami et al. (2014, p. 581) argue that analytic thinking fosters "careful and deliberate processing of information," which in turn makes individuals pay more attention to their own cognitive biases, ultimately preventing them to endorse conspiracy beliefs. If this hypothesis was true, then a lack of meta-cognitive ability may impair reasoning both in the formation and in the updating phases. For

example, when collecting evidence to form a new belief on a certain event, a subject who is not aware of her instinctive preference for proportional or intentional explanations might formulate erroneous judgments, ultimately leading to a conspiracy belief. Similarly, a subject who is not aware of the self-protecting cognitive strategies she exploits to avoid disconfirming evidence, might distort their information-seeking behavior when updating her beliefs.

Moreover, if the meta-cognitive hypothesis was confirmed, then cognitive interventions to reduce biases, such as de-biasing strategies, might provide a practical tool to mitigate conspiracism. Individuals may be prompted to re-evaluate the evidence they use to back up the CTs they endorse, inhibiting intuitions and heuristic-driven thoughts, through a meta-cognitive process that enhances self-awareness.

However, the link between the style of thinking and conspiracy beliefs is not as straightforward as it may appear. Not only this account mostly relies on correlational studies which may have methodological issues (e.g., Gagliardi & Rusconi, 2023; Smallpage et al., 2022), but it may also present theoretical weaknesses (Bago et al., 2022). Even if people are made to deliberate more, they might lack the technical or historical knowledge to evaluate many traditional or new CTs. Thinking more slowly may improve the quality of reasoning, but only if one has the actual possibility to think more soundly about the problem (Lawson et al., 2020). Also, certain cognitive biases, such as confirmation bias, are enhanced by deliberation (Dickinson & Kakoschke, 2021).[7]

Other authors, instead, focused on the purpose of cognitive biases, which are often employed as strategies to reduce cognitive dissonance derived from encountering conflicting evidence. For example, biases that revolve around information avoidance (e.g., ostrich effect, confirmation bias, etc.) may be employed to reduce the effect of disconfirming evidence. This hypothesis about the specific role of cognitive biases in the domain of conspiracy studies was recently introduced by Hattersley et al. (2022) as the Overfitting Hypothesis. The idea is that some CTs are more implausible than others when they attempt to over-fit conspiracy-related data, while performing poorly to explain wider data that fall outside the limited subset of data. For instance, one CT (e.g., the Earth is flat) may explain a limited set of data (e.g., a picture of the horizon which appears flat) but performs poorly to explain wider data (e.g., pictures of the Earth taken from space). This feature is consistent with the unfalsifiable nature of CTs, which incorporates any new disconfirming pieces of evidence into the theory itself (Goertzel, 2010). Thus, in the previous example, someone who holds a strong conviction that the Earth is flat, may discredit the source of the pictures taken from space and hypothesize that they are actually part of the plot. In this case, confirmation bias would kick in serving the intentional purpose of neglecting or discrediting a disconfirming piece of evidence to reduce dissonance.

The Overfitting Hypothesis also resonates with the account of cognitive biases as motivated reasoning. According to Bénabou and Tirole (2016), cognitive distortions are not blind violations of normative rules of behavior, but rather they are oriented to make beliefs advantageous to the self, reinforcing previously held beliefs. From this point of view, a confirmation bias entails an information-seeking behavior aimed to preserve some held conviction which, in some cases, may be relevant to one's identity.

On a similar note, Miller et al. (2016, p. 826) present conspiracy beliefs as a form of motivated or "directional" reasoning, in which individuals are strongly motivated to follow reasoning processes "aimed at bolstering or maintaining their attitudes in the face of attitude-challenging information." Their argument seems to disregard the idea that CTs are linked to sophistication and knowledgeability, leveraging on a wealth of literature that shows how, for instance, confirmation bias affects people's judgments independently of how sophisticated they are (e.g., Kahan et al., 2017) and in some cases it is even exacerbated by the level of knowledge (e.g., Taber & Lodge,

2006). To support this argument, Miller et al. (2016) suggest that more knowledgeable and sophisticated individuals hold stronger political attitudes, and thus, they have more reasons to protect their beliefs, engaging in a "worldview-confirming" motivated reasoning.

This last argument on the role of distorted cognitive processes in conspiracy beliefs is, at least apparently, in stark contrast with Swami et al. (2014)'s meta-cognitive account of higher sophistication leading up to higher self-awareness of biases and reduced conspiracy beliefs. However, I argue that these two accounts are not necessarily in contradiction and that the issue may be simply related to what we mean by "cognitive biases." As a term, it is often used with a very broad meaning, gathering a set of widely different phenomena. Just to mention a couple of examples which will be further discussed in the following sections, conjunction fallacy (Tversky & Kahneman, 1982) and confirmation bias (Nickerson, 1998) violate two very different normative rules of reasoning, but they are both classified as systematic judgment errors and often put on the same logical level (e.g., Binnendyk & Pennycook, 2022; Stall & Petrocelli, 2022), despite recent calls for more parsimony and preciseness in bias research (Oeberst & Imhoff, 2023).

One may argue that bolstering sophistication and analytic thinking might indeed lead an individual to be less susceptible to conjunction fallacy, which is a violation of a probabilistic rule, thus confirming Swami et al. (2014)'s hypothesis, but that does not necessarily apply also to confirmation bias, which is a violation of a normative belief-updating rule and it has a self-serving nature. Hence, it is not possible to argue, at least not at the general level, that self-awareness of any cognitive biases through increased analytical thinking or deliberation ultimately leads to reduced conspiracy beliefs.

Thus, because of the impossibility to draw a general line on a set of extremely varied phenomena, in this paper, I propose a different, probably more simplistic approach, for classifying cognitive biases in terms of how they contribute to conspiracist ideation. As stated before, this approach does not necessarily describe how conspiracism naturally occurs, but it serves as a didactic way to classify the plethora of phenomena generally classified as "cognitive biases" in conspiracy studies. Specifically, the proposed classification categorizes biases based on when they intervene in the conspiracy ideation, separating those that kick in before the belief is formed and those that enter later in the process, when one belief has been already formed.[8]

3 | COGNITIVE BIASES CONTRIBUTING TO CONSPIRACY BELIEFS FORMATION

Although the representativeness heuristic, just like any other simplified rule of thumb, often produces accurate results, it might still produce systematic mistakes. Indeed, representativeness heuristic is a model of thinking rooted in bounded rationality and based on stereotypes—in other words, it is defined as an "attribute substitution model" for which individuals who must formulate a complex judgment substitutes such task with an attribute that can be more easily computed (Kahneman, 2003), providing fast judgments under conditions of limited cognitive resources. Moreover, representativeness is deeply linked to categorization, which is a fundamental feature of human perception and understanding of the world: in fact, the judgments of similarity necessarily imply the existence of categories in our minds.

In the classification proposed by this paper, systematic errors deriving from representativeness heuristic are classified as formation biases. By that, I mean that the following errors contribute to the formation of a conspiracy belief that before that moment did not exist (i.e., prior). Instead, the errors reviewed in Section 4 necessarily imply that a prior already existed. Thus, the classification

proposed here mainly relies on the moment in which cognitive distortions occur in the process, rather than their function: an ante-belief moment (when no prior exists) and a post-belief moment (when a prior already exists).

3.1 | Conjunction fallacy

One important set of cognitive biases stemming from the representativeness heuristic derive from violations of probabilistic rules.[9] A very famous example of this is the "Linda problem" (Tversky & Kahneman, 1982), that is an experiment in which subjects are asked to read a description of a fictional character named Linda, "a 31-years-old, single, outspoken and very bright" woman, who studied philosophy and is very passionate about social issues. After reading such text, subjects are asked which of the following sentences is more likely: "Linda is a bank teller" or "Linda is a bank teller who is active in the feminist movements." Subjects who overestimated the likelihood of the second sentence violated a very simple law of probabilities: the occurrence of two events in conjunction is always less than or equal to the probability of one occurring alone (however, see Gigerenzer, 1991). Nevertheless, since the second sentence matches more the stereotyped description of an activist, people attribute more likelihood to the conjunction rather than to the single event. The tendency to make this logical mistake is called conjunction fallacy and its effect is particularly strong when individuals can find a causal pattern that links the two events (Nestler, 2008). Thus, the conjunction fallacy facilitates the formation of a new belief that there exists a causal link between two co-occurring events. For this reason, conjunction fallacy was classified as a formation bias, as it does not imply the existence of a prior to operate.

In order to see this bias at work, let us consider the example of the "umbrella man" (Cutler, 1995). Seconds before the assassination of John F. Kennedy, a man, later identified as Louie Steven Witt, had been seen opening an umbrella in the background of the scene. Some conspiracy theorists considered this as a sign for the killer that it was the right time to shoot. In reality, decades later, during an interview, Louie Steven Witt admitted that he had opened the umbrella as a joke to the President: back in the days, in fact, opening a black umbrella during a public event was considered as a sign of protest against nazis (Morris, 2011). Here, it is clear that two unrelated events (the assassination and the umbrella opening) are considered as being causally related just because they co-occur in the same place and at the same moment, hence the conjunction fallacy led up to the infamous Umbrella Man CT.

Conjunction fallacy has been directly studied in the conspiracy beliefs domain by Brotherton and French (2014). In their study, susceptibility to conjunction fallacy was measured by using a modified version of the Scenario Judgement Questionnaire (Rogers et al., 2009), which is a scale consisting of 24 vignettes describing a situation (e.g., "Leanne arrives home late one evening after visiting her sister, who lives six miles away, and goes to bed. Leanne rarely has nightmares, but this night she is awakened by a particularly frightening dream."), followed by three statements that subjects were asked to rate in terms of likelihood. The first two statements included a single explanation for the vignette (e.g., "Leanne dreams that a house is on fire" and "a fire breaks out in Leanne's sister's house"), while the third included the first two explanations in conjunction, linked together by a causality statement that implied some conspiratorial or paranormal or neutral event (e.g., "Leanne dreams that a house is on fire, and a fire breaks out in Leanne's sister's house"—paranormal themed example). Each judgment attributing more likelihood to the conjunction statement represented a conjunction error. About 76.9% of the sample committed at least one conjunction error for the conspiratorial items (against 69.2% for the paranormal items

and 87.9% for the neutral items). Researchers also found that susceptibility to conjunction errors correlated with beliefs in CTs (measured by the Generic Conspiracy Beliefs scale) more than with paranormal beliefs, regardless of the error types (neutral, conspiratorial, or paranormal). This result seems to point out that susceptibility to conjunction fallacy for conspiracy believers is not domain-specific, implying that those who fall for CTs are generally more prone to overestimate that likelihood of co-occurring events causally linked together. Authors suggest that this is due to the fact that "[conspiracy] theories often rely on a confluence of events being subsumed under a singular narrative." In other words, conspiracy believers may perceive conjunctions as more representative explanations than singular causes for events.

On a similar note, Dagnall et al. (2017) investigated the link between conspiracism and susceptibility to conjunction fallacy (and errors in perception of randomness). In their study, they employed two different measures of conspiracism (the aforementioned Generic Conspiracy Beliefs scale and the General Measure of Conspiracism scale by Drinkwater et al., 2012), one of paranormal beliefs (Revised Paranormal Belief scale by Tobacyk & Milford, 1983), plus a scenario questionnaire to measure conjunction errors. They only partially replicated results from previous works; in fact, they found that while susceptibility to conjunction errors predicted conspiracy beliefs, errors in perception of randomness predicted paranormal beliefs, which were only weakly related to conjunction fallacy. Dagnall et al. (2017) dismissed as an overgeneralization previous literature (e.g., Brotherton & French, 2014) which linked paranormal and conspiracy beliefs on the basis of susceptibility to conjunction errors. Such assumption, they argue, neglects "the complex and varied nature of unusual/unconventional beliefs." Wabnegger et al. (2021) replicated previous studies by designing a similar method to Scenario Judgment Scenario (Rogers et al., 2009), but in their study, the main topics of the statements included in the questionnaire were Covid-19-related CTs and miraculous healing, apart from a control condition, in which the theme was neutral. One Covid-19-related vignette was: "The Bill Gates Foundation fights against Corona," and the statements were (a) "The Bill Gates Foundation strives for a high vaccination rate" (single); (b) "The Bill Gates Foundation strives for a high vaccination rate and thus wants to increase its wealth" (conjunction).[10] In their study, 74% of participants made at least one conjunction error throughout all conditions and 64% made at least one in the conspiracy condition. Covid-19-related errors were only predicted by conspiracy beliefs, that is, for each increase of one point in the questionnaire (Generic Conspiracy Beliefs scale), the likelihood of committing one conjunction error rose by 33%. Thus, these results successfully replicated previous literature (Brotherton & French, 2014; Rogers et al., 2009).

Similarly, Drinkwater et al. (2018) found that proneness to conjunction fallacy predicts beliefs in PRS (i.e., a common theme in many CTs where a powerful elite manipulates the population by introducing a problem and then proposing their own means to solve that problem). In their paper, they proposed that conjunction errors in conspiracy studies entail two processes: first, a misperception of chance and second, the attribution of causation to a higher power (in the case of PRS). Another study which successfully replicated Brotherton and French (2014) is Moulding et al. (2016), which also measured conjunction fallacy by the means of Scenario Judgment Questionnaire and found that a proneness to fall for this type of error correlates with conspiracist ideation. Similarly, but by employing a substantially different scenario questionnaire, van der Wal et al. (2018) also found that perceiving an underlying cause or a pattern between a streak of consistent events correlate with conspiracy beliefs.

Overall, the evidence reviewed so far seems to support the idea that conspiracy mentality could indeed be driven by a set conjunction fallacy, which not only contributes to conspiracy studies, but also to other anomalistic beliefs. In fact, previously, other authors studied conjunction fallacy

in relation to paranormal beliefs, with mixed results. Dagnall et al. (2007), for example, found no correlation, but their study was criticized for sampling issues and scales quality (Rogers et al., 2009). Later, Rogers et al. (2009, 2011) investigated the very same phenomenon by employing superior methods and found patterns of results that are similar to Brotherton and French (2014): paranormal believers are more prone to conjunction fallacy, regardless of the content of the conjunctions. These results, combined with those which show an association between paranormal and conspiracy beliefs (e.g., van Prooijen & Acker, 2015), seem to suggest that the set of cognitive processes underlying anomalistic systems of beliefs may even be the same.

3.2 | Jumping-to-conclusions bias

Another representativeness-related cognitive bias, which has been investigated in the field of conspiracy studies, is the jumping-to-conclusion bias (JTC), which is defined as the tendency to stop collecting evidence relatively soon before making a decision (Moritz & Woodward, 2005). Thus, in the domain of conspiracy beliefs, JTC represents a tendency to produce hasty judgments after having collected relatively little evidence. Consequently, in the categorization proposed by this paper, JTC is classified a bias contributing to the formation of beliefs, as it does not imply the existence of a prior to operate.

This phenomenon is usually measured by employing a beads task (Huq et al., 1988) in which subjects are shown two jars containing two types of beads in an opposite ratio (e.g., 60% black and 40% white, and vice versa). Subjects are subsequently presented with one bead at a time from only one jar and in each round, they are asked whether they're ready to guess from which jar the beads are drawn. The sooner they stop collecting evidence, the more they're affected by JTC bias. JTC bias has been observed in several cases of delusions formation (Garety et al., 2013).

The first study, which assessed the link between JTC bias and conspiracy beliefs, was Moulding et al. (2016). Authors employed a modified version of the beads task, called "fish task," in which subjects are faced with a scenario involving a fisherman fishing two differently colored species of fishes from two possible lakes, A and B. Lakes contains opposite ratios of fishes (e.g., A contains 70 red fishes and 30 blue fishes, while B contains 30 blue fishes and 70 orange fishes). Subjects are presented with one fish after the other, in sequence (e.g., RBRRBRBRRB), and at each step, they are asked to guess whether the fish was fished from lake A or lake B. The basic measure of this bias was the number of draws to decision, thus the lower the number of draws, the higher the tendency to "jump to conclusions." They found a strong correlation between JTC bias and conspiracist ideation, strengthening the link between processes of paranoia and conspiracism; but more interestingly, they included a measure of belief in historically true CTs, and found that JTC bias is more strongly related to belief in false CTs.

Similar results were found by Pytlik et al. (2020), who found that subjects showing a higher JTC bias in the fish task were also more prone to endorse CTs and showed a stronger tendency to adopt an intuitive thinking style. On a similar note, Kuhn et al. (2021) replicated Pytlik et al.'s results by employing an analogous fish task to measure JTC bias in a sample of German-speaking subjects, specifically focusing on conspiracy beliefs related to coronavirus.[11]

Another recent work by Hattersley et al. (2022) expanded previous studies on JTC bias by hypothesizing that reasoning biases serve the purpose of reducing the dissonance between a false narrative and wider data that need to be fitted in the CT. Thus, they investigated whether believing more implausible CTs (i.e., false narratives, which account well for a limited set of data but explain poorly data outside this subset of data) correlates with cognitive-reducing biases (i.e.,

cognitive strategies, which minimize the costs of holding implausible beliefs, such as information avoidance). Among these, authors included a task to measure JTC bias, which varied slightly from the fish task or the beads task, but essentially took into consideration the number of draws before decision. As predicted, they found that belief in implausible CTs, but not plausible ones, correlates with lower decision thresholds in the JTC task, a pattern of results that is consistent with the original results by Moulding et al. (2016).

3.3 | Proportionality bias

Resemblance might also be perceived between the alleged cause and the effect of certain events. If the cause resembles the effect, then some individuals might be biased towards thinking that a similarly looking cause is more likely of an explanation for a certain event. One of the features on which the cause-effect resemblance judgment can be made is the size: some scholars have argued that people might seek for explanations that are proportional to the consequence of the phenomenon. Hence, an event with big consequences (e.g., a pandemic) must have big causes (e.g., a secret conspiracy for reducing world's population) rather than small causes (e.g., a spillover coming from a bat). A very clear example of this is when superstitious craps shooters adjust their dice roll depending on whether they need to get a high or a low number (Henslin, 1967). In order to get a low number (small effect), superstitious shooters tend to roll slowly (small cause); for big numbers (big effect), instead, they tend to roll energetically (big cause). Thus, proportionality bias contributes to the formation of a belief about the likelihood that a certain event is the cause of another based on their resemblance. It does not require the existence of a prior to operate, thus it was included in the class of cognitive biases contributing to the formation phase.

In the conspiracy beliefs domain, the first study trying to assess a link between conspiracy beliefs and proportionality bias was conducted by McCauley and Jacques (1979). In their first study, authors asked subjects to rate the likelihood that the sniper who attacked a fictional president was part of a conspiracy (big cause) or was alone and unaided (small cause), after having read that the shooter had shot and killed him (big effect) or shot and missed him (small effect). The authors found that subjects who read that the president was killed were more likely to endorse the CT.

In an attempt to replicate this study and further explain the link between CTs and need for proportional explanations, Leman and Cinnirella (2007) found evidence that supports the existence of such "major event-major cause" bias, but also found that individuals are all equally susceptible to such inferential mistake, regardless of their prior support for CTs; hence, it should not be the case that those who endorse CTs are more prone to commit proportionality bias. However, Leboeuf and Norton (2012) found that subjects were more likely to endorse a CT if they were asked to explain an event that had larger social consequences: for example, subjects were more likely to believe that the president J. F. Kennedy was killed by a conspiracy when they were told that his assassination prolonged the Vietnam War, causing 40,000 deaths, with respect to the group of subjects who were told the opposite version of the story (75 vs. 64%). When subjects are able to match causes and consequences in such way, they feel more confident about the causal relationship they identified.

A preference for size consistency between effects and explanations was also found in four different studies by van Prooijen and van Dijk (2014). Specifically, they found that when reading about an event with big consequences (a lethal car crash involving an African political leader of the opposition), subjects held stronger conspiracy beliefs, compared with the condition in which

they read about an event with small consequences (a nonlethal car crash involving the same leader). More interestingly, however, this effect was mediated by perspective taking, as only the subjects who were asked to imagine themselves as citizens of Benin, thus assuming the point of view of African citizens, suffered from proportionality bias. This result suggests that heuristic-driven sense-making may be mediated by a social dynamic in which individuals take into account the reference group's perspective, which has been damaged by a highly relevant and potentially harmful event, such as the death of a political leader.

3.4 | Agency detection bias

Another dimension on which the resemblance judgment can be based is agency. Explanations of events could sound more convincing when they imply the presence of agents that actively cause certain occurrences. As seen before, CTs always imply agency by definition: nothing happens randomly, but things happen because someone planned it that way. Hence, those who tend to overattribute agency might be more prone to endorse CTs. Moreover, agency detection bias has been found to play a fundamental role in other anomalistic beliefs, such as paranormal beliefs (e.g., Riekki et al., 2012) and religious beliefs (e.g., Petrican & Burris., 2012). Such bias represents a preference for explanations involving intentionality and agency, which facilitates the formation of a belief that a certain event is caused by the intentional behavior of agents. Thus, since this bias does not require the existence of a prior belief to operate, it was included in the formation category.

Agency detection bias has been studied in the domain of CTs from different perspectives, and this has caused the co-existence of several terms to identify closely related phenomena and a large variety of methods employed to measure this variable.

First, a few scholars focused on *intentionality*: if agents are the ultimate cause of a certain event, then their behaviors must have been intentional and nonrandom. This stream of literature built on Rosset (2008), who investigated intentionality bias in a general domain by the means of three experimental studies to test the assumption that all actions are automatically interpreted by humans as being intentional at first glance, until this belief is updated on second thought. This account describes agency detection bias as a perceptual bias: "when evaluating an agent and an action, an intentional inference is automatically activated as the cause of the action." In Brotherton and French (2015), intentionality bias was directly investigated in the CTs domain, by employing a modified version of Rosset's method which consisted of a list of 12 sentences describing an ambiguous action that could either be interpreted as intentional or nonintentional (e.g., "He set the house on fire" or "She kicked the dog"). They found a small, but statistically significant correlation between general conspiracy beliefs and the tendency to make intentional inferences.

However, secondly and more commonly, several scholars have focused on measures of agency detection such as *anthropomorphism*, which is defined as the tendency to attribute human-like features, intentions and motivations to nonhuman agents' behavior (Epley et al., 2007). This type of bias is quite different from intentionality bias as described by Rosset (2008), as here the main focus is on ambiguous actions performed by nonhuman agents, like objects or animals, rather than by humans. Nevertheless, this concept has been widely employed by researchers to operationalize agency detection in general. For example, Imhoff and Bruder (2014) employed anthropomorphism as a proxy of agency detection bias (they define it as hypersensitive agency detection), measured it by the means of a validated scale called Individual Differences in Anthropomorphism Questionnaire (Waytz et al., 2010)[12] and found that it was related to CTs endorsement, replicating results

from a previous study that employed the same measure, always by Bruder et al. (2013). Later, van der Tempel and Alcock (2015) employed a different measure (Belief in the Purpose of Random Events scale––Lindeman & Arnio, 2007) which consists of a set of 18 sentences that describe positive, neutral or negative events.[13] Subjects were asked to imagine these occurrences happening to themselves and state how much they considered them as being purposeful (where purpose meant "planned" or "intent"). They found that hypersensitive agency detection was related to conspiratorial ideation, as CTs usually provide individuals with agents on which they can project responsibility for events, independently of the valence of the events (i.e., neutral, positive, or negative events were all equally likely to trigger such bias).

On a different note, Douglas et al. (2016) investigated agency detection bias by employing two methods: anthropomorphism and perceived intentionality.[14] They found that both these measures were related to conspiracy beliefs. Finally, in a series of studies included in the aforementioned paper by Bortherton and French (2015), authors investigated anthropomorphism and intentionality, by the means of the Individual Differences in Anthropomorphism Questionnaire, finding a positive correlation with conspiracy beliefs. However, they could not find any evidence that anthropomorphism was actually related to intentionality bias, as it should be (since they are both dimensions of agency detection). In their Study 3, they found that subjects with higher levels of anthropomorphism "were no more likely to interpret ambiguous sentences as intentional." Also, they found that the relation between anthropomorphism and conspiracy beliefs was stronger and more significant than the relation with intentionality bias, hence the former cannot be justified in terms of biased attribution of intentions. This has led the authors to argue that these two dimensions are actually two distinct traits measuring different things: intentionality bias is a tendency to make immediate intentional inferences on ambiguous human actions, whereas anthropomorphism reflects a broader attitude towards reality.

One final proxy of agency detection is *teleological thinking*, which is defined as the tendency to ascribe a final cause to natural events (Gonzales Galli & Meinardi, 2011) and often implies the existence of an entity, for instance a divinity. Wagner-Egger et al. (2018) found that teleological bias was moderately correlated with conspiracist ideation and creationism, which were in turn correlated with each other.

4 | UPDATING CONSPIRACY BELIEFS

The biased cognitive processes reviewed so far contribute to the formation of conspiracy beliefs. Conspiracy believers attribute more probability to causal explanations that co-occur with the consequences of such events (conjunction fallacy), that are proportional to the effects (proportional bias) or that are intentional (agency detection bias). However, another important perspective of investigation is how distortions influence the updating process of conspiracy beliefs: once the belief has been formed, new evidence gets collected and processed in a biased way. Thus, this categorization implies that a prior belief already exists. For example, confirmation bias distorts the collection of new evidence towards pieces of information that are consistent with previously held beliefs. Consequently, biases reviewed in this section contribute to the process in a post-belief moment (i.e., when a prior already exists), as they require the existence of a prior to operate. In the following paragraphs, I will review the existing evidence for such processes.

4.1 | Confirmation bias

Collection of new evidence can be limited by a biased process of interpreting new data that systematically takes into account only consistent information, while neglecting or misinterpreting disconfirmatory evidence. Such mechanism is commonly known as confirmation bias (Nickerson, 1998). According to Miller et al. (2016, p. 826), "once a CT is endorsed, confirmation bias often kicks in, leading individuals to seek out and perceive consistent information, thus solidifying the belief." When disconfirming pieces of evidence are encountered, conspiracy believers might (i) simply ignore it, or (ii) produce fake evidence against it, or (iii) interpret it in a way that corroborates their prior beliefs. According to Rabin and Schrag's (1999) model of confirmation bias, even with infinite amount of correct information, one individual can still get convinced of the wrong hypothesis, as when she encounters a signal that counters her belief about the state of the world, such signal gets unconsciously misread.

By definition, confirmation bias describes the tendency to seek new evidence that is consistent with previously held beliefs. Thus, it is a distortion that necessarily occurs in a phase in which the conspiracy belief has already been formed and new belief-relevant information has to be incorporated (or disregarded) into a previously formed belief. For this reason, it was classified as a bias contributing to the belief updating process, as it requires the existence of a prior.

As mentioned above, CTs are in fact unfalsifiable, as one cannot produce any piece of evidence that contradicts the theory. Any attempt to prove the theory wrong is actually considered as part of the plot on which the theory is built. From this point of view, CTs are by definition the "ultimate case" of confirmation bias (Wagner-Egger, 2022). In this sense, CTs have a built-in defense system that make them immune to fact-checking. As a result, individuals with conspiratorial attitudes might get further polarized: instead of updating their beliefs in the right direction, believers might actually end up being more in favor of their initial position.

Lord et al. (1979) documented a phenomenon called biased assimilation that closely resembles confirmation bias; in their study, individuals who held strong opinions on socio-political topics tended to be biased by their own accounts in the process of analyzing new evidence. Specifically, individuals were uncritical towards corroborating evidence but critical towards contrary evidence, consistently with the definition of confirmation bias by Nickerson (1998). McHoskey (1995) successfully replicated these results, by investigating confirmation bias in the CTs domain, specifically focusing on false narratives on the assassination of President John Kennedy. In this study, subjects were first surveyed on their attitudes towards the cause of President assassination,[15] and then were presented with one of two texts of equal length supporting each theory. After reading the texts, subjects were asked to repeat the initial survey, to find out whether their attitudes had changed. Not only they found that biased assimilation occurred, as individuals with pre-existing attitudes rated consistent information as more trustworthy than competing information, but they also found that attitude polarization in individuals who endorsed the CT was stronger than in individuals who endorsed the official account of events.

More recently, Kuhn et al. (2021) investigated the role of confirmation bias in conspiracy beliefs by employing the Bias Against Disconfirmatory Evidence task (Woodward et al., 2006). Essentially, the task consists in a series of ambiguous scenarios being sequentially presented to participants; at each step, scenarios become less ambiguous, and subjects are asked to evaluate the strength of some hypotheses, based on the available evidence, which can be confirming or disconfirming. A disproportionately focus on confirming information in updating their beliefs is a sign of confirmation bias at work. It was found that a greater bias against disconfirmatory evidence

predicted higher levels of specific conspiracy beliefs. By employing a similar task, Georgiou et al. (2021) found that belief flexibility was negatively correlated with conspiracy beliefs in a sample of more than 500 adults with varying levels of autistic traits.

Although several commentaries (e.g., Jussim et al., 2019; Leman, 2007; Myers, 2019; Weigmann, 2018) address confirmation bias as one of the most relevant phenomena for conspiracism and despite this being very plausible, it should be noted that evidence supporting such hypothesis in the CTs domain is still scarce. On a different note, a recent study by Jiménez et al. (2020) found no evidence that pre-existing vaccine attitudes influenced perception of severity and recall of the symptoms of the disease aimed to prevent through vaccination.

One thing that should be noted is that confirmation bias may be interpreted in terms of motivated reasoning (Bénabou, 2015), which implies that such cognitive error does not occur in a vacuum: it is not simply an undirected statistical error, it is actually goal-oriented. Bénabou (2015) gives the example of self-judgments in depressive versus nondepressive individuals: only the former would interpret ambiguous cues (e.g., someone insistently looking at them) as corroborating their a priori negative self-views because of lack of self-confidence (Alloy & Abrahmson, 1979). Bénabou and Tirole (2016) interpret this phenomenon as self-serving, because cognitive distortions are oriented (sometimes unconsciously) towards making beliefs advantageous to the self.[16] Following this reasoning, in the CTs domain, believers who already endorse certain theories will incur in biased information-seeking behaviors as they will collect only corroborating evidence as a way to serve their own goals (e.g., to preserve a conspiracy belief that is relevant for their belief system).

This account of confirmation bias moves beyond the bounded rationality framework, which generally postulates that more sophisticated thinkers are less likely to fall victim of poor reasoning and are less prone to cognitive biases. In fact, Kahan et al. (2017) found that even more than average sophisticated individuals commit confirmation bias when updating beliefs that are ideologically relevant for one's identity.[17] If confirmation bias occurs independently of the cognitive style of the believer, then results showing that analytical thinking and higher education are negatively correlated with conspiracy beliefs (e.g., Gligorić et al., 2021) are not useful in assessing the susceptibility of conspiracy believers to confirmation bias. However, a distinction should be made between biases that are indeed the byproduct of motivated reasoning and those which stem from lack of sophistication. In fact, while the motivated reasoning account can apply to mistakes involved in making sense of and interpreting contradictory evidence, it does not necessarily apply to other kinds of cognitive biases, where less sophistication in thinking does in fact play a role, such as loss aversion or hyperbolic discounting (Frederick, 2005). However, it certainly can be applied to cognitive biases that are involved in CTs that fulfill ideological and psychological needs (Miller et al., 2016).

4.2 | Availability bias

Availability bias is the systematic error related to the tendency to rely on the most available piece of information in one's memory when making judgment or estimating the likelihood of an event (Tversky & Kahneman, 1973). Please note that following this definition, one may also consider availability bias as an error which contributes to belief formation phase. In fact, one may form a belief only after encountering a certain piece of information for several times. However, following Connors and Halligan (2015) model of belief formation, I assume that individuals form a belief whenever new information is met for the first time. Consequently, when individuals encounter

the information for the second or third time, they are already revising the previously formed belief, and thus, repetition strengthens it. For this reason, availability bias was included in the class of updating biases, as it necessarily implies the existence of a prior.

This phenomenon can influence CTs endorsement as the ease with which individuals can recall anecdotes and facts might corroborate their erroneous beliefs. Also, since sensationalistic phenomena—which are at the core of CTs (Brotherton & French, 2014)—usually receive copious media coverage, involving unverified facts, deceptive journalism (Govaert et al., 2020) and plain disinformation in the news (Tsfati et al., 2020), it is very likely that these pieces of erroneous information will easily stick with conspiracy theorists' minds.

Moreover, as Enke and Zimmermann (2017) argued, since news outlets tend to rely on the same sources, news are often similar and this results in an over-share of the same narratives, that get repeated over and over through media. The problem, they argue, is that individuals neglect the correlation between apparently different news and "double-count" the signals about the state of the world, polarizing their opinion on the topic. Correlation neglect can indeed increase availability of one piece of information more than it would normally happen if individuals were aware that the different news they are consuming share the same source (thus, they are the same signals).

This hypothesis on availability bias is derived from studies on the impact of media coverage on the salience of information, and ultimately, the perception of reality. These studies usually employ designs in which media exposure is experimentally manipulated (e.g., subjects are made to watch specific news) or simply implicit (e.g., subjects should be more aware of news because of their nationality). An example of the latter category is Eisenman (1993), in which it was found that subjects had a misperception about the increase of drug use in the United States in the 90's that was due to the excessive media coverage of drug cases at that time. Coverage through media and other channels of communication (e.g., interpersonal conversations) can indeed distort risk perceptions and frequency perceptions of events in the real world. In order to investigate this, Tyler and Cook (1984) adopted a different, more direct approach, by examining how media coverage about abuses in home health care would increase societal and individual perception of risk. For example, in Study 1, authors divided subjects in two groups and contacted the subjects 1–2 weeks before the experimental task: the experimental group was asked to watch an upcoming 20-min NBC program about the topic, while the control group was asked to watch another television program that would be aired at the same time, in order to avoid that control subjects would watch the target program. At the societal level, subjects were asked to report the magnitude of the issue of home health care abuses, while at the individual level, they were asked to report how they feel at risk that they will not be able to find fraud-free programs of home health care. Their studies confirm that media coverage has an influence on risk perceptions, but only at the societal level; in other words, media impact through exposure is mostly impersonal.

Generally speaking, increasing availability through repetition has been found to lead to an inflation of judgments of truth about statements, independently of their actual truth (for a meta-analysis, see Dechêne et al., 2010). Such phenomenon is commonly defined as the "truth effect," and in the field of conspiracy studies, it has been investigated by Béna et al. (2023), though not explicitly framing it as "availability bias." Authors found that repeated statements about CTs were judged as being more true than new statements. Thus, increasing exposure to certain false narratives has been shown to increase their credibility. Moreover, in a previous pre-print also by Béna et al. (2023), authors found that CTs which were perceived as familiar were more likely to be regarded as true, with respect to never heard before CTs.

Not only excessive media coverage of real facts impacts beliefs on reality, but also fictional media exposure does. Ost et al. (2008) exploited the tragic event of the explosion of the No. 30 bus

in Tavistock Square, London on July 7th, 2005 as the target event for their experiment in which they compared responses by subjects from UK and responses by subjects from Sweden. Subjects were asked to report if they had watched three types of footages of the accident, with two of them being fake. Subjects from UK were more likely to report that they had seen all three types of news, compared to subjects from Sweden. Authors concluded that media exposure to disinformation contribute to the formation of false memories.

Salience of certain narratives can also be increased by exposure to entertainment products and media, such as books and movies. Butler et al. (1995, p. 245) provides a good example of this mechanism, as experimenters asked participants to watch Oliver Stone's controversial film "JFK" about the assassination of the President John F. Kennedy and compared their pre-view and post-view conspiracy beliefs. After having watched the movie, subjects "attributed a greater likelihood of involvement in the assassination to everyone listed" (including Cuban exiles, weapons manufacturers, CIA, etc.) except for Oswald, Mafia, and the Dallas police. In a similar vein, Douglas and Sutton (2008) measured conspiracy beliefs about Princess Diana's assassination in subjects who were asked to read popular CTs on the subject, finding a greater endorsement when compared to the control group who did not receive any information.

Media coverage is not the only channel through which availability bias can be triggered. For example, in the vaccine hesitancy literature, several studies underline the negative importance of exposure to rare adverse events in the vaccination decision-making process (for a review, see Azarpanah et al., 2021). Such information may come from the media, but also from detailed reports, which are handed out to patients before getting vaccinated, or from personal advice coming from health-care providers with antivaccination attitudes (MacDonald & Dubé, 2015). All of these sources can make rare adverse events excessively salient in patients' minds, leading them to overestimate the likelihood that such cases might occur to them and ultimately to become vaccine hesitant.

Again, although several scholars refer to availability bias as another important driver for updating conspiracy beliefs (e.g., Myers, 2019), to our knowledge, there is no empirical evidence supporting this hypothesis. The main assumption is that once an individual becomes aware of and endorses one CT, repetition through exposure strengthens the belief.[18]

4.3 | Overconfidence

Overconfidence is an excess of self-confidence, which leads individuals to overestimate their own abilities (in terms of performance, often in comparison to the abilities of others) and the accuracy of their own judgments and beliefs (Moore & Schatz, 2017). Overconfidence is a form of self-deception, which is always self-serving, as the distorted beliefs it produces are always in the interest of the self. Overconfidence limits the process of belief updating as it may make beliefs highly resistant to change. If one individual feels that her beliefs have a high explanatory power and/or overestimate her degree of competence on a given subject, this might prevent her from encountering new disconfirming pieces of evidence. Just like with confirmation bias, overestimation of beliefs implies the existence of previously held beliefs, thus overconfidence has been classified as a bias affecting belief updating.

When individuals are overly confident, they mis-calibrate their judgments on their skills and might fail to take action in order to improve them. For example, students who are overconfident about their preparation might fail to study enough for the exams (Miller & Geraci, 2011). Moreover, overconfident individuals might be less willing to confront with other more skilled people, as they

feel like they have nothing to learn from others, since they already consider themselves the experts (Sheldon et al., 2014). This behavioral pattern is commonly defined as the Dunning–Kruger effect (Kruger & Dunning, 1999), a cognitive bias based on lack of self-awareness of one's own skills, that leads the individual to self-overestimation with respect to other people––however, this theory has recently received some criticism, as data from the original study could also be explained statistically in terms of regression to the mean (Magnus & Peresetsky, 2022).

Griffin and Tversky (1992) proposed a notion of confidence that can be decomposed in two dimensions of evidence: its strength and its validity. For example, to evaluate a recommendation letter for a student, a professor might consider its strength (e.g., the warmth of the letter) and its validity (e.g., the credibility of the writer). Individuals are normatively assumed to balance these two features, but they actually tend to rely more on the strength of the impression and then make adjustments in response to its weight, in an anchor-and-adjust fashion (Quattrone, 1982). Griffin and Tversky (1992) argue that individuals tend to be overconfident when strength is high and validity is low. In the case of conspiracy beliefs, this may occur when the emotional salience or personal relevance of the evidence is high.

For the purpose of this review, we focus on overconfidence that is related to the self-assessment of the explanatory power of one's beliefs. In fact, in the conspiracy beliefs domain, overconfidence has been found to lead believers to (i) attribute a greater explanatory power to incorrect beliefs and (ii) fail to update their beliefs since they are not willing to collect new evidence, especially if it comes from sources that belong to opposite side of their political spectrum.

Regarding the first point, Vitriol and Marsh (2018) argue that since common people have only a superficial understanding of complex phenomena, they are not able to accurately estimate the quality and the depth of their explanations of events, leading them to be overconfident about their beliefs. In a previous work by Marsh and Vitriol (2018), they deemed it as "explanation hubris," recalling the ancient Greek term for excessive pride and outrage, but they actually borrow this concept from Rozenblit and Keil (2002) *Illusion of Explanatory Depth* framework, in which it was found that subjects who significantly overestimated their understanding of everyday objects (cell phones, sewing machines, and zippers), after being asked to write a brief but detailed description of how these items work, tended to downwards rerate their own knowledge. In Vitriol and Marsh (2018), subjects were asked to perform a similar task, but this time they had to rate their understanding of political phenomena. It is interesting to note that in their experimental design, the post-explanation rating of their knowledge had the purpose of assessing the extent to which subjects remained self-confident of the accuracy of their previous beliefs. The act of providing an explanation was designed to make subjects recalibrate their assessment about their knowledge. Finally, authors intended to investigate how this biased updating process was related to conspiracy beliefs. Consistently with previous literature on *Illusion of Explanatory Depth*, they found that post-explanation ratings generally tended to decrease; however, subjects who stayed confident of their political knowledge post-explanation were more likely to endorse conspiracy beliefs. This result was valid at the general level of conspiratorial beliefs (measured by the means of Generic Conspiracy Beliefs scale), but also when specific conspiracy beliefs were investigated. In fact, they also looked into the relationship between Illusion of Explanatory Depth and conspiratorial beliefs about the 2016 USA election. Specifically, they found that individuals who were more confident about their understanding of 2016 election post-explanation were also more likely to believe that the result of the election was illegitimate. This relationship, they found, was also mediated by vote choice: post-explanation confidence was still stronger among those who voted for the losing candidate (Clinton) than among those who voted for the winning one (Trump). Finally, authors

argue that requiring believers to explain the causal mechanism of key features of a CT they endorse might reduce the confidence they have in their belief.

Regarding the second point (i.e., failing to collect new evidence to update one's belief), Vranic et al. (2022) investigated the relationship between conspiratorial ideation and correlates of trust in science, which are key features of scientific communication. Among these variables, they included demographics, political orientation, and overconfidence in own's reasoning. They argue that metacognitive deficits as the Dunning–Kruger effect can contribute to conspiracy beliefs as they ultimately lead to polarization, because it reduces the likelihood that overconfident people will come across different sources of information. People might refuse to accept opinions and knowledge coming from the other side of the political spectrum, which, in the case of conspiracy theorists, could be represented by authorities and official institutions. To measure participants' overconfidence in their own reasoning, Vranic et al. (2022) made subjects complete a syllogisms test, after which they had to report the number of correct answers. Overconfidence was computed as the difference between actual and estimated performance, and it was found to correlate with the endorsement of Covid-19 CTs. Authors argue that lack of awareness of the quality of one's knowledge make believers unable to distinguish between science, leading them towards the *I did my own research* thinking trap.

Finally, in a recent study by Giuliani and Presaghi (2023), overconfidence was investigated in relation to conspiratorial ideation and populist attitudes in the context of Covid-19 emergency. Specifically, the authors focused on subjects' overconfidence regarding the risks of Covid-19 infection by employing a specific scale.[19] They found that being overconfident about the perceived risks of the disease increases the likelihood of not complying with preventive health measures and it is positively associated with general conspiracy beliefs. However, unlike Vitriol and Marsh (2018), in this study, overconfidence was not conceptualized as the confidence about the quality of one's explanations of events, neither as the confidence about one's reasoning skills (Vranic et al., 2022), but rather as the confidence in one's ability to predict her (low) risks.

Finally, just like confirmation bias, overconfidence may be a case of motivated reasoning (Thaler, 2021). In other words, when individuals collect feedback about their performance to update the self-assessment of their own skills, they might distort information in a direction that is self-enhancing (Bénabou & Tirole, 2002).

5 | CONCLUDING REMARKS

In this paper, I have shown that there has been a paradigm shift in how conspiracy beliefs have been investigated in socio-cognitive terms at the individual level. In the early stages of conspiracy studies, researchers focused on general beliefs systems. According to this account, conspiracy believers hold a conspiracy mentality, a network of interrelated conspiracy beliefs, each one of them reinforcing the other. However, it was found that even contradicting conspiracy beliefs were related to each other, thus researchers resorted to an attitudinal explanation: conspiracy mentality is a generalized attitude, which conceptualizes the society as being secretly dominated by conspiracies (nuclear idea approach). Finally, some authors proposed a conceptual shift (van Prooijen, 2018): from a set of beliefs or a set of attitudes to a set of cognitive processes. Conspiracy mentality is the consequence of a set of systematic cognitive errors (cognitive biases), which in turn derive from simplified and intuitive rules of reasoning (heuristics). In this paper, I reviewed the available experimental evidence in the field of social and cognitive psychology, clarifying the role of cognitive biases in conspiracy beliefs, as it has been shown that susceptibility to such mistakes is associated with conspiracism.

However, as with any other attempt to explain social phenomena by employing the heuristics and biases research program, there are a few questions left unanswered that posit a challenge for future research:

1. First, if cognitive biases are so widespread and they are linked to epistemically suspect beliefs, then why are not we all conspiracy theorists? Individual and cultural differences in susceptibility to cognitive biases could be a possible explanation. In other words, not all of those who generally commit cognitive mistakes are conspiracy theorists, but those who commit more of such errors tend on average to hold more of such beliefs. Moreover, focusing exclusively on cognitive factors may induce us to underestimate the importance of social and political factors, which may in turn influence individual susceptibility to systematic errors (e.g., lack of education). In fact, such cognitive approach seems to be anchored to a strongly individualistic view of conspiracism, which seems to underweight the role of social engagement in conspiracism (Wagner-Egger et al., 2022). Incorporating the cognitive biases approach into research on socio-political factors could also help us considering systematic errors in judgments (or at least, some of them) as cognitive strategies that serve political ideology and identitarian purposes. Thus, future efforts to investigate cognitive biases should put more focus on the motives behind such errors to integrate this approach into other lines of conspiracy research.
2. What is the role of motivation behind cognitive mistakes? Cognitive biases are not necessarily blind statistical errors, as we have seen in the case of confirmation bias and overconfidence. Whenever there is room for self-oriented motivated reasoning (e.g., self-deception to protect one's identity, self-enhancing beliefs), motivation can play a role in triggering cognitive biases, and ultimately, conspiracy beliefs. For example, Imhoff and Lamberty (2017) found that conspiracy beliefs satisfy individuals' need for uniqueness––that is, the need to feel special and "stick out from the crowd"—but they also satisfy social and existential needs (Douglas et al., 2017). In any case, whatever the ultimate reason for believing, reviewed literature suggests that believers follow well-established biased patterns of reasoning to form and update their erroneous beliefs. In other words, cognitive biases play an activating role for conspiratorial ideation, *a sine qua non*. This means that maybe not all of those who commit cognitive mistakes are conspiracy theorists, but, as studies have shown, those who hold conspiracy beliefs commit on average *more* cognitive mistakes. As a consequence, CTs are narratives built to look appealing for and "to tempt" intuitive style of thinking.
3. Finally, if cognitive biases are to blame for conspiracy beliefs, what should we do to mitigate them? A recent stream of literature has shown that debiasing strategies are often successful in mitigating biases (Korteling et al., 2021), but to our knowledge, there is still no evidence that they work for individuals who believe CTs. On the one hand, debiasing might work better than debunking, as while the latter is about showing how a certain concept is wrong (Dentith, 2021), the former is more about making people aware of how certain reasoning processes can produce systematic errors. Moreover, simply providing individuals with corrective information may lead to a backfire effect (Lewandosky et al., 2012), where previous attitudes get strengthened, if messages are not conveyed in a world-view consonant frame (Kahan et al., 2011). This is consistent with the notion of confirmation bias reviewed in this paper and also with studies on polarization in public discourse. Nevertheless, works (e.g., Van Der Meer et al., 2020) on corrective information underline the important role of providing factual elaboration on debunking attempts, rather than mere rebuttal of false narratives. As we have mentioned before, proving a CT wrong somehow legitimizes it, especially when it is official authorities that select which theories have to be debunked and which are simply to be ignored (Sunstein & Vermeule, 2008).

Debiasing, instead, could be a solution that deals with the root of the problem, or at least, it tackles the issue at a higher level than mere debunking. One example of debiasing, previously discussed in this paper, is priming rationality. Swami et al. (2014) succeeded in decreasing the level of conspiracy beliefs through a verbal fluency task. However, Bago et al. (2022) found much smaller effects, and also found that increasing deliberation has an effect on belief accuracy only for those individuals with a strong anticonspiracy or a strong pro-conspiracy mindset, raising doubts on the whole approach of increasing deliberation through experimental tasks. Furthermore, a recent work by Véckalov et al. (2024) has failed to replicate results by Swami et al. (2014), showing that neither verbal fluency task nor the difficult-to-read fonts did elicit analytic thinking, and did not impact conspiracy beliefs, raising doubts about the viability and replicability of de-biasing strategies. Other more specific debiasing approaches have been tested as well. For example, Siebert and Siebert (2023) compared three different strategies: the awareness-raising technique (Aczel et al., 2015), where people get trained about their own cognitive biases, the counter-explanation technique (Anderson, 1982), where people were asked to produce causal explanations for an alternative hypothesis, and the counter-speech technique, which mostly revolves around refutations. While all of these techniques succeeded in mitigating belief perseverance bias (i.e., individuals persevering in their biased beliefs after being exposed to disconfirming evidence), it appears that counter-speech strategies were the most effective.

As argued before in this paper with respect to bias research in general, also debiasing strategies must take into account the varied nature of cognitive biases. Debiasing a confirmation bias, which has strong implications for one's identity, is a very different thing from debiasing an anchoring bias. These concerns are supported by evidence showing that those who are motivated in their biased reasoning are more resistant to debiasing interventions (Christensen & Moynihan, 2022).

In conclusion, this review of the role of cognitive biases in conspiracy beliefs has shed light on the complex and multifaceted nature of this phenomenon. While it is clear that cognitive biases play a significant role in shaping individuals' beliefs and attitudes towards CTs, there is still much to learn about how and why this happens.

Future theoretical and experimental efforts should take into account some classification of cognitive biases to disentangle different phenomena. Whether this classification is based on the existence of priors, like the one proposed in this review, or on the purpose of certain cognitive strategies, like Baron's (2008) classification of biases, I argue that more preciseness and parsimony in bias research in conspiracy studies is necessary to gain a deeper understanding of how such varied and complex phenomena contribute to unwarranted beliefs.

The classification I proposed might be useful to investigate individual differences in terms of susceptibility to cognitive biases, based on the role such fallacies play for conspiracist ideation. For instance, can we distinguish different categories of believers based on which biases they suffer from? Can we categorize CTs based on which biases they capitalize on? Further research on these topics might enable us to generate and test new hypothesis, while making concepts and notions clearer.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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No data were generated for this paper.

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ENDNOTES

[1] However, while this perspective can help rethinking conspiracy beliefs as part of human condition, it also raises questions on the relatively low widespread of such beliefs (Cassam, 2019). If we are all affected by cognitive biases, which are related to conspiracy beliefs, then why are not we all conspiracy theorists? I will try to discuss this topic in the last section of this paper.

[2] It should be noted that in conspiracy studies, the term "belief system" is used to define a network of themed beliefs that usually reinforce one another in a system of interrelations. Hence, it is a very distinct notion with respect to how this term is used in economics and in game theoretical settings. With regard to the definition of belief itself, instead, cognitive psychology defines a belief as a mental state that represents the internal acceptance of the validity or actuality of some idea (Schwitzgebel, 2010). The act of internally accepting its validity can be conceptualized as a subjective probability attribution to a certain state of the world. Thus, beliefs entail two features: (i) a representation of the world and (ii) a judgmental act which evaluates such stance as being true (Connors & Halligan 2015).

[3] However, recently, scholars have questioned these counterintuitive results by observing this apparent contradiction from a different perspective; on a second look, many competing conspiracy beliefs may be not as mutually exclusive as they appear (Walker, 2023).

[4] However, the pre-existence of older CTs does in fact predict endorsement for newer ones over time (Granados Samayoa et al., 2022).

[5] One way to think about it is using the famous Tinbergen's "four questions" framework (1963). According to Tinbergen, a behavior can be explained under four dimensions, two of which are ultimate––its function (why does that behavior exist?) and its evolution (how did it evolve?)––and two are proximate––its causation (what are the mechanisms behind it?) and its development (how does the behavior develop during the lifetime of an individual?). In this framework, cognitive biases could be considered as proximate reasons (a mechanism) for conspiracy beliefs, while attitudes and other antecedents play a functional role and should be considered as ultimate reasons.

[6] However, as I will show in the following sections, however, this link between conspiracism and dual-process theory is not so straightforward, and it may not apply to all cognitive biases.

[7] However, Binnendyk and Pennycook (2022) cited confirmation bias as a special case of "excessive deliberation" facilitating intuitions, quoting results indicating that those who do not revise their beliefs according to evidence tend to be more conspiratorial (Pennycook et al. 2020).

[8] Other classifications were also possible. For example, following the Overfitting Hypothesis (Hattersley et al. 2022), biases could have been classified between those that reduce cognitive dissonance (e.g., confirmation bias) and those that do not, but I reckon that such classification would only be possible if we assume that any cognitive bias is a form of motivated reasoning, thus a goal-oriented reasoning process, and that is not necessarily true.

[9] Another important set of deviations derive from data neglection, such as the base rate neglect. However, for the purpose of this study, we are going to focus on violations of probabilistic rules.

[10] It should be noted, however, that while in Brotherton and French (2014), the conjunction statements only implicitly implied a causal connection between the two events, in Wabnegger et al. (2021), this connection is explicitly verbalized through the adverb "thus"; this feature may have suggested the causality perception in respondents

who committed the conjunction fallacy, provided that, independently of the causality connection, it is still a violation of probabilistic laws.

[11] In their study, however, they found that the link between conspiracy beliefs and reasoning biases is nonlinear.

[12] An example of the items included in this scale is "To what extent does a television set experience emotions?."

[13] An example of the items included in this scale is "A stone falls from a scaffold and seriously injures you."

[14] Interestingly, perceived intentionality was measured by a classical psychology task, the Heider and Simmel's short film (1944), which is a short ambiguous video that shows geometrical figures moving in a space, evoking living beings acting and behaving agentically.

[15] Survey was based on this single item: "Do you believe that President John F. Kennedy was killed by a lone assassin named Lee Harvey Oswald, or that there were multiple assassins, and therefore a conspiracy to kill President Kennedy?"

[16] They are not advantageous in the sense that they necessarily self-enhance one's identity (e.g., exaggerated positive beliefs about the self in overconfident individuals), but in the sense that they always reinforce one's previously existing beliefs.

[17] According to this account, cognitive mistakes do actually serve a purpose, and this is especially true for those updating errors that concern value-loaded issues, such as gun control, abortion, and so forth, around which CTs are quite often built (e.g., vaccination, climate change, etc.)

[18] One thing that must be noted, though, is that while confirmation bias is about partisanship and ideology, availability bias is all about saliency. The more one piece of information is salient, the more individuals will attribute likelihood to it. Instead, for someone who biasedly seeks for corroborating information, it only takes few pieces of evidence to be furtherly convinced. Instead, for someone who simply relies on the availability of information, repetition is what truly makes beliefs stick. In that sense, further research should focus on differentiating different "types" of believers based on different underlying cognitive processes, and, consequently, on the different goals they may pursue.

[19] An example of the items included in this scale is: "Being infected by Covid-19 won't have severe consequences for me."

REFERENCES

Aarnio, K., & Lindeman, M. (2005). Superstition, education and thinking styles. *Personality and Individual Differences*, *39*, 1227–1236.

Aczel, B., Bago, B., Szollosi, A., Foldes, A., & Lukacs, B. (2015). Is it time for studying real-life debiasing? Evaluation of the effectiveness of an analogical intervention technique. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.01120

Ahadzadeh, A. S., Ong, F. S., & Wu, S. L. (2021). Social media skepticism and belief in conspiracy theories about COVID-19: The moderating role of the dark triad. *Current Psychology*, *42*(11), 8874–8886. https://doi.org/10.1007/s12144-021-02198-1

Ahn, W.-K., & Bailenson, J. (1996). Causal attribution as a search for underlying mechanisms: An explanation of the conjunction fallacy and the discounting principle. *Cognitive Psychology*, *31*(1), 82–123. https://doi.org/10.1006/cogp.1996.0013

Alloy, L. T., & Abramson, L. Y. (1979). Judgement of contingency in depressed and nondepressed students: Sadder but wiser? *Journal of Experimental Psychology: General*, *108*, 441–485.

Anderson, C. A. (1982). Inoculation and counterexplanation: Debiasing techniques in the perseverance of social theories. *Social Cognition*, *1*(2), 126–139. https://doi.org/10.1521/soco.1982.1.2.126

Azarpanah, H., Farhadloo, M., Vahidov, R., & Pilote, L. (2021). Vaccine hesitancy: Evidence from an adverse events following immunization database, and the role of cognitive biases. *BMC Public Health [Electronic Resource]*, *21*(1), 1686. https://doi.org/10.1186/s12889-021-11745-1

Béna, J., Rihet, M., Carreras, O., & Terrier, P. (2023). Repetition could increase the perceived truth of conspiracy theories. *Psychonomic Bulletin Review*, *30*(6), 2397–2406. https://doi.org/10.3758/s13423023-02276-4

Béna, J., Rihet, M., Carreras, O., & Terrier, P. (2023). Repetition could increase the perceived truth of conspiracy theories. Psychonomic bulletin & review, *30*(6), 2397–2406. https://doi.org/10.3758/s13423-023-02276-4

Bénabou, R. (2015). The economics of motivated beliefs. *Revue d'économie politique, Dalloz*, *125*(5), 665–685.

Bénabou, R., & Tirole, J. (2002). Self-confidence and personal motivation. *The Quarterly Journal of Economics*, *117*(3), 871–915. https://doi.org/10.1162/003355302760193913

Bénabou, R., & Tirole, J. (2016). Mindful economics: The production, consumption, and value of beliefs. *Journal of Economic Perspectives*, *30*(3), 141–164. https://doi.org/10.1257/jep.30.3.141

Badino, M. (2022). *Bubbles and chambers: Post-truth and belief formation in digital social epistemic environments*. PhilSci-Archive. Pitt.edu.

Bagó, B., Rand, D. G., & Pennycook, G. (2022). Does deliberation decrease belief in conspiracies? *Journal of Experimental Social Psychology*, *103*, 104395. https://doi.org/10.1016/j.jesp.2022.104395

Bago, B., Rand, D. G., & Pennycook, G. (2022). Does deliberation decrease belief in conspiracies? *Journal of Experimental Social Psychology*, *103*, 104395. https://doi.org/10.1016/j.jesp.2022.104395

Bar-Hillel, M., & Wagenaar, W. A (1991). Perceptions of randomness. *Advances of Applied Mathematics*, *12*, 428–454.

Baron, J. (2008). *Thinking and deciding* (4th ed.). Cambridge University Press.

Basham, L., & Dentith, M. (2016). Social science's conspiracy theory panic: Now they want to cure everyone. *Social Epistemology Review and Reply Collective*, *5*(10), 12–19.

Basham, L. (2018). Social Scientists and Pathologizing Conspiracy Theorizing. In M. R. X. Dentith (ed.), *Taking Conspiracy Theories Seriously*. London: Rowman and Littlefield. pp. 95–107.

Bhatia, S. (2015). The power of the representativeness heuristic. In Proceedings of the annual meeting of the cognitive science society 2015.

Binnendyk, J., & Pennycook, G. (2022). Intuition, reason, and conspiracy beliefs. Current opinion in psychology, *47*, 101387. https://doi.org/10.1016/j.copsyc.2022.101387

Brotherton, R., & French, C. C. (2014). Belief in conspiracy theories and susceptibility to the conjunction fallacy. *Applied Cognitive Psychology*, *28*(2), 238–248. https://doi.org/10.1002/acp.2995

Brotherton, R., & French, C. C. (2015). Intention seekers: Conspiracist ideation and biased attributions of intentionality. *PLoS ONE*, *10*(5), e0124125. https://doi.org/10.1371/journal.pone.0124125

Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy theories: The generic conspiracist beliefs scale. *Frontiers in Psychology*, *4*, 279. https://doi.org/10.3389/fpsyg.2013.00279

Bruder, M., Haffke, P., Neave, N., Nouripanah, N., & Imhoff, R. (2013). Measuring individual differences in generic beliefs in conspiracy theories across cultures: Conspiracy Mentality Questionnaire. *Frontiers in Psychology*, *4*, 225. https://doi.org/10.3389/fpsyg.2013.00225

Butler, L. D., Koopman, C., & Zimbardo, P. G. (1995). The psychological impact of viewing the film JFK: Emotions, beliefs, and political behavioral intentions. *Political Psychology*, *16*(2), 237–257. https://doi.org/10.2307/3791831

Camerer, C. F. (1987). Do biases in probability judgment matter in markets? *Experimental Evidence. American Economic Review*, *77*(5), 981–997.

Carlson, S. (1985). A double-blind test of astrology. *Nature*, *318*(6045), 419–425. https://doi.org/10.1038/318419a0

Cassam, Q. (2019). *Conspiracy Theories*. Polity Press.

Christensen, J., & Moynihan, D. P. (2022). Motivated reasoning and policy information: Politicians are more resistant to debiasing interventions than the general public. *Behavioural Public Policy*, 1–22. https://doi.org/10.1017/bpp.2020.50

Connors, M. H., & Halligan, P. W. (2015). A cognitive account of belief: A tentative road map. *Frontiers in Psychology*, *5*, 1588. https://doi.org/10.3389/fpsyg.2014.01588

Curley, L. J., Munro, J., & Lages, M. (2020). An inconvenient truth: More rigorous and ecologically valid research is needed to properly understand cognitive bias in forensic decisions. *Forensic Science International. Synergy*, *2*, 107–109. https://doi.org/10.1016/j.fsisyn.2020.01.004

Cutler, R. B. (1995). *The umbrella man: Evidence of conspiracy*. The Conspiracy Museum, Incorporated. ASIN: B004C33O4K.

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2017). Statistical bias and endorsement of conspiracy theories. *Applied Cognitive Psychology*, *31*(4), 368–378. https://doi.org/10.1002/acp.3331

Dagnall, N., Parker, A., & Munley, G. (2007). Paranormal belief and reasoning. *Personality and Individual Differences*, *43*(6), 1406–1415. https://doi.org/10.1016/j.paid.2007.04.017

Dechêne, A., Stahl, C., Hansen, J., & Wĺanke, M. (2010). The truth about the truth: A metanalytic review of the truth effect. *Personality and Social Psychology Review*, *14*(2), 238–257.

Denovan, A., Dagnall, N., Drinkwater, K., Parker, A., & Neave, N. (2020). Conspiracist beliefs, intuitive thinking, and schizotypal facets: A further evaluation. *Applied Cognitive Psychology*, *34*(6), 1394–1405. https://doi.org/10.1002/acp.3716

Dentith, M. R. X. (2021). Debunking conspiracy theories. *Synthese*, *198*(10), 9897–9911. https://doi.org/10.1007/s11229-020-02694-0

Dickinson, D. L., & Kakoschke, N. (2021). Seeking confirmation? Biased information search and deliberation in the food domain. *Food Quality and Preference*, *91*, 104189. https://doi.org/10.1016/j.foodqual.2021.104189

Douglas, K. M., & Sutton, R. M. (2008). The hidden impact of conspiracy theories: Perceived and actual influence of theories surrounding the death of princess Diana. *The Journal of Social Psychology*, *148*(2), 210–222. https://doi.org/10.3200/socp.148.2.210-222

Douglas, K. M., Sutton, R. M., Callan, M. J., Dawtry, R. J., & Harvey, A. J. (2016). Someone is pulling the strings: Hypersensitive agency detection and belief in conspiracy theories. *Thinking and Reasoning*, *22*(1), 57–77. https://doi.org/10.1080/13546783.2015.1051586

Douglas, K. M., Sutton, R. M., & Cichocka, A. (2017). The psychology of conspiracy theories. *Current Directions in Psychological Science*, *26*(6), 538–542. https://doi.org/10.1177/0963721417718261

Douglas, K. M., & Sutton, R. M. (2011). Does it take one to know one? Endorsement of conspiracy theories is influenced by personal willingness to conspire. *The British journal of social psychology*, *50*(3), 544–552. https://doi.org/10.1111/j.2044-8309.2010.02018

Drinkwater, K., Dagnall, N., Denovan, A., Parker, A., & Clough, P. (2018). Predictors and associates of problem–reaction–solution: Statistical bias, emotion-based reasoning, and belief in the paranormal. *SAGE Open*, *8*(1). https://doi.org/10.1177/2158244018762999

Drinkwater, K., Dagnall, N., & Parker, A. (2012). Reality testing, conspiracy theories and paranormal beliefs. *Journal of Parapsychology*, *76*, 57–78.

Eisenman, R. (1993). Belief that drugs usage in the United States is increasing when it is really decreasing: An example of the availability heuristic. *Bulletin of the Psychonomic Society*, *31*, 249–252.

Enke, B., & Zimmermann, F. (2017). Correlation neglect in belief formation. *The Review of Economic Studies*, *86*, 313–332. https://doi.org/10.1093/restud/rdx081

Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism. *Psychological Review*, *114*(4), 864–886. https://doi.org/10.1037/0033295X.114.4.864

Fisher, K. L., & Statman, M. (2000). Cognitive biases in market forecasts. *The Journal of Portfolio Management*, *27*(1), 72–81. https://doi.org/10.3905/jpm.2000.319785

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, *19*(4), 25–42. https://doi.org/10.1257/089533005775196732

Gagliardi, L., & Rusconi, M. (2023). Investigating Conspiracy Beliefs: Methodological Biases and Experimental Challenges. Pre-print available at SSRN: http://dx.doi.org/10.2139/ssrn.4614218

Garety, P., Joyce, E., Jolley, S., Emsley, R., Waller, H., Kuipers, E., Bebbington, P., Fowler, D., Dunn, G., & Freeman, D. (2013). Neuropsychological functioning and jumping to conclusions in delusions. *Schizophrenia research*, *150*(2-3), 570–574. https://doi.org/10.1016/j.schres.2013.08.035

Georgiou, N., Delfabbro, P., & Balzan, R. P. (2021). Conspiracy theory beliefs, scientific reasoning and the analytical thinking paradox. *Applied Cognitive Psychology*, *35*(6), 1523–1534. https://doi.org/10.1002/acp.3885

Gigerenzer, G. (1991). How to make cognitive illusions disappear: Beyond "heuristics and biases". *European Review of Social Psychology*, *2*, 83–115. https://doi.org/10.1080/14792779143000033

Gilovich, T., & Savitsky, K. (2002). Like Goes with like: The role of representativeness in erroneous and pseudo-scientific beliefs. *Heuristics and Biases*, 617–624. https://doi.org/10.1017/cbo9780511808098.036

Giuliani, A., & Presaghi, F. (2023). Populist Attitude and Conspiracist beliefs contribution to the overconfidence about the risk of Covid-19: implications for Preventive Health Behaviors. *Fortune Journal of Health Sciences*, *06*(01). https://doi.org/10.26502/fjhs.099

Gligorić, V., Silva, M. M., Eker, S., Hoek, N., Nieuwenhuijzen, E., Popova, U., & Zeighami, G. (2021). The usual suspects: How psychological motives and thinking styles predict the endorsement of well-known and COVID-19 conspiracy beliefs. *Applied Cognitive Psychology*, *35*(5), 1171–1181. https://doi.org/10.1002/acp.3844

Goertzel, T. (1994). Belief in conspiracy theories. *Political Psychology*, *15*(4), 731–742. https://doi.org/10.2307/3791630

Goertzel, T. (2010). Conspiracy theories in science. *EMBO Reports*, *11*(7), 493–499. https://doi.org/10.1038/embor.2010.84

Gonzalez Galli, L. M., & Meinardi, E. N. (2011). The role of teleological thinking in learning the Darwinian model of evolution. *Evolution: Education and Outreach*, *4*(1), 145–152. https://doi.org/10.1007/s12052-010-0272-7

Govaert, C., Lagerwerf, L., & Klemm, C. (2020). Deceptive journalism: Characteristics of untrustworthy news items. *Journalism Practice*, *14*(6), 697–713. https://doi.org/10.1080/17512786.2019.1637768

Graeupner, D., & Coman, A. (2017). The dark side of meaning-making: How social exclusion leads to superstitious thinking. *Journal of Experimental Social Psychology*, *69*, 218–222. https://doi.org/10.1016/j.jesp.2016.10.003

Granados Samayoa, J. A., Moore, C. A., Ruisch, B. C., Boggs, S. T., Ladanyi, J. T., & Fazio, R. H. (2022). A gateway conspiracy? Belief in COVID-19 conspiracy theories prospectively predicts greater conspiracist ideation. *PLoS ONE*, *17*, e0275502. https://doi.org/10.1371/journal.pone.0275502

Green, R., & Douglas, K. M. (2018). Anxious attachment and belief in conspiracy theories. *Personality and Individual Differences*, *125*, 30–37. https://doi.org/10.1016/j.paid.2017.12.023

Griffin, D., & Tversky, A. (1992). The weighing of evidence and the determinants of confidence. *Cognitive Psychology*, *24*(3), 411–435. https://doi.org/10.1016/0010-0285(92)90013

Haselton, M. G., Nettle, D., & Andrews, P. W. (2005). The evolution of cognitive bias. In D. M. Buss (Ed.), *The handbook of evolutionary psychology* (pp. 724–746). John Wiley and Sons, Inc.

Hattersley, M., Brown, G. D. A., Michael, J., & Ludvig, E. A. (2022). Of tinfoil hats and thinking caps: Reasoning is more strongly related to implausible than plausible conspiracy beliefs. *Cognition*, *218*, 104956. https://doi.org/10.1016/j.cognition.2021.104956

Hayward, T. (2022). "Conspiracy theory": The case for being critically receptive. *Journal of Social Philosophy*, *53*(2), 148–167. https://doi.org/10.1111/josp.12432

Heider, F., & Simmel, M. (1944). An experimental study of apparent behavior. *The American Journal of Psychology*, *57*, 243–259. https://doi.org/10.2307/1416950

Henslin, J. M. (1967). Craps and magic. *American Journal of sociology*, *73*(3), 316–330. https://doi.org/10.1086/224479

Hertwig, R., & Todd, P. M. (2002). Heuristics. In *Encyclopedia of the human brain*. Academic Press. https://doi.org/10.1016/B0-12-227210-2/00162-X

Hirshleifer, D. (2015). Behavioral finance. *Annual Review of Financial Economics*, *7*(1), 133–159. https://doi.org/10.1146/annurev-financial-092214-043752

Huq, S. F., Garety, P. A., & Hemsley, D. R. (1988). Probabilistic judgements in deluded and non-deluded subjects. *The Quarterly Journal of Experimental Psychology Section A*, *40*(4), 801–812. https://doi.org/10.1080/14640748808402300

Imhoff, R., & Bruder, M. (2014). Speaking (un–)truth to power: Conspiracy mentality as a generalised political attitude. *European Journal of Personality*, *28*(1), 25–43. https://doi.org/10.1002/per.1930

Imhoff, R., & Lamberty, P. (2018). How paranoid are conspiracy believers? Toward a more fine-grained understanding of the connect and disconnect between paranoia and belief in conspiracy theories. *European Journal of Social Psychology*, *48*(7), 909–926. https://doi.org/10.1002/ejsp.2494

Imhoff, R., & Lamberty, P. K. (2017). Too special to be duped: Need for uniqueness motivates conspiracy beliefs. *European Journal of Social Psychology*, *47*(6), 724–734. https://doi.org/10.1002/ejsp.2265

Jiménez, A. V., Mesoudi, A., & Tehrani, J. J. (2020). No evidence that omission and confirmation biases affect the perception and recall of vaccine-related information. *PLoS ONE*, *15*(3), e0228898. https://doi.org/10.1371/journal.pone.0228898

Jussim, L., Stevens, S. T., Honeycutt, N., Anglin, S. M., & Fox, N. (2019). Scientific gullibility. In J. P. Forgas, & R. Baumeister (Eds.), *The social psychology of gullibility: Conspiracy theories, fake news and irrational beliefs* (pp. 279–303). Taylor and Francis Inc. https://doi.org/10.4324/9780429203787

Kahan, D. M., Jenkins-Smith, H., & Braman, D. (2011). Cultural cognition of scientific consensus. *Journal of Risk Research*, *14*(2), 147–174. https://doi.org/10.1080/13669877.2010.511246

Kahan, D. M., Peters, E., Dawson, E. C., & Slovic, P. (2017). Motivated numeracy and enlightened self-government. *Behavioural Public Policy*, *1*(1), 54–86. https://doi.org/10.1017/bpp.2016.2

Kahneman, D. (2003). Maps of bounded rationality: Psychology for behavioral economics. *The American Economic Review*, *93*(5), 1449–1475. http://www.jstor.org/stable/3132137

Kahneman, D. (2011). *Thinking fast and slow*. Allen Lane.

Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology*, *3*(3), 430–454. https://doi.org/10.1016/00100285(72)90016-3

Kanwisher, N. (1989). Cognitive heuristics and american security policy. *Journal of Conflict Resolution*, *33*(4), 652–675. https://doi.org/10.1177/0022002789033004004

Kareev, Y. (1992). Not that bad after all: Generation of random sequences. *Journal of Experimental Psychology: Human Perception Performance*, *18*(4), 1189–1194.

Korteling, J. H., Gerritsma, J. Y. J., & Toet, A. (2021). Retention and transfer of cognitive bias mitigation interventions: A systematic literature study. *Frontiers in Psychology*, *12*, 629354. https://doi.org/10.3389/fpsyg.2021.629354

Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology*, *77*(6), 1121–1134. https://doi.org/10.1037//0022-3514.77.6.1121

Kuhn, S. A. K., Lieb, R., Freeman, D., Andreou, C., & Zander-Schellenberg, T. (2021). Coronavirus conspiracy beliefs in the German-speaking general population: Endorsement rates and links to reasoning biases and paranoia. *Psychological Medicine*, 1–15. https://doi.org/10.1017/S0033291721001124

Lawson, M. A., Larrick, R. P., & Soll, J. B. (2020). Comparing fast thinking and slow thinking: The relative benefits of interventions, individual differences, and inferential rules. *Judgment and Decision Making*, *15*(5), 660–684. https://doi.org/10.1017/S1930297500007865

LeBoeuf, R. A., & Norton, M. I. (2012). Consequence-cause matching: Looking to the consequences of events to infer their causes. *Journal of Consumer Research*, *39*(1), 128–141. https://doi.org/10.1086/662372

Leman, P. J. (2007). The born conspiracy. *New Scientist*, *195*(2612), 35–37. https://doi.org/10.1016/S0262-4079(07)61774-6

Leman, P. J., & Cinnirella, M. (2007). A major event has a major cause: Evidence for the role of heuristics in reasoning about conspiracy theories. *Social Psychological Review*, *9*(2), 18–28.

Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N., & Cook, J. (2012). Misinformation and Its Correction. *Psychological Science in the Public Interest*, *13*(3), 106–131. https://doi.org/10.1177/1529100612451018

Lindeman, M., & Aarnio, K. (2007). Superstitious, magical, and paranormal beliefs: An integrative model. *Journal of Research in Personality*, *41*(4), 731–744. https://doi.org/10.1016/j.jrp.2006.06.009

Lord, C., Ross, L., & Lepper, M. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, *37*, 2098–2109.

MacDonald, M. G. (2000). Illusory correlation: A function of availability or representativeness heuristics? *Perceptual and Motor Skills*, *91*(1), 343–350. https://doi.org/10.2466/pms.2000.91.1.343

MacDonald, N. E., & Dubé, E. (2015). Unpacking vaccine hesitancy among healthcare providers. *EBioMedicine*, *2*(8), 792–793. https://doi.org/10.1016/j.ebiom.2015.06.028

Magnus, J. R., & Peresetsky, A. (2022). A statistical explanation of the Dunning–Kruger effect. *Frontiers in Psychology*, *13*, 840180. https://doi.org/10.3389/fpsyg.2022.840180

Malmendier, U., & Nagel, S. (2011). Depression babies: Do macroeconomic experiences affect risk taking? *Quarterly Journal of Economics*, *126*, 373–416.

Mao, J., Yang, S., & Guo, Y. (2020). Are individuals from lower social classes more susceptible to conspiracy theories? An explanation from the compensatory control theory. *Asian Journal of Social Psychology*, *23*(4), 372–383. https://doi.org/10.1111/ajsp.12417

Marsh, J. K., & Vitriol, J. A. (2018). Explanation hubris and conspiracy theories: A case of the 2016 Presidential election. In T. T. Rogers, M. Rau, X. Zhu, & C. W. Kalish (Eds.), *Proceedings of the 40th annual conference of the cognitive science society* (pp. 2090–2095). Cognitive Science Society.

Mathie, R. T., Lloyd, S. M., Legg, L. A., Clausen, J., Moss, S., Davidson, J. R., & Ford, I. (2014). Randomised placebo-controlled trials of individualised homeopathic treatment: Systematic review and meta-analysis. *Systematic Reviews*, *3*, 142.

McCauley, C., & Jacques, S. (1979). The popularity of conspiracy theories of presidential assassination: A Bayesian analysis. *Journal of Personality and Social Psychology*, *37*(5), 637–644. https://doi.org/10.1037/0022-3514.37.5.637

McHoskey, J. W. (1995). Case closed? On the John F. Kennedy assassination: Biased assimilation of evidence and attitude polarization. *Basic and Applied Social Psychology*, *17*(3), 395–409. https://doi.org/10.1207/s15324834basp1703

Miller, J. M. (2020). Do COVID-19 conspiracy theory beliefs form a monological belief system? *Canadian Journal of Political Science*, *53*(2), 319–326. https://doi.org/10.1017/s0008423920000517

Miller, J. M., Saunders, K. L., & Farhart, C. E. (2016). Conspiracy endorsement as motivated reasoning: The moderating roles of political knowledge and trust. *American Journal of Political Science*, *60*(4), 824–844. https://doi.org/10.1111/ajps.12234

Miller, T. M., & Geraci, L. (2011). Unskilled but aware: Reinterpreting overconfidence in lowperforming students. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *37*(2), 502–506. https://doi.org/10.1037/a0021802

Moore, D. A., & Schatz, D. (2017). The three faces of overconfidence. *Social and Personality Psychology Compass*, *11*(8), e12331. https://doi.org/10.1111/spc3.12331

Moritz, S., & Woodward, T. S. (2005). Jumping to conclusions in delusional and nondelusional schizophrenic patients. *British Journal of Clinical Psychology*, *44*(2), 193–207. https://doi.org/10.1348/0144665051̈35678

Morris, E. (2011, November 22). Opinion — 'The Umbrella Man'. The New York Times. https://www.nytimes.com/2011/11/22/opinion/the-umbrella-man.html

Moulding, R., Nix-Carnell, S., Schnabel, A., Nedeljkovic, M., Burnside, E. E., Lentini, A. F., & Mehzabin, N. (2016). Better the devil you know than a world you don't? Intolerance of uncertainty and worldview explanations for belief in conspiracy theories. *Personality and Individual Differences*, *98*, 345–354.

Myers, D. G. (2019). Scientific gullibility. In J. P. Forgas, & R. Baumeister (Eds.), *The social psychology of gullibility: Conspiracy theories, fake news and irrational beliefs* (pp. 319–332). Taylor and Francis Inc. https://doi.org/10.4324/9780429203787

Napolitano, M. G. (2021). Conspiracy theories and evidential self-insulation. In S. Bernecker, A. K. Flowerree, & T. Grundmann (Eds.), *The epistemology of fake news*. Oxford University Press. https://doi.org/10.1093/oso/9780198863977.003.0005

Nera, K., Wagner-Egger, P., Bertin, P., Douglas, K. M., & Klein, O. (2021). A power-challenging theory of society, or a conservative mindset? Upward and downward conspiracy theories as ideologically distinct beliefs. *European Journal of Social Psychology*, *51*(4-5), 740–757. https://doi.org/10.1002/ejsp.2769

Nestler, S. C. (2008). Hindsight bias, conjunctive explanations and causal attribution. *Social Cognition*, *26*(4), 482–493.

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology*, *2*(2), 175–220. https://doi.org/10.1037/1089-2680.2.2.175

Nisbett, R., & Ross, L. (1985). *Human inference: Strategies and shortcomings of social judgement*. Prentice Hall.

Oeberst, A., & Imhoff, R. (2023). Toward Parsimony in Bias Research: A Proposed Common Framework of Belief-Consistent Information Processing for a Set of Biases. *Perspectives on Psychological Science*, *18*(6), 1464–1487. https://doi.org/10.1177/17456916221148147

Ost, J., Granhag, P. A., Udell, J., & Roos af Hjelmsäter, E. (2008). Familiarity breeds distortion: The effects of media exposure on false reports concerning media coverage of the terrorist attacks in London on 7 July 2005. *Memory (Hove, England)*, *16*(1), 76–85. https://doi.org/10.1080/09658210701723323

Paul, D. (2019, January 20). *What President Trump keeps getting wrong about "Global Waming."* Washington Post; The Washington Post. https://www.washingtonpost.com/weather/2019/01/20/dear-mr-president-thats-not-howglobal-warming-works/

Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015). Everyday Consequences of Analytic Thinking. *Current Directions in Psychological Science*, *24*(6), 425–432. https://doi.org/10.1177/0963721415604610

Pennycook, G., Cheyne, J., Koehler, D., & Fugelsang, J. (2020). On the belief that beliefs should change according to evidence: Implications for conspiratorial, moral, paranormal, political, religious, and science beliefs. *Judgment and Decision Making*, *15*(4), 476–498. https://doi.org/10.1017/S1930297500007439

Petrican, R., & Burris, C. T. (2012). Am I the stone? Overattribution of agency and religious orientation. *Psychology of Religion and Spirituality*, *4*(4), 312–323. https://doi.org/10.1037/a0027942

Petrović, M., & Zeželj, I. (2022). Both a bioweapon and a hoax: The curious case of contradictory conspiracy theories about COVID-19. *Thinking and Reasoning*, 1–32. https://doi.org/10.1080/13546783.2022.2088618

Popper, K. (2002). *Conjectures and refutations: The growth of scientific knowledge (Routledge classics)* (2nd ed.). Routledge.

Pytlik, N., Soll, D., & Mehl, S. (2020). Thinking preferences and conspiracy belief: Intuitive thinking and the jumping to conclusions-bias as a basis for the belief in conspiracy theories. *Frontiers in Psychiatry*, *11*, 568942. https://doi.org/10.3389/fpsyt.2020.568942

Quattrone, G. A. (1982). Overattribution and unit formation: When behavior engulfs the person. *Journal of Personality and Social Psychology*, *42*, 593–607.

Rabin, M. (2002). Inference by believers in the law of small numbers. *The Quarterly Journal of Economics*, *117*(3), 775–816. https://doi.org/10.1162/003355302760193896

Rabin, M., & Schrag, J. L. (1999). First impressions matter: A model of confirmatory bias. *The Quarterly Journal of Economics*, *114*(1), 37–82. http://www.jstor.org/stable/2586947

Rabin, M., & Vayanos, D. (2010). The Gambler's and hot-hand fallacies: Theory and applications. *The Review of Economic Studies*, *77*(2), 730–778. http://www.jstor.org/stable/40587644

Rapoport, A., & Budescu, D. V. (1997). Randomization in individual choice behavior. *Psychology: Review*, *104*(3), 603–617.

Riekki, T., Lindeman, M., Aleneff, M., Halme, A., & Nuortimo, A. (2012). Paranormal and religious believers are more prone to illusory face perception than skeptics and nonbelievers. *Applied Cognitive Psychology*, *27*(2), 150–155. https://doi.org/10.1002/acp.2874

Rizeq, J., Flora, D. B., & Toplak, M. E. (2020). An examination of the underlying dimensional structure of three domains of contaminated mindware: paranormal beliefs, conspiracy beliefs, and anti-science attitudes. *Thinking & Reasoning*, *27*(2), 187–211. https://doi.org/10.1080/13546783.2020.1759688

Rogers, P., Davis, T., & Fisk, J. (2009). Paranormal belief and susceptibility to the conjunction fallacy. *Applied Cognitive Psychology*, *23*(4), 524–542. https://doi.org/10.1002/acp.1472

Rogers, P., Fisk, J. E., & Wiltshire, D. (2011). Paranormal belief and the conjunction fallacy: Controlling for temporal relatedness and potential surprise differentials in component events. *Applied Cognitive Psychology*, *25*(5), 692–702. https://doi.org/10.1002/acp.1732

Rosset, E. (2008). It's no accident: Our bias for intentional explanations. *Cognition*, *108*(3), 771–780. https://doi.org/10.1016/j.cognition.2008.07.001

Rozenblit, L., & Keil, F. (2002). The misunderstood limits of folk science: An illusion of explanatory depth. *Cognitive Science*, *26*(5), 521–562.

Rozin, P., & Nemeroff, C. (2002). Sympathetic magical thinking: The contagion and similarity "Heuristics". In *Heuristics and biases* (pp. 201–216). Cambridge University Press. https://doi.org/10.1017/cbo9780511808098.013

Ruby, P. M. (2011). Experimental research on dreaming: State of the art and neuropsychoanalytic perspectives. *Frontiers in Psychology*, *2*, 286. https://doi.org/10.3389/fpsyg.2011.00286

Schwitzgebel, E. (2010). Belief. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy*. Stanford University.

Sheldon, O. J., Dunning, D., & Ames, D. R. (2014). Emotionally unskilled, unaware, and uninterested in learning more: Reactions to feedback about deficits in emotional intelligence. *Journal of Applied Psychology*, *99*(1), 125–137. https://doi.org/10.1037/a0034138

Siebert, J., & Siebert, J. U. (2023). Effective mitigation of the belief perseverance bias after the retraction of misinformation: Awareness training and counter-speech. *PLOS ONE*, *18*(3): e0282202. https://doi.org/10.1371/journal.pone.0282202

Smallpage, S. M., Enders, A. M., Drochon, H., & Uscinski, J. E. (2022). The impact of social desirabil- ity bias on conspiracy belief measurement across cultures. *Political Science Research and Methods*, 1–15. https://doi.org/10.1017/psrm.2022.1

Šrol, J., Ballová Mikuˇsková, E., & Cavojová, V. (2021). When we are worried, what are we thinking? Anxiety, lack of control, and conspiracy beliefs amidst the COVID-19 pandemic. *Applied Cognitive Psychology*, *35*(3), 720–729. https://doi.org/10.1002/acp.3798

Stall, L. M., & Petrocelli, J. V. (2022). Countering conspiracy theory beliefs: Understanding the conjunction fallacy and considering disconfirming evidence. *Applied Cognitive Psychology*, *37*(2), 266–276. Portico. https://doi.org/10.1002/acp.3998

Stoica, C. A., & Umbres, R. (2021). Suspicious minds in times of crisis: Determinants of Romanians' beliefs in COVID-19 conspiracy theories. *European Societies*, *23*(Sup1), S246–S261. https://doi.org/10.1080/14616696.2020.1823450

Stojanov, A., & Halberstadt, J. (2020). Does lack of control lead to conspiracy beliefs? A meta-analysis. *European Journal of Social Psychology*, *50*(5), 955–968. https://doi.org/10.1002/ejsp.2690

Sunstein, C. R., & Vermeule, A. (2008). Conspiracy theories. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1084585

Sutton, R. M., & Douglas, K. M. (2020). Conspiracy theories and the conspiracy mindset: Implications for political ideology. *Current Opinion in Behavioral Sciences*, *34*, 118–122. ISSN 2352-1546. https://doi.org/10.1016/j.cobeha.2020.02.015

Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014). Analytic thinking reduces belief in conspiracy theories. *Cognition*, *133*(3), 572–585. https://doi.org/10.1016/j.cognition.2014.08.006

Taber, C. S., & Lodge, M. (2006). Motivated skepticism in the evaluation of political beliefs. *American Journal of Political Science*, *50*, 755–769. https://doi.org/10.1111/j.15405907.2006.00214.x

Thaler, M. (2021). Gender differences in motivated reasoning. *Journal of Economic Behavior Organization*, *191*, 501–518. https://doi.org/10.1016/j.jebo.2021.09.016

Thomas, O. (2018). Two decades of cognitive bias research in entrepreneurship: What do we know and where do we go from here? *Management Review Quarterly*, *68*(2), 107–143. https://doi.org/10.1007/s11301-018-0135-9

Thorburn, S., & Bogart, L. M. (2005). Conspiracy beliefs about birth control: Barriers to pregnancy prevention among African Americans of reproductive age. *Health Education and Behavior*, *32*(4), 474–487. https://doi.org/10.1177/1090198105276220

Tinbergen, N. (1963). On aims and methods of Ethology. *Zeitschrift FuÍr Tierpsychologie*, *20*(4), 410–433. https://doi.org/10.1111/j.1439-0310.1963.tb01161.x

Tobacyk, J., & Milford, G. (1983). Belief in paranormal phenomena: Assessment instrument development and implications for personality functioning. *Journal of Personality and Social Psychology*, *44*, 1029–1037.

Tsfati, Y., Boomgaarden, H., Strömbäck, J., Vliegenthart, R., Damstra, A., & Lindgren, E. (2020). Causes and consequences of mainstream media dissemination of fake news: Literature review and synthesis. *Annals of the International Communication Association*, *44*, 157–173.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, *5*, 207–232.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124–1131.

Tversky, A., & Kahneman, D. (1982). Judgments of and by representativeness. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases* (pp. 84–98). Cambridge University Press. https://doi.org/10.1017/CBO9780511809477.007

Tyler, T. R., & Cook, F. L. (1984). The mass media and judgments of risk: Distinguishing impact on personal and societal level judgments. *Journal of Personality and Social Psychology*, *47*(4), 693–708. https://doi.org/10.1037/0022-3514.47.4.693

Uscinski, J. E., Enders, A. M., Seelig, M. I., Klofstad, C. A., Funchion, J. R., Everett, C., Wuchty, S., Premaratne, K., & Murthi, M. N. (2021). American politics in two dimensions: Partisan and ideological identities versus anti-establishment orientations. *American Journal of Political Science*, *65*(4), 877–895. https://doi.org/10.1111/ajps.12616

Véckalov, B., Gligorić, V., & Petrović, M. (2024). No evidence that priming analytic thinking reduces belief in conspiracy theories: A registered report of high-powered direct replications of Study 2 and Study 4 from. *Journal of Experimental Social Psychology*, *110*, 104549. https://doi.org/10.1016/j.jesp.2023.104549

van der Tempel, J., & Alcock, J. E. (2015). Relationships between conspiracy mentality, hyperactive agency detection, and schizotypy: Supernatural forces at work? *Personality and Individual Differences*, *82*, 136–141. https://doi.org/10.1016/j.paid.2015.03.010

van der Meer, T. G. L. A., & Jin, Y. (2020). Seeking Formula for Misinformation Treatment in Public Health Crises: The Effects of Corrective Information Type and Source. *Health communication*, *35*(5), 560–575. https://doi.org/10.1080/10410236.2019.1573295

van der Wal, R. C., Sutton, R. M., Lange, J., & Braga, J. P. N. (2018). Suspicious binds: Conspiracy thinking and tenuous perceptions of causal connections between co-occurring and spuriously correlated events. *European journal of social psychology*, *48*(7), 970–989. https://doi.org/10.1002/ejsp.2507

van Prooijen, J. W. (2018). Architecture of belief. In *The psychology of conspiracy theories* (pp. 38–39). Routledge. https://doi.org/10.4324/9781315525419

van Prooijen, J.-W., & Acker, M. (2015). The influence of control on belief in conspiracy theories: Conceptual and applied extensions. *Applied Cognitive Psychology*, *29*(5), 753–761. https://doi.org/10.1002/acp.3161

van Prooijen, J.-W., Krouwel, A. P. M., & Pollet, T. (2015). Political extremism predicts belief in conspiracy theories. *Social Psychological and Personality Science*, *6*, 570–578.

van Prooijen, J.-W., & van Dijk, E. (2014). When consequence size predicts belief in conspiracy theories: The moderating role of perspective taking. *Journal of Experimental Social Psychology*, *55*, 63–73.

van Prooijen, J.-W., & van Vugt, M. (2018). Conspiracy theories: Evolved functions and psychological mechanisms. *Perspectives on Psychological Science*, *13*(6), 770–788. https://doi.org/10.1177/1745691618774270

van Prooijen, J.-W. V., Klein, O., & Dordevic, J. M. (2020). Social-cognitive processes underlying belief in conspiracy theories (pp. 168–180) in Butter M., & Knight P. G., (2020) Routledge Handbook of Conspiracy Theories.

Vitriol, J. A., & Marsh, J. K. (2018). The illusion of explanatory depth and endorsement of conspiracy beliefs. *European Journal of Social Psychology*, *48*(7), 955–969. https://doi.org/10.1002/ejsp.2504

Vranic, A., Hromatko, I., & Tonkovíc, M. (2022). "I did my own research": Overconfidence, (dis)trust in science, and endorsement of conspiracy theories. *Frontiers in Psychology*, *13*, 931865. https://doi.org/10.3389/fpsyg.2022.931865

Wabnegger, A., Gremsl, A., & Schienle, A. (2021). The association between the belief in coronavirus conspiracy theories, miracles, and the susceptibility to conjunction fallacy. *Applied Cognitive Psychology*, *35*(5), 1344–1348. https://doi.org/10.1002/acp.3860

Wagner-Egger, P. (2022). The noises of conspiracy: Psychology of beliefs in conspiracy theories. PsyArXiv. https://doi.org/10.31234/osf.io/fv52e

Wagner-Egger, P., Bangerter, A., Delouvťee, S., & Dieguez, S. (2022). Awake together: Sociopsychological processes of engagement in conspiracist communities. *Current Opinion in Psychology*, *47*, 101417. https://doi.org/10.1016/j.copsyc.2022.101417

Wagner-Egger, P., Delouvée, S., Gauvrit, N., & Dieguez, S. (2018). Creationism and conspiracism share a common teleological bias. *Current Biology*, *28*(16), R867–R868. https://doi.org/10.1016/j.cub.2018.06.072

Walker, J. (2023, March 24). Conspiracy theorists not quite as kooky as previously reported. Reason.com. https://reason.com/2023/03/22/this-just-in-conspiracy-theorists-notquite-as-kooky-as-previously-reported/

Waytz, A., Cacioppo, J., & Epley, N. (2010). Who sees human? *Perspectives on Psychological Science*, *5*, 219–232. https://doi.org/10.1177/1745691610369336

Weigmann, K. (2018). The genesis of a conspiracy theory. *EMBO Reports*, *19*(4), e45935. 10.15252/embr.201845935

Wood, M. J., Douglas, K. M., & Sutton, R. M. (2012). Dead and alive: Beliefs in contradictory conspiracy theories. *Social Psychological and Personality Science*, *3*(6), 767–773. https://doi.org/10.1177/1948550611434786

Woodward, T. S., Moritz, S., Cuttler, C., & Whitman, J. C. (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions in schizophrenia. *Journal of Clinical and Experimental Neuropsychology*, *28*(4), 605–617. https://doi.org/10.1080/13803390590949511

Zusne, L., & Jones, W. H. (1989). *Anomalistic psychology: A study of magical thinking* (2nd ed.). Lawrence Erlbaum Associates.

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