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Antecedents and consequences of COVID-19 conspiracy beliefs: A systematic review

Valerie van Mulukom [a,*], Lotte J. Pummerer [b,**], Sinan Alper [c], Hui Bai [d], Vladimíra Čavojová [e], Jessica Farias [f], Cameron S. Kay [g], Ljiljana B. Lazarevic [h], Emilio J.C. Lobato [i], Gaëlle Marinthe [j], Irena Pavela Banai [k], Jakub Šrol [e], Iris Žeželj [h]

[a] Coventry University, United Kingdom
[b] Leibniz-Institut für Wissensmedien, Schleichstraße 6, 72076 Tübingen, Germany
[c] Yasar University, Turkey
[d] Stanford University, United States
[e] Slovak Academy of Sciences, Slovakia
[f] University of Brasilia, Brazil
[g] University of Oregon, United States
[h] University of Belgrade, Serbia
[i] University of California-Merced, United States
[j] University of Paris 8, France
[k] J. J. Strossmayer University of Osijek, Croatia

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ABSTRACT

Rationale: Belief in COVID-19 conspiracy theories can have severe consequences; it is therefore crucial to understand this phenomenon, in its similarities with general conspiracy belief, but also in how it is context-dependent.
Objective: The aim of this systematic review is to provide a comprehensive overview of the available research on COVID-19 conspiracy beliefs and to synthesise this research to make it widely accessible.
Methods: We present a synthesis of COVID-19 conspiracy belief research from 85 international articles, identified and appraised through a systematic review, in line with contemporary protocols and guidelines for systematic reviews.
Results: We identify a number of potential antecedents of COVID-19 conspiracy beliefs (individual differences, personality traits, demographic variables, attitudes, thinking styles and biases, group identity, trust in authorities, and social media use), their consequences (protective behaviours, self-centred and misguided behaviours such as hoarding and pseudoscientific health practices, vaccination intentions, psychological wellbeing, and other negative social consequences such as discrimination and violence), and the effect sizes of their relations with the conspiracy beliefs.
Conclusions: We conclude that understanding both the potential antecedents and consequences of conspiracy beliefs and how they are context-dependent is highly important to tackle them, whether in the COVID-19 pandemic or future threats, such as that of climate change.

1. Introduction

Conspiracy theories about COVID-19 emerged almost immediately after the first news of COVID-19 (Gogarty and Hagle, 2020) and continued to attract attention. Although the popularity of such theories should not be exaggerated (Sutton and Douglas, 2020), there has been a substantial group of believers (Sanders, 2020; YouGov, 2020). Since SARS-CoV-2 is highly contagious and can cause serious health complications, governments all over the world have implemented safety guidelines aimed at curtailing the spread of the virus. However,

* Corresponding author. Centre for Trust, Peace and Social Relations, Innovation Village IV5, Cheetah Road, Coventry, CV1 2TL, United Kingdom.
** Corresponding author.
E-mail addresses: ac2492@coventry.ac.uk (V. van Mulukom), l.pummerer@iwm-tuebingen.de (L.J. Pummerer).

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COVID-19 conspiracy beliefs negatively influence adherence to these guidelines (e.g., Allington et al., 2021; Freeman et al., 2022), endangering the lives of many. In addition, COVID-19 conspiracy beliefs have been linked to other problematic attitudes, such as prejudice (He et al., 2020; Roberto et al., 2020) and reduced vaccination intentions (Bertin et al., 2020; Romer and Jamieson, 2020). It is, therefore, both highly important and timely to understand why COVID-19 conspiracy theories arise and gain supporters (antecedents), as well as what the range of potential effects of such beliefs is (consequences).

Conspiracy theories are "attempts to explain the ultimate causes of significant social and political events and circumstances with claims of secret plots by two or more powerful actors" (Douglas et al., 2019, 4) and "proposed explanation of events that cites as a main causal factor a small group of persons (the conspirators) acting in secret for their own benefit, against the common good" (Uscinski et al., 2016, 2). Here we conduct a systematic review to identify the available empirical data on belief in COVID-19 conspiracy theories specifically. We identify potential *antecedents* of COVID-19 conspiracy beliefs such as individual differences (demographic variables, personality traits, coping styles), beliefs, biases and attitudes (epistemically suspect beliefs, thinking styles and biases, and attitudes towards science), and social factors (group identities, trust in authorities, and social media use). We then describe potential *consequences*, such as protective behaviours (safeguarding guideline behaviours and self-centred and misguided behaviours) and health and social consequences (vaccination intentions, psychological wellbeing, and other negative social consequences such as discrimination and violence), see Fig. 1.

Our systematic review aims to provide a comprehensive overview of the currently available research on COVID-19 conspiracy beliefs by identifying potential antecedents and consequences of COVID-19 conspiracy beliefs, and to synthesise this research to make it widely available and comprehensible. This effort serves to support both ongoing and future research and applications.

2. Methods

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Moher et al., 2009) to conduct and report the systematic review, and checked it with the AMSTAR 2 Checklist (Shea et al., 2017) to examine any potentially remaining issues with the systematic review following the PRISMA protocol (Johnson and Hennessy, 2019); see Supplementary Materials SM.1 for PRISMA and AMSTAR 2 statements. We chose to do a systematic review rather than a meta-analysis given the wide variety of research designs, measures, and outcomes within the conspiracy belief literature. We moreover did not want to focus on a singular aspect of COVID-19 conspiracy beliefs, and instead present an accessible overview of potential antecedents and consequences.

We ran a database search to inform this review in October 2020 and repeated the search in March 2021; the results of these searches have been combined and the final set of reports is presented in Fig. 2. We searched Web of Science (incl. MEDLINE), Scopus, and PsycINFO databases for articles on COVID-19 conspiracy beliefs. Our search strategy included the words 'COVID*(−19)' or 'corona*(virus)' or 'SARS-CoV-2' and 'conspir*(acy)'. Our strategy was to cast the net wide and to include all COVID-19 articles mentioning conspiracy beliefs. After removing duplicates, 142 records were identified. All authors moreover conducted their own searches for additional articles, and to avoid publication bias, we also allowed for preprints and searched the online preprint database *PsyArXiv* (https://psyarxiv.com/) (listed under 'Additional records identified through other sources', Fig. 2). Finally, Google Scholar alerts were enabled to ensure the inclusion of accepted articles and preprints (Goreis and Voracek, 2019).

The records were screened (title and abstract) by the first author for three eligibility criteria: (1) The article must contain primary, empirical data; (2) The article must assess COVID-19 conspiracy beliefs, or general conspiracy belief/thinking concerning specific COVID-19 phenomena such as guideline adherence; (3) The article must be written in English, to ensure that all authors would be able to accurately assess the article. Next, full-text articles were assessed for eligibility for this review in duplicate - by the first author and authors of each subsection (authorship was determined prior to the database search; see Table SM.2). The final selection consisted of eighty-five articles, which were critically evaluated whether the conclusions made in each article were appropriate given the article's (i) sample, (ii) research design and methods, (iii) conspiracy belief measures, and (iv) analyses (Higgins et al., 2019), and was provided with an assessment of low, medium, or high risk of bias, see Table SM.4 and Table SM.5.

3. Results

3.1. Descriptive features

The 85 articles contained 133 studies (including separate country samples, multiple studies within one article, and multiple waves in longitudinal studies), with 56 articles (42.1%) reporting just one study in their analysis. Most studies had data collected in March–May 2020 (76.8%), recruiting adults from the general public, predominantly through convenience sampling (though paid and representative sampling was used often as well), using a cross-sectional design (see Table SM.3). Participants were mostly from North America and Europe, more specifically the United States (n = 30, 33.0%) and the United

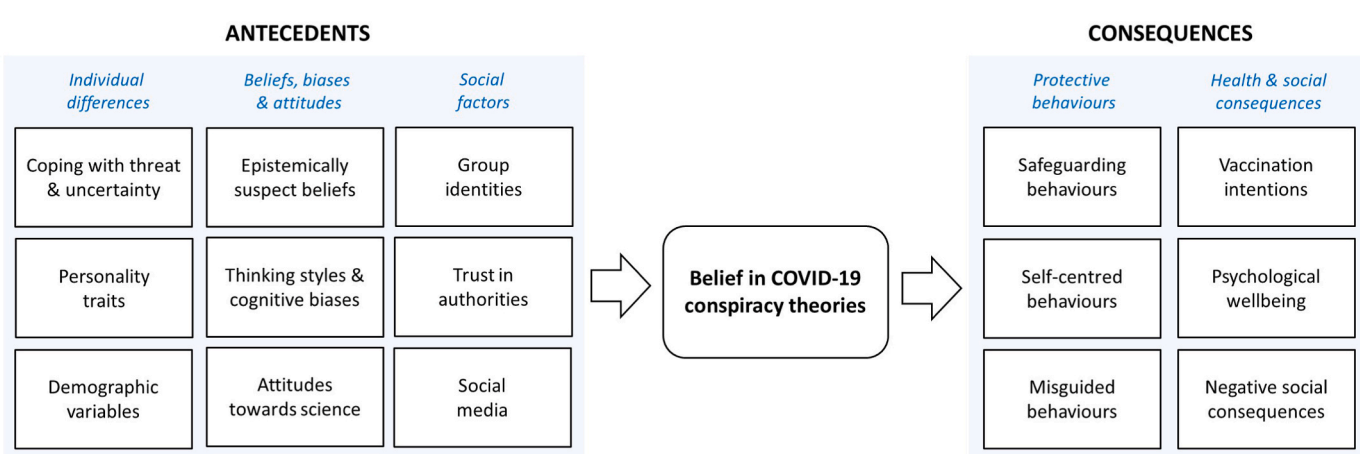

Fig. 1. Overview of the paper.

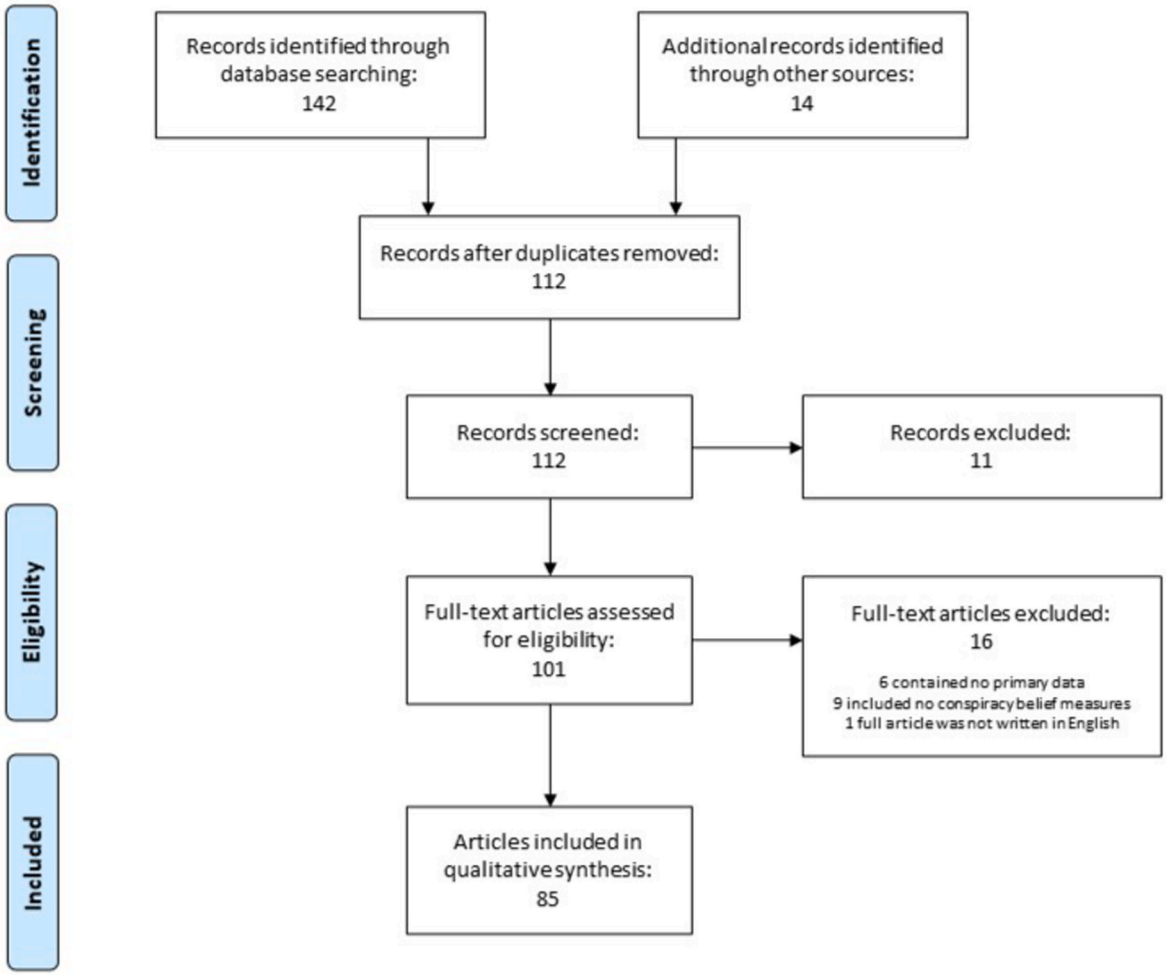

Fig. 2. PRISMA flowchart of the systematic review procedure.

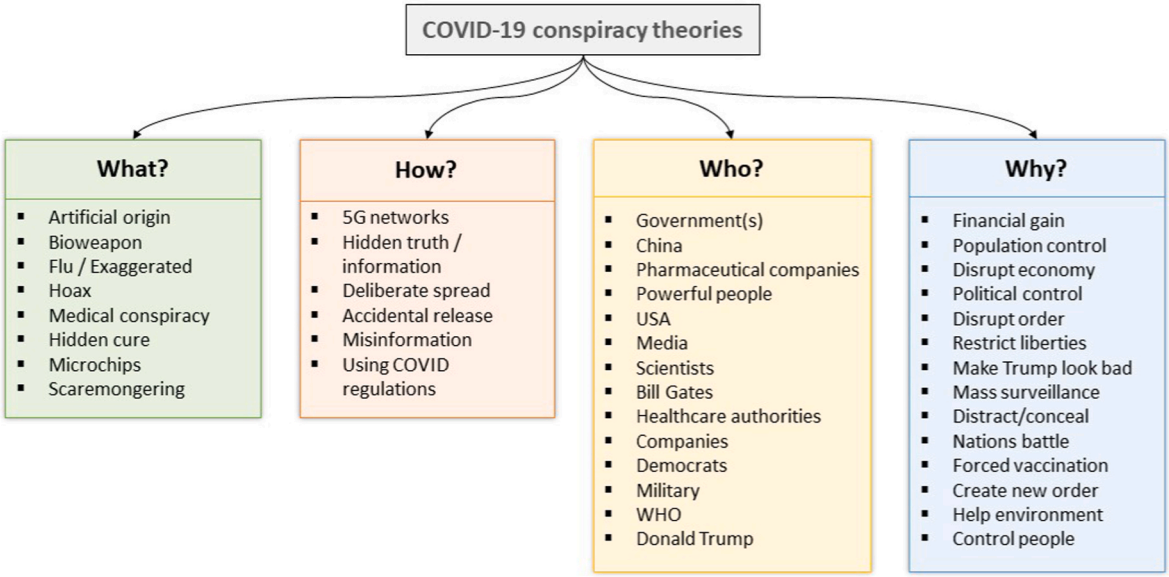

Fig. 3. Overview of the categories (What, How, Who, Why) and subcategories (ordered in frequency of occurrence) of the conspiracy theory items used in the reviewed studies.

Kingdom (n = 14, 15.4%). Sample size varied considerably but was typically over 200 participants per sample. The average age of participants was 36.8 years (SD = 7.8, range: 19.5–52.5 years). Notably, the majority of samples had a larger proportion of female than male participants (M = 58.3%, SD = 12.2%, range 30.8–87.3%).

Six studies used the 15-item Generic Conspiracist Beliefs scale (GCB; Brotherton et al., 2013), also called 'conspiracy ideation', and six studies employed the 5-item Conspiracy Mentality Questionnaire (CMQ; Bruder et al., 2013). The majority of COVID-19 conspiracy belief studies included specific COVID-19 conspiracy theory items, often newly designed for this purpose (see Table SM.4). Fig. 3 lists the most frequently *tested* theories (see Table SM.6 for an overview of all categories with example items and percentages of occurrence, and Table SM.7 for all items). The tested theories deal with the complex event of the COVID-19 pandemic by explaining *what* is happening (e.g., the virus is a bioweapon, vaccines contain microchips), *how* it is happening (e.g., 5G allows the virus to spread, the truth is hidden), *who* is involved (e.g., Bill Gates, Big Pharma) and *why* this is happening (e.g., to control the population, for financial gain). Often, COVID-19 conspiracy belief was generally measured with a composite average of items reflecting several theories at once (with Cronbach's α ranging from 0.66 to 0.98, M = 0.84, SD = 0.08), meaning that only occasionally inferences can be made about the effects of individual theories. The items were most often rated on a Likert scale measuring agreement (52.5%), followed by measurements of truth (17.1%), naturalness versus artificiality (8.2%), and believability (5.1%).

3.2. Antecedents

3.2.1. Individual differences

People differ in the degree to which they endorse conspiracy theories (Darwin et al., 2011), and some of this variation may be attributable to characteristics of the individual. For COVID-19 conspiracy beliefs, research has examined how differences in demographic variables, personality traits, and reactions to threat and uncertainty affect the tendency to believe in these theories.

3.2.1.1. Coping with uncertainty and threat. The COVID-19 crisis is marked by many uncertainties about health and the economy (Cipolletta and Ortu, 2020; Freckelton Qc, 2020; Jutzi et al., 2020), which can lead individuals to develop or adopt narratives to make sense of these events - including conspiracy theories (Wagner-Egger et al., 2011), hereby satisfying epistemic needs (i.e., needs for knowledge and certainty). Indeed, higher levels of uncertainty (Miller, 2020a, b) and intolerance or avoidance of uncertainty have been related to higher levels of COVID-19 conspiracy beliefs (Alper et al., 2020; Larsen et al., 2021) and conspiracy mentality (Farias and Pilati, 2021; Maftei and Holman, 2022).

However, the threat of COVID-19 does not just involve an epistemic need violation – a lack of certainties – but also existential need violations, such as a lack of autonomy and agency (Jutzi et al., 2020). COVID-19 conspiracy belief was associated with a lack of personal control (Biddlestone et al., 2020; Kim and Kim, 2021; Oleksy et al., 2021; Šrol et al., 2021, 2022). Threat perception was a predictor of COVID-19 conspiracy beliefs (Heiss et al., 2021). Experimentally manipulating threat salience of COVID-19 led to increased feelings of fear and anxiety, which in turn was associated with belief in conspiracy theories (Jutzi et al., 2020), providing evidence for threat salience as an antecedent of later conspiracy belief. COVID-19 conspiracy beliefs have also been associated with greater anxiety more broadly (Hartman et al., 2021; Kim and Kim, 2021; Radnitz and Hsiao, 2020; Sallam et al., 2020a, 2020b; Šrol et al., 2021, 2022). Similarly, risk perception, including both infection-related risks and consequence-related anxiety, was a consistent predictor of COVID-19 conspiracy beliefs (Kim and Kim, 2021; Pizarro et al., 2020). Nevertheless, risk perception, like anxiety, might not only be a predictor, but also a consequence or correlate of COVID-19 conspiracy beliefs, something which may be disentangled in further non-cross-sectional research.

3.2.1.2. Personality traits. A person's tendency to believe in conspiracy theories may also be driven, in part, by their personality traits (Bowes et al., 2021; March and Springer, 2019). People scoring high on the Dark Tetrad traits (e.g., Machiavellianism, narcissism, psychopathy, and sadism; Chabrol et al., 2009) are more likely to endorse COVID-19 conspiracy theories (Gligorić et al., 2021; Hughes and Machan, 2021; Kay, 2020, 2021b; Malesza, 2021). This may be the result of a tendency of high-scorers to distrust others and suffer from delusions (e.g., believing that other people can read one's mind) (Kay, 2021a, b; Larsen et al., 2021; Meuer and Imhoff, 2021). Indeed, lower interpersonal trust was associated with COVID-19 conspiracy belief in participants from Germany, New Zealand, Portugal, and Serbia (De Coninck et al., 2021; van Mulukom, 2022), but not from 15 Latin American countries (Jovančević and Milićević, 2020).

There is also substantial evidence that specific aspects of the Dark Tetrad traits are associated with conspiracist ideation for different reasons. Machiavellian individuals—who are manipulative and cynical—seem to endorse conspiracy theories because they are attracted to the thought of taking part in a conspiracy themselves (Douglas and Sutton, 2011). Narcissistic individuals, in contrast, appear to be drawn to these theories because they are excessively preoccupied with the opinions others hold about them (Cichocka et al., 2016a; Kay, 2021b). This excessive preoccupation is believed to breed mistrust and paranoia, which has, in turn, been associated with believing in COVID-19 conspiracy theories (Jolley and Paterson, 2020; Kuhn et al., 2021; Larsen et al., 2021).

Impulsivity, traditionally considered a key feature of psychopathy (Hare, 1999), has been tied to believing that COVID-19 was spread intentionally (Alper et al., 2020). This may be because impulsivity is associated with hasty reasoning processes (e.g., jumping to conclusions) and a failure to engage in open-minded thinking (e.g., flexible thinking and critically questioning one's own ideas), both of which are associated with the tendency to believe in COVID-19 conspiracy theories and misguided treatments for COVID-19 (Erceg et al., 2020; Kuhn et al., 2021; Stoica and Umbreș, 2021). Impulsivity and risk-taking tendencies may also help explain why those with dark personalities are less likely to engage in behaviours intended to limit one's exposure to COVID-19 (Nowak et al., 2020).

3.2.1.3. Demographic variables. Broad individual differences, such as socio-demographic factors including age, gender, ethnicity, income, and education levels, are related to the endorsement of COVID-19 conspiracy beliefs. Nonetheless, there are conflicting results: While younger people tend to give more credence to COVID-19 conspiracy theories in some studies, including studies from Cyprus, Greece, Poland, England, Germany, Switzerland, and the United States (Constantinou et al., 2021; De Coninck et al., 2021; Duplaga, 2020; Earnshaw et al., 2020; Freeman et al., 2020b; Kuhn et al., 2021; Pizarro et al., 2020; Romer and Jamieson, 2020; Uscinski et al., 2020), older people do so in other studies including samples from the United Kingdom, Brazil, and Portugal (Juanchich et al., 2021; van Mulukom, 2022). Results are similarly inconclusive for gender: In some studies, women were more likely to adopt such beliefs, including studies using multinational samples (Pizarro et al., 2020; van Mulukom, 2022) and samples from Turkey, Jordan, Kuwait, Saudi Arabia, and Greece (Alper et al., 2020; Sallam et al., 2020b; Sallam et al., 2020a, 2021). However, in one large sample from the United States (Cassese et al., 2020), men were more likely to endorse COVID-19 conspiracy theories, which was linked to higher levels of learned helplessness and general conspiratorial thinking, whereas no gender differences in COVID-19-related conspiracy beliefs were found in other samples from the United States, United Kingdom, Germany and Switzerland (Earnshaw et al., 2020; Freeman

et al., 2020b; Kuhn et al., 2021). These conflicting findings suggest the effect of age and gender on COVID-19 conspiracy beliefs may be part of a complex interplay of psychological and social factors (e.g., specific age and gender roles and expectations connected to predictors of conspiracy beliefs. like feelings of low power). Furthermore, examining interactions between gender and age, education or income may be illuminating here. Different measures of conspiracy beliefs may have also played a role in the different effects reported above (Goreis and Voracek, 2019). Indeed, two of the three studies which showed no gender differences are also the studies that averaged scores of a relatively large number of items (n = 48) for a composite score of conspiracy belief, whereas studies comparing scores of individual items demonstrated varying differences between male and female gender (Patsali et al., 2020).

More consistently, people who are white have been found to endorse COVID-19 conspiracy beliefs less often than other ethnic groups in the United Kingdom and United States (Freeman et al., 2020b; Romer and Jamieson, 2020), where a higher percentage of Black people endorse them than other ethnicities do (Earnshaw et al., 2020). This effect may be associated with lower levels of trust and higher levels of experienced threat in these individuals. Similarly, individuals with lower (vs. higher) income tend to hold stronger beliefs in COVID-19 conspiracy theories (Constantinou et al., 2021; Hornik et al., 2021; Romer and Jamieson, 2020; Sallam et al., 2020a, 2020b; van Mulukom, 2022), as do individuals with lower (vs. higher) levels of education (Achimescu et al., 2021; Constantinou et al., 2021; De Coninck et al., 2021; Duplaga, 2020; Georgiou et al., 2020; Hartman et al., 2021; Hornik et al., 2021; Kuhn et al., 2021; Pizarro et al., 2020; Romer and Jamieson, 2020; Sallam et al., 2020b, 2021; van Mulukom, 2022), which may be associated with lower levels of information. Again, effects may vary according to the type of conspiracy theory. When comparing broad (e.g., "The virus is a hoax") to narrow (e.g., "The elite have created the virus to establish a one-world government") COVID-19 conspiracy beliefs, only broad beliefs were associated with lower education levels in an English sample (Freeman et al., 2020b).

3.2.2. Beliefs, biases, and attitudes

Unwarranted or epistemically suspect beliefs are beliefs that constitute low levels of correct, scientific information. Such beliefs, which include conspiracy beliefs, have repeatedly been shown to be strongly interrelated (Čavojová et al., 2020; Lobato et al., 2014), and to share common predictors, such as ontological confusions (Lobato et al., 2014; Rizeq et al., 2020), the inhibition of analytical reasoning (Stanovich, 2009), preference of intuitive over analytic thought (Pennycook et al., 2015), and lower levels of scientific reasoning (Čavojová et al., 2020). In this section, these beliefs, reasoning processes, and attitudes will be reviewed in consideration with belief in COVID-19 conspiracy theories.

3.2.2.1. Epistemically suspect beliefs. Epistemically suspect beliefs are a category of beliefs that are not in line with the state of currently accumulated empirical knowledge (Lobato et al., 2014; Pennycook et al., 2015); the three most commonly recognised types are paranormal, conspiracy, and pseudoscientific beliefs (Lobato et al., 2014). People who believe COVID-19 conspiracy theories are also more likely to endorse: other and even contradictory COVID-19 conspiracy beliefs (Miller, 2020a), popular generic conspiracy theories and motives (Freeman et al., 2020b; Georgiou et al., 2020), claims about the effectiveness of pseudoscientific remedies for COVID-19 and other serious illnesses (Čavojová et al., 2022; Fuhrer and Cova, 2020; Pavela Banai et al., 2021), pseudoscientific attitudes toward vaccination (Bertin et al., 2020), and paranormal phenomena (Šrol et al., 2021). Spirituality in the form of eco-awareness (e.g., belief in a higher power or universal intelligence, and meditating to gain access to one's "inner spirit") has also predicted COVID-19 conspiracy beliefs (Gligorić et al., 2021). Finally, individuals who infer relationships between unrelated phenomena (such as those measured by illusory correlations and base-rate neglect) were more likely to believe in COVID-19 conspiracy theories (Teovanović et al., 2021).

3.2.2.2. Thinking styles and cognitive biases. Several cognitive biases and styles, usually those that conflict with more analytical, elaborative thinking, are argued to foster conspiracy beliefs (Brotherton and French, 2014; Douglas et al., 2016; Swami et al., 2014). Lower performance on the Cognitive Reflection Test (CRT; Frederick, 2005), a typical measure of analytical thinking, was related to endorsing more COVID-19 conspiracy beliefs (Alper et al., 2020; Čavojová et al., 2022; Erceg et al., 2020; Sadeghiyeh et al., 2020; Stanley et al., 2021; Stoica and Umbreş, 2021; Teovanović et al., 2021). Similarly, 'cognitive sophistication', which is a composite of cognitive reflection, numeracy, science literacy, and low bullshit receptivity, was found to be negatively related to COVID-19 misperceptions (Pennycook et al., 2021).

Moreover, self-report measures on preference for intuitive versus analytical thinking showed that more intuitive and less analytical thinking styles were related to higher levels of COVID-19 conspiracy beliefs (Alper et al., 2020; Erceg et al., 2020; Fuhrer and Cova, 2020; Gligorić et al., 2021; Kim and Kim, 2021; Lazarević et al., 2021). Individuals who tend to rely on their intuitions and who had lower basic scientific knowledge were furthermore less able to distinguish between true and false information regarding COVID-19 and more likely to share misinformation (Pennycook et al., 2020). This may be due to hasty reasoning processes (Pennycook and Rand, 2019): endorsing COVID-19 conspiracy theories has been associated with a greater jumping-to-conclusions bias (collecting less information before making a decision), liberal acceptance bias (making judgments with low-to-moderate certainty), and bias against disconfirmatory evidence (adhering more to an already held specific belief, even if this turns out to be invalid) (Kuhn et al., 2021). Indeed, misinformation research has similarly demonstrated that reminding individuals to pay more attention to the claims' accuracy resulted in them being less likely to share misinformation, including misinformation about COVID-19 (Pennycook et al., 2020, 2021).

3.2.2.3. Attitudes towards science. Several of the more prominent COVID-19 conspiracy theories rely on the rejection of genuine scientific research, such as research indicating a natural origin of the virus (Andersen et al., 2020). Higher interest in science has been related to having fewer unfounded beliefs and greater knowledge about COVID-19 (Bruder and Kunert, 2021; Constantinou et al., 2021; Erceg et al., 2020), whereas belief in COVID-19 conspiracy theories has been associated with lower scientific reasoning, and, in turn, less correct knowledge and more false beliefs about COVID-19 (Čavojová et al., 2022; Sallam et al., 2020a). Distrust in science is associated with populist attitudes that are closely related to conspiracy beliefs about COVID-19, independent of political ideology (Eberl et al., 2021). Moreover, the effect of conspiracy ideation on non-compliance with health guidelines is mediated by trust in science (Plohl and Musil, 2021), which is one of the strongest predictors of compliance with health guidelines (Dohle et al., 2020; Koetke et al., 2020; Plohl and Musil, 2021).

Similarly, belief in COVID-19 conspiracy theories is negatively correlated with self-reported knowledge about COVID-19 (Kim and Kim, 2021; van Mulukom, 2022). This may be associated with denialism, which is a predisposition to reject information from experts and official accounts, a major predictor of COVID-19 conspiracy beliefs (Uscinski et al., 2020). This suggestion is demonstrated by Kim and Kim (2021) who find that the belief that coronavirus-related information provided by the government is objective and scientifically based predicted reduced conspiracy theory endorsement. Similarly, low levels of trust in science and scientists and general scepticism about science predicted the degree to which people accepted additional, alternative explanations of the origin of the virus and greater willingness to spread various kinds of

misinformation about COVID-19, including conspiracy claims (Agley and Xiao, 2021; Lobato et al., 2020; Roozenbeek et al., 2020). In countries with less belief in science (indexed by prevalence of climate sceptics), adherence to physical distancing measures was also lower (Brzezinski et al., 2020). On the other hand, belief in conspiracy narratives can also co-exist with belief in narratives in line with scientific consensus (Agley and Xiao, 2021).

3.2.3. Social factors

While conspiracy beliefs may be broadly categorised as epistemically suspect beliefs or misinformation, they are still distinct from such beliefs as they importantly also involve a social or intergroup dimension (Cichocka et al., 2016b; van Prooijen and van Lange, 2014). Conspiracy beliefs postulate that there is a(n) (out)group, often small and hidden but powerful and nefarious, which is in some way threatening the individual or their ingroup (van Prooijen and van Lange, 2014). In this section, social contexts will be reviewed in their effect on the endorsement of COVID-19 conspiracy theories.

3.2.3.1. Group identities. Belonging to a group means having a group of individuals, an 'ingroup', who you can trust to fall back onto, for protection or information. However, this may also mean the creation of 'outgroups' (a group with which one does not identify), allowing conspiracy beliefs to be used to justify and defend the socio-political status of one's ingroup (Imhoff and Bruder, 2014), thus buffering any criticism in the process. This may explain why higher levels of collective narcissism are associated with belief in COVID-19 conspiracy theories (Hughes and Machan, 2021; Sternisko et al., 2021), as the latter may be a way to protect grandiose national identities that are threatened by the pandemic. National identities in turn are superordinate levels of identity which provide support and guidance during a time of uncertainty and threat (Abrams et al., 2021; Oleksy et al., 2021). For a more nuanced understanding, it may be helpful to distinguish the effects of 'downward' and 'upward' conspiracy theories (Nera et al., 2021), targeting relatively powerless and powerful groups, respectively. In Polish samples, for example, belief in COVID-19 conspiracy theories that were related to targeting outgroups (i.e., a downward conspiracy theory) generally was linked to support for xenophobic policies, while belief in government-related COVID-19 conspiracy theories (i.e., an upward conspiracy theory) was not (Oleksy et al., 2021).

COVID-19 conspiracy beliefs may also be expected in groups who might feel threatened due to their political identity. For example, in samples from the United States, conservative individuals tend to hold stronger beliefs in COVID-19 conspiracy theories than liberals (Calvillo et al., 2020; Havey, 2020; Miller, 2020b; Romer and Jamieson, 2020; Uscinski et al., 2020), perceive less personal vulnerability, and rate the virus as less severe (Calvillo et al., 2020); potentially also as a reaction to criticism concerning the handling of the pandemic by the Republican president at the time (Miller, 2020b). Conservatives are also less accurate than liberals at discerning between real and fake headlines (Calvillo et al., 2020) and are more willing to spread conspiracy-themed misinformation online (Lobato et al., 2020).

In a Turkish sample, those who subscribed to right-wing ideologies were more likely to believe in COVID-19 conspiracy theories (Alper et al., 2020), and in a Brazilian sample, these ideologies were linked to believing in (generic) conspiracy theories about personal wellbeing and the control of information (but, interestingly, not government malfeasance) (Farias and Pilati, 2021). Both right-wing authoritarianism and social dominance orientation (a measure of preference for a hierarchical social system) predicted belief in certain specific (i.e., non-general) conspiracy theories (Hartman et al., 2021; Pizarro et al., 2020). In a Romanian sample, far-right political views were *negatively* related to belief in COVID-19 conspiracy theories (Stoica and Umbreș, 2021), which might be due to the specific situation in Romania, where being on the left of the political spectrum is related to religiosity and being less progressive. Moreover, in another Romanian sample, holding pro-Russian as well as anti-EU, U.S. and NATO attitudes were associated with stronger COVID-19 conspiracy beliefs (Achimescu et al., 2021). In German and Swiss samples, extremes of political ideology on both sides (i.e., left and right) were associated with increased endorsement of conspiracy theories (Kuhn et al., 2021), while in a South Korean sample no effect of conservative or progressive ideology was found (Kim and Kim, 2021).

There also seems to be a connection between religiosity and COVID-19 conspiracy belief in some countries. In a sample comprising mostly Americans, political conservatism, religious orthodoxy, and conspiracist ideation were associated with less trust in science, which explained their unwillingness to adhere to safeguarding behaviours (Plohl and Musil, 2021), and in another United States sample, Republican partisanship, conservative ideology, and religiosity were each significant predictors of COVID-19 conspiracy beliefs (Uscinski et al., 2020). Religiosity predicted COVID-19 conspiracy belief in Turkey (Alper et al., 2020). Similarly, in a Polish sample, an increase in religious commitment during the pandemic was associated with increased conspiracy beliefs (in particular in overpopulation and US-China economic war theories) and possession of incorrect or less knowledge about COVID-19 (Boguszewski et al., 2020). In a South Korean sample, religiosity predicted COVID-19 conspiracy beliefs, but being a Christian was associated with reduced belief, with no effect on the other listed religious affiliations (Kim and Kim, 2021). This suggests that religiosity, or a stronger commitment to certain religious beliefs, may be connected to greater conspiracy belief in particular.

3.2.3.2. Trust in authorities. Conspiracy beliefs frequently call into question the very institutions which can provide accurate information (Connolly et al., 2019; Rutjens et al., 2021), hereby removing or replacing some of the typical (authoritative) sources of information people generally rely on. Generic beliefs in conspiracy theories (during the COVID-19 pandemic) have, for example, been associated with distrust in the German government, health institutions, and healthcare system (Bruder and Kunert, 2021). Believing specific COVID-19 conspiracy theories was associated with doubting or denying technical claims about COVID-19 in Germany (Rothmund et al., 2020) and with distrust in scientists and health organisations in multinational samples (De Coninck et al., 2021; van Mulukom, 2022). In contrast, obtaining information from medical doctors and scientific journals was associated with fewer COVID-19 conspiracy beliefs (Sallam et al., 2020b). Likewise, trust in science predicted adherence to guidelines in Germany (Dohle et al., 2020) and in a large international sample (n = 23,733) with representative samples from 23 countries (Han et al., 2021). It also mediated the negative effect of general conspiracy ideation on adherence to guidelines (Plohl and Musil, 2021). Nonetheless, while trust in science and conspiracy beliefs seem irreconcilable, both trust in scientists and the belief that COVID-19 was artificially created predicted compliance to COVID-19 guidelines (van Mulukom, 2022): potentially due to a suspicion that the artificially created virus might be used against oneself, for example as a bioweapon.

Oftentimes, scientific information is not directly transmitted from scientists, but relayed by governments or national health institutions, rendering trust in these institutions critical. Distrust in the government, politicians, the military, doctors, scientists, the World Health Organization (WHO), the United Nations (UN), and/or the European Union (EU) were associated with belief in COVID-19 conspiracy theories (Achimescu et al., 2021; De Coninck et al., 2021; Freeman et al., 2020b; Kim and Kim, 2021). Instagram posts with the conspiracy hashtags #hoax and #plandemic were often co-presented with narratives containing distrust in the government and other authorities (E. K. Quinn et al., 2021). Distrust in government officials further mediated the relationship between (political) COVID-19 and generic conspiracy beliefs with reduced adherence to guidelines (Bruder and Kunert, 2021;

Karić and Međedović, 2021; Pavela Banai et al., 2021; Pummerer et al., 2022).

In a sample from the United States, belief in COVID conspiracy theories was associated with *more* trust in the country's government and President Trump (Earnshaw et al., 2020; van Mulukom, 2022), but at the same time less trust in one's state and local government (Earnshaw et al., 2020), suggesting that trust in governmental institutions is intertwined with political ideology. Nevertheless, distrust in science and research and distrust in political institutions together predicted COVID-19 conspiracy beliefs in Austria more strongly than right-left ideology (Eberl et al., 2021). Thus, COVID-19 conspiracy beliefs may be especially predicted by populist attitudes, fuelled by anti-elitism (i.e., a broad breakdown of trust in mainstream authorities as credible sources of information) (Eberl et al., 2021; Rothmund et al., 2020). In line with this suggestion, COVID-19 conspiracy beliefs have been associated with trust in one's government for countries with populist governments (e.g., Brazil, United Kingdom, United States), but with distrust for countries without these types of governments (e.g., Finland, New Zealand) (van Mulukom, 2022).

3.2.3.3. Social media. Social media platforms have been major contributors to the COVID-19 infodemic (M. S. Islam et al., 2020a), overloading users with (mis)information (Zarocostas, 2020). Although not all social media posts engaging with a conspiracy theory endorse that theory (Ahmed et al., 2020b) and although some social media companies have responded to the proliferation of COVID-19 misinformation on their platforms (Kelion, 2020; B. Quinn, 2020), conspiratorial claims are among the most attention-grabbing content on social media (Marchal and Au, 2020; Mutanga and Abayomi, 2022; Rovetta and Bhagavathula, 2020). This has important implications for the spread of conspiracy theories. Like other conspiracy theories, COVID-19 conspiracy theories shared over social media are transmitted more rapidly and reach broader audiences than fact-checked information (Bruns et al., 2020; Rodríguez et al., 2020). The rapid transmission of COVID-19 conspiracies may be driven by a more negative valence of COVID-19 conspiracies relative to other kinds of COVID-19 (mis)information shared over social media (Charquero-Ballester et al., 2021).

Social media bots may be a large driver of COVID-19 conspiracy theory diffusion. Twitter accounts ranked most likely to be a bot were 27 times more likely to tweet about COVID-19 than accounts ranked least likely to be bots (Ferrara, 2020). Bot accounts were also highly engaged in spreading conspiratorial, right-wing political propaganda related to COVID-19 (e.g., anti-Chinese conspiracies), linking to conservative partisan websites as references (Ahmed et al., 2020a). Repetition of information in echo chambers may render it trustworthy on appearance (Unkelbach et al., 2019), and the large group of apparent 'individuals' posting conspiracy theories might steer into biases like the bandwagon bias (Anderson, 2019).

Right-wing ideology is another major driver of COVID-19 conspiracy theories and misinformation on social media platforms (Marone, 2021) and other right-leaning news outlets (Motta et al., 2020). Individuals with conservative leanings report a higher willingness to share COVID-19 conspiracies over social media relatiev to liberals (Lobato et al., 2020). Users tweeting in support of right-wing narratives were more likely to retweet COVID-19 conspiracies than users who were either neutral or who tweeted in support of left-wing narratives (Jiang et al., 2020). Pro-Trump Twitter accounts are a substantial contributor to the continuation of claims that COVID-19 is a hoax (Gruzd and Mai, 2020), and Trump's own Twitter messages have likely contributed to increases in anti-vaccination attitudes in his supporters (Hornsey et al., 2020). Likewise, claims of media exaggerating COVID-19 and that there is a lot of 'fake news' out there have been correlated with the belief that COVID-19 was artificially created (van Mulukom, 2022). Geospatial analysis revealed that COVID-19 conspiracy theories propagate over social media more in countries like the United States, where right-wing politicians repeat online conspiracy theories (Stephens, 2020).

Trust in social media as sources of information predicts conspiratorial thinking (De Coninck et al., 2021; Earnshaw et al., 2020; Kim and Kim, 2021; Sallam et al., 2021; van Mulukom, 2022). People who used social media (vs. mainstream news outlets) for information about COVID-19 were also more likely to endorse COVID-19 conspiracies (Bridgman et al., 2020; De Coninck et al., 2021; Freeman et al., 2020b) and less likely to follow COVID-19 health-protective behaviours (Allington et al., 2021). Similarly, social media users who shared conspiratorial claims were less likely to engage in online discussions on public health or COVID-19 prevention (Jiang et al., 2020), and social media users who reported a greater preference for engagement with diverse political views were less likely to endorse the view that COVID-19 was artificially created (Su, 2021).

3.3. Consequences

3.3.1. Protective behaviours

For all COVID-19 conspiracy theories except the hoax and exaggeration/flu theories, SARS-CoV-2 is considered real and dangerous, and as such, engagement in protective behaviours would still be expected. These behaviours come in many forms (see Table 1), with some overlapping recommended safety guidelines (i.e., safeguarding behaviours) and others not overlapping with recommended safety guidelines (e.g., hoarding or pseudoscientific health practices). In this section, we will discuss associations between these varying practices and COVID-19 conspiracy theory endorsements.

3.3.1.1. Safeguarding guideline behaviours. Throughout the pandemic, governments and official health institutions have issued behavioural guidelines aimed at reducing the spread of the disease. Among the safeguarding behaviours are adherence to hygiene-, distancing-, and mask-related guidelines, which all have been effective in curbing the virus (N. Islam et al., 2020b; Leung et al., 2020). Overall, self-reported adherence to these guidelines was negatively related to COVID

Table 1
Overview of examples of protective behaviours during the COVID-19 pandemic.

Safeguarding guideline behaviours			Self-centred behaviours	Misguided behaviours
Hygiene	*Distancing*	*Mask wearing*	*Hoarding*	*Pseudoscientific health practices*
- Disinfecting hands - Washing hands - Not touching the face - Covering mouth/nose when coughing/sneezing - Cleaning/disinfecting home	- Avoiding social contacts - Avoiding crowds - Staying at home in quarantine - Avoiding shaking hands with other people - Avoiding any physical contact with other people - Keeping a safe distance from others	- Wearing protective face masks out of the house - Wearing an N-95 or higher (health grade) mask	- Stocking up on food, water, toilet paper and/or sanitary items - Buying weapons for defence and security purposes - Stocking up on petrol and oil - Buying equipment for water storage and water purification	- Using alternative remedies like homeopathy or essential oils - Consuming information from alternative sources online

Note. Examples adapted from Imhoff and Lamberty (2020) and van Mulukom, 2022.

conspiracy beliefs (Allington et al., 2021; Bierwiaczonek et al., 2020; Constantinou et al., 2021; Erceg et al., 2020; Fountoulakis et al., 2020; Freeman et al., 2020b; Karić and Međedović, 2021; Kowalski et al., 2020; Maftei and Holman, 2022; Oleksy et al., 2021; Pavela Banai et al., 2021; Romer and Jamieson, 2020; Soveri et al., 2021; Swami and Barron, 2021; Teovanović et al., 2021). However, there was also a small number of studies that did not find a relation (Alper et al., 2020; Čavojová et al., 2022; Juanchich et al., 2021) or no unique effect of COVID conspiracy beliefs on COVID-19 guideline adherence (Díaz and Cova, 2020; Soveri et al., 2021).

Mask-wearing was typically measured together with the other safeguarding behaviours, but when it was measured separately, mask-wearing was predicted in ways similar to the other safeguarding behaviours (Hornik et al., 2021; van Mulukom, 2022). Some studies measured adherence to hygiene and distancing guidelines separately. Here, adherence to distancing guidelines was generally lower than adherence to hygiene guidelines and in some cases, only distancing behaviours were related to COVID-19 conspiracy belief (Biddlestone et al., 2020; Bruder and Kunert, 2021; Farias and Pilati, 2021; Kowalski et al., 2020; Marinthe et al., 2020; Pummerer et al., 2022). Moreover, belief in COVID-19 conspiracy theories predicted reduced adherence to distancing guidelines in a longitudinal study with a U.S. sample (Bierwiaczonek et al., 2020). The full picture as to why there might be differences in the relation between COVID-19 conspiracy beliefs and adherence to hygiene versus distancing guidelines has not yet emerged. However, people high in conspiratorial thinking seem to prefer non-normative actions and behaviours which go against governmental regulations (Jolley et al., 2019; Marinthe et al., 2020). As the governmental interference had more tangible consequences for distancing guidelines – for example through lockdowns or regulations –, people high in conspiratorial thinking might have been more likely to express their disagreement through not following distancing guidelines as compared to hygiene measures. This idea is supported by articles reporting that distrust in governmental officials and science mediated the association between COVID-19 conspiracy beliefs and adherence to guidelines (Karić and Međedović, 2021; Pavela Banai et al., 2021; Plohl and Musil, 2021; however, see also Pummerer et al., 2022). Similarly, conspiracy beliefs mediated the effect of distrust in (non-populist) governments and scientists on hygiene and distancing behaviours (van Mulukom, 2022). While most of the studies on COVID-19 conspiracy belief and safeguarding behaviours are cross-sectional, there are also two studies using a longitudinal (and experimental) design, supporting the claim that believing in COVID-19 conspiracy theories leads to subsequent lower adherence to safeguarding behaviours (Bierwiaczonek et al., 2020; Pummerer et al., 2022).

Support and adherence to guidelines also seem to differ between beliefs in different kinds of conspiracy theories (Farias and Pilati, 2021; Oleksy et al., 2021; though see Karić and Međedović, 2021). Believing in conspiracy theories claiming that the coronavirus SARS-CoV-2 is a hoax or caused by 5G is more negatively related to the adherence to guidelines than believing that the virus is artificially created, potentially as a bioweapon (Allington et al., 2021; Imhoff and Lamberty, 2020), which may follow from the fact that the latter conspiracy theories still assume that the virus is dangerous (Chan et al., 2021). The findings that the artificial origin COVID-19 conspiracy belief predicted hygiene but not distancing behaviours (van Mulukom, 2022), and that generic conspiracy ideation is associated with both reduced compliance to distancing guidelines and reduced perceived risk (Maftei and Holman, 2022), supports this idea.

3.3.1.2. Self-centred behaviours. Believing in COVID-19 conspiracies is related to greater concerns for oneself than others (Hornsey et al., 2021), and has predicted hoarding (Bai, 2020; Imhoff and Lamberty, 2020; Juanchich et al., 2021; van Mulukom, 2022), possibly reflecting the fact that hoarding items can help people to regain a sense of security and control (Arafat et al., 2020). This idea is supported by the finding that self-centred prepping behaviour was predicted differently depending on the type of conspiracy theory that was endorsed (Imhoff and Lamberty, 2020): Individuals were more likely to engage in self-centred prepping behaviour when they believed that COVID-19 was artificially created than when they believed that it was a hoax. Hoarding behaviours during the COVID-19 pandemic may further be spurred on by greater perceived threats, such as concerns for food shortages (Jovančević and Milićević, 2020), low income (Juanchich et al., 2021), and Dark Triad personality traits (Nowak et al., 2020).

3.3.1.3. Misguided behaviours. Typically viewed as harmless, many non-evidence-based health practices can be deceptive at best and very dangerous at worst during a pandemic (Freckelton Qc, 2020). Practices range from drinking ginger tea or consuming garlic to ingesting deadly substances such as methanol or disinfectant, in the belief that they are "miracle cures". The short film 'Plandemic' for example, which appeared online on May 4th of 2020 and quickly gained millions of views (Kaplan, 2020), called itself a documentary (Allen, 2020) despite containing a large number of falsities (Neil and Campbell, 2020), related to such pseudoscientific health practices. These practices have become so widespread that the WHO even had to put up an official website to fact-check and debunk them (World Health Organization, 2020). Endorsing pseudoscientific health practices has repeatedly been linked to a conspiratorial worldview (Lobato et al., 2014). Similarly, the endorsement of COVID-19 conspiracy theories was related to pseudoscientific behaviours (Pummerer et al., 2022; Teovanović et al., 2021).

3.3.2. Other health and social consequences

Vaccinations are an important factor in humankind dealing with preventable diseases. Belief in conspiracy theories has consistently been linked to negative attitudes towards vaccinations (Hornsey et al., 2018). Conspiracy beliefs about COVID-19 are no exception and are similarly associated with reduced vaccination intentions. Along with detrimental effects on individual and public health - including effects on psychological wellbeing -, COVID-19 conspiracy beliefs are also shown to have other negative social consequences, such as prejudice, discrimination, and violence.

3.3.2.1. Vaccination intentions. Since the onset of the COVID-19 pandemic, it has become clear that SARS-CoV-2 will stay with us for a long time, which has started a race to develop a vaccine. Vaccine hesitancy (Sallam, 2021) has consistently been linked to COVID-19 conspiracy beliefs (Allington et al., 2021; Bertin et al., 2020; Cislak et al., 2021; Freeman et al., 2020a; Freeman et al., 2020b; Hornsey et al., 2021; Hughes and Machan, 2021; Romer and Jamieson, 2020; Ruiz & Bell; Salali and Uysal, 2020; Sallam et al., 2021; Soveri et al., 2021; Teovanović et al., 2021). Intentions to vaccinate against COVID-19 have also been shown to be negatively associated with other predictors of conspiracy beliefs mentioned above, namely, epistemically suspect beliefs (Čavojová et al., 2022; Soveri et al., 2021; Teovanović et al., 2021), higher intuitive and biased thinking (Teovanović et al., 2021; Tomljenovic et al., 2020), lower analytic and scientific thinking (Čavojová et al., 2022).

Because the COVID-19 vaccines are new, people have to base their risk perception mostly on their experience and knowledge of existing vaccines. Unfortunately, vaccination attitudes have historically been influenced by misinformation (e.g., that the Measles, Mumps, and Rubella (MMR) vaccine causes autism; Jolley and Douglas, 2014a) and conspiracy theories (e.g., that vaccines are for mind control; Blaskiewicz, 2013). Confusion due to the overwhelming amount of constant information, distress from emotive negative messages, and distrust following incompetence in the governments' responses and conflicting stories from different sources may further negatively impact vaccination intentions (Lockyer et al., 2021). However, although higher intentions

to get vaccinated have been predicted by worry (Faasse and Newby, 2020; Ward et al., 2020), and concern about how threatening the disease is considered to be (Karlsson et al., 2021), belief in COVID-19 conspiracy theories may cancel these effects out: Perceived threat and helplessness reduce intentions to get vaccinated when they concurrently increase belief in COVID-19 conspiracy theories (Šrol et al., 2021).

3.3.2.2. Psychological wellbeing. Believing in COVID-19 conspiracy theories has been associated with greater (future) anxiety, a sense of lacking control, feelings of powerlessness, and higher levels of uncertainty (Biddlestone et al., 2020; Duplaga and Grysztar, 2021; Miller, 2020a, b; Sallam et al., 2020a; Šrol et al., 2021) as well as momentary stress (Kuhn et al., 2021), higher levels of depression (De Coninck et al., 2021; Fountoulakis et al., 2020), negative emotions (Kim and Kim, 2021), and less resilience (Miller, 2020b). Belief in the artificial creation theory, but not the theory that the virus occurred naturally, was related to more anxiety, psychological distress, and less life and job satisfaction in a sample of Ecuadorian healthcare workers (Chen et al., 2020).

Conflicting or confusing information can be particularly inflammatory to psychological well-being, especially when the information is threatening or when combined with the relentless stream of negative news on social networks and media (Amanzio et al., 2020; Mukhtar, 2021). As such, belief in COVID-19 conspiracy theories, feeling insufficiently informed, and a lack of trust in the readiness of the government to deal with the pandemic was associated with greater feelings of hopelessness during the early stages of quarantine in Russia (Egorova et al., 2020).

Believing in conspiracy theories generally has been associated with mental health disorders and decreased well-being (Freeman and Bentall, 2017). However, the direction of this relationship between conspiracy beliefs and psychological well-being is not yet fully understood. It might be that low psychological well-being increases the likelihood of endorsement of conspiracy theories, as experimentally manipulating the COVID-19 threat leads to a greater belief in COVID-19 conspiracy theories, and this was mediated by increased feelings of fear and anxiety (Jutzi et al., 2020). Likewise, heightened anxiety (Grzesiak-Feldman, 2013) and the perception of lack of control (Whitson and Galinsky, 2008) has been associated with belief in general conspiracy theories. At the same time, belief in conspiracy theories themselves might also lead to lower psychological well-being, as being exposed to conspiracy theories led to feelings of powerlessness in political (Jolley and Douglas, 2014b) and health (Jolley and Douglas, 2014a) contexts, as well as to higher feelings of *anomie* (Jolley et al., 2019), which describes perceptions of alienation, the disorderliness of the (social) world and general dissatisfaction. Overall, it seems likely that conspiracy beliefs and lower psychological well-being interact and strengthen each other (Douglas et al., 2017), and believing COVID-19 conspiracy theories may lead to lower psychological well-being in the long term, for example through associations of feelings of powerlessness and uncertainty (Duplaga and Grysztar, 2021).

3.3.2.3. Negative social consequences. An effective response to a pandemic requires a coordinated effort within and across countries. In the case of COVID-19, however, this cooperation has been undermined from the outset by people engaging in blame games (Jakovljevic et al., 2020) and 'us (ingroup) versus them (outgroup)' narratives associated with COVID-19 conspiracy theories (Kim and Kim, 2021). Indeed, blaming China for the virus is predicted by generic conspiracy ideation (Prichard and Christman, 2020) and nationalist conspiracy theorising (Nie, 2020). People who believe in the artificial origin of COVID-19 report a greater willingness to penalise China and less support for biomedical research of zoonotic viruses (Bolsen et al., 2020). Overall, pandemics like the COVID-19 pandemic can give rise to intergroup fractures, visible in prejudice, social and economic inequality, xenophobia, racism, extremism, and violence (Abrams et al., 2021) - which are intertwined with belief in COVID-19 conspiracy theories (Hardy, 2020; Jaiswal et al., 2020; Levinsson et al., 2021; Marone, 2021; Šrol et al., 2022).

Early in the pandemic, exposure to information about COVID-19 led to negative attitudes against Asian people (Sorokowski et al., 2020) as well as an increased support for xenophobic public policies (Oleksy et al., 2021). Likewise, the belief that the virus was artificially created was associated with the tendency to avoid Asian food and restaurants (van Mulukom, 2022). Negative social effects like prejudice are often driven by perceived threats (to the individual or their group). Indeed, prejudice against Asian people, and a desire for social distance from them, was predicted by a perceived threat (Mandalaywala et al., 2021; Tabri et al., 2020). This threat likely was amplified in conspiracy theories about threatening outgroups. As mentioned above, COVID-19 conspiracy theories often spread on social media, which could be one reason why the desired social distance from Asian, Hungarian, and Italian individuals was also predicted by increased exposure to media in British and Polish participants (Sorokowski et al., 2020).

Moreover, since the spread of the theory that COVID-19 is caused or spread by 5G technologies, there have been numerous public demonstrations, documented cases of abuse of technicians at mobile phone towers, and arsons (Meese et al., 2020). More specifically, higher levels of justification and willingness to engage in violence, such as setting cell phone towers ablaze (Jolley and Paterson, 2020), or participating in violent anti-government protests (Šrol et al., 2022), were associated with greater anger, linked to generic COVID-19 and 5G COVID-19 conspiracy beliefs. Generic COVID-19 conspiracy beliefs were furthermore related to higher sympathy for violent radicalization among Canadian young adults, especially those with higher reported levels of psychological distress (Levinsson et al., 2021). Extremists, ranging from jihadists to left-wing extremists, but in particular right-wing extremists, have used the pandemic to further their propaganda, recruit sympathisers, and lash out against their usual enemies through conspiracy theories (Marone, 2021).

4. Discussion

The COVID-19 pandemic is an extraordinarily challenging time for many: Not only do people have to deal with the possibility of catching a potentially debilitating and even lethal disease, but they also have to deal with many uncertainties about the present and future that have implications for their social relationships, health, and economic well-being. Even though COVID-19 has been experienced as challenging for many, not all endorse COVID-19 conspiracy beliefs. Here, we conducted a rigorous systematic review of the current evidence of potential antecedents and consequences of COVID-19 conspiracy beliefs using PRISMA protocol (Moher et al., 2009) and the AMSTAR 2 Checklist (Shea et al., 2017). Since we also included preprints, checked four major databases, and had co-authors search through reference lists and other venues, it is unlikely we missed many articles published on COVID-19 conspiracy beliefs and written in English before March 2021, and believe this systematic review is a reasonable representation of the phenomenon of interest.

In terms of potential antecedents, small but consistent associations were found between COVID-19 conspiracy beliefs and lack of control (*r-values* 0.18-0.28), feelings of uncertainty, and uncertainty avoidance (*r-values* 0.12-0.57), and perceived risk and anxiety (*r*-values 0.10-0.29). These factors likely serve as antecedents of conspiracy beliefs; for example, one longitudinal study has reported a small causal effect of anxiety increasing COVID-19 conspiracy beliefs over time (Heiss et al., 2021). Nonetheless, this does not mean that COVID-19 conspiracy theories succeed in offering such control and certainty. In fact, the belief that evil forces are at play likely also serves to reinforce feelings of low control and uncertainty – making this relationship a reinforcing cycle. This is why anxiety, fear, and feelings of powerlessness were also included as potential consequences in terms of well-being. So far, studies

on this potentially reinforcing cycle are missing, but this may be investigated in future studies on conspiracy beliefs using longitudinal design with several measurement points.

COVID-19 conspiracy beliefs were consistently though somewhat weakly (*r*-values 0.12-0.33) associated with Dark Tetrad personality traits (narcissism, Machiavellianism, psychopathy, and sadism), with similar associations for paranoia and delusional ideation (*r*-values 0.18-0.44). In terms of thinking styles, COVID-19 conspiracy beliefs were associated with lower performance on measures of analytical thinking (*r*-values −0.18 to −0.46), with greater correlations when numeracy, science literacy, and bullshit receptivity were controlled for (Pennycook et al., 2021). Smaller effects were found for self-report measures of thinking styles, though they were in the same direction: more intuitive and less analytical thinking styles were related to higher levels of COVID-19 conspiracy beliefs (*r*-values. 13–0.28). In line with these findings, small but consistent correlations were found between COVID-19 conspiracy beliefs and epistemically suspect beliefs (*r*-values 0.23-0.56).

The associations between COVID-19 conspiracy beliefs and trust in science were similar in range to these previous correlations (*r*-values from −0.20 to −0.47, and β-values from −0.16 to −0.42): the less people trust science, the more they endorse conspiracy theories. This distrust transfers to the people communicating science, as distrust in scientists, health experts, and health institutions were also negatively associated with COVID-19 conspiracy beliefs (*r*-values −0.19 to −0.30). A more complicated picture arose with regards to governments: generally speaking, COVID-19 conspiracy belief was associated with and predicted by distrust in one's government (*r*-values −0.12 to −0.35; β-values −0.08 to −0.48, Cohen's $d = 0.32$) and to a lesser extent international organisations (*r*-values −0.07 to −0.17), but with *trust* in President Trump or populist governments (β-values 0.15-0.23, Cohen's $d = 0.76$). COVID-19 conspiracy beliefs were also linked to collective narcissism (*r*-values 0.27-0.48), support for xenophobic policies ($r = 0.35$), and political conservatism and religiosity (*r*-values 0.10-0.20). COVID-19 conspiracy beliefs were consistently predicted by trust in, and reliance on, social media, in particular Facebook (β-values 0.08-0.10, $r = 0.13$, Cohen's $d = 0.51$), though distrust in mainstream media seemed to be even greater ($\beta = -0.37$).

In terms of hypothesised consequences of COVID-19 conspiracy beliefs, the main investigated consequence was adherence to safeguarding guideline behaviours. In general, COVID-19 conspiracy beliefs were negatively related to adherence to hygiene, physical distance, and mask-wearing guidelines (*r*-values between −0.20 and −0.50), whereby negative correlations for adherence to physical distancing guidelines were usually larger than the ones for hygiene measures. Adherence to guidelines was often found to be mediated by trust towards the government and feelings of powerlessness. COVID-19 conspiracy beliefs were also related to lower vaccination intentions with similar correlations (*r*-values 0.28-0.48). On the other hand, COVID-19 conspiracy belief was positively correlated with self-centred behaviours such as hoarding goods (*r*-values 0.17-0.71) and with misguided behaviours, such as pseudoscientific practices (*r*-values 0.18-0.28). Regarding other potential health and social consequences, correlations of COVID-19 conspiracy beliefs to vaccination intentions were generally somewhat larger though still modest (*r*-values 0.28-0.48). COVID-19 conspiracy belief was moreover generally associated with lower psychological well-being, whether higher levels of anxiety, depression, feelings of powerlessness, or uncertainty (*r*-values 0.18-0.31). Again, a (bi)directional effect or reinforcing cycle seems likely here. Finally, COVID-19 conspiracy beliefs were related to a wide range of negative social consequences like prejudice, discrimination willingness to engage in violent actions and sympathy for violent radicalization (*r*-values 0.11-0.60).

The effect sizes of the reviewed studies were similar to each other, in particular for correlation coefficients, which ranged from approximately $|r| = 0.16$ to $|r| = 0.40$, demonstrating weak to moderate correlations. The majority of the reviewed studies were cross-sectional. Therefore, the direction of most effect(s) is not clear and might also be the result of a multidirectional effect or the cause of additional variables. Further examinations of COVID-19 conspiracy beliefs would greatly benefit from (a combination of) experimental or longitudinal approaches (e.g., Pummerer et al., 2022). Longitudinal studies (e.g., Bierwiaczonek et al., 2020) are especially interesting as they can take into account the continuously evolving situation of the pandemic. Such research designs would also be able to further elucidate whether factors influencing COVID-19 conspiracy beliefs are antecedents, consequences, or both. Additionally, more pre-registered studies are necessary to rule out post-hoc hypothesising.

Furthermore, more attention to, and variety in, samples would be desirable: A considerable number of the studies were using convenience samples, usually comprised of people who are skillful in using computers (as most studies were completed online), from a relatively select number of countries and regions, with few studies with well-executed country comparisons (for an exception, see De Coninck et al., 2021). Cross-national differences are the next point of future investigation, as varying cultural and political situations, including populist governments, invariably influence both the antecedents and consequences of conspiracy beliefs (e.g., see Adam-Troian et al., 2021), effects of which we saw particularly in studies with samples from countries with governments which at times supported, and/or at least did not hinder, the spread of COVID-19 conspiracy theories (e.g., Slovakia, Romania, and the United States). In this systematic review, cross-national comparisons could often not be made here due to varying methodology, samples, etc. Therefore, we urge researchers to consider these factors for future research. Moreover, as COVID-19 conspiracy beliefs seemed to be more prevalent in specific subgroups, such as minority groups (Earnshaw et al., 2020; Freeman et al., 2020b; Jaiswal et al., 2020), it would be informative for future research to specifically target these subgroups, through different recruiting methods if necessary. Most but not all studies reported the time at which the studies were conducted. This is important as early studies examining vaccination intentions arguably measured a more abstract intention than studies later on when vaccinations had become available. Moreover, effect sizes relating conspiracy beliefs to safeguarding behaviours increased as governments increased pressure through regulations, which depended both on the time of the study and the country investigated.

The main aim of this systematic review was to synthesise the current research on COVID-19 conspiracy beliefs to make it widely accessible, which was met by identifying potential antecedents and consequences of COVI-19 conspiracy beliefs reported in 85 articles comprising 133 studies. The practical value of this synthesis should not be overlooked: To deal with what is already an extremely challenging time, government and healthcare officials can gain much from understanding what may lead to conspiracy beliefs during the COVID-19 pandemic, and what the consequences of such beliefs might be, especially since these consequences have effects on whole populations, not just subgroups of believers. In other words, COVID-19 conspiracy beliefs are pressing social issues, and policymakers and practitioners could consider the proposed potential antecedents for interventions, and other mechanisms through which conspiracy beliefs may be challenged.

This review also shows how conspiracy theories and their effects are context-dependent. We have attempted to map previous conspiracy belief research ideas to the context of the COVID-19 pandemic. Overall, COVID-19 conspiracy beliefs function much like other conspiracy beliefs (as also evidenced by high correlations between COVID-19 and generic conspiracy beliefs or measures of conspiracy mentality). Nevertheless, this systematic review bears witness to how general principles of conspiracy belief play out in a very specific context and time. Before COVID-19, behaviours like hoarding, physical distancing, and prejudice against specifically Asians were irrelevant in relation to conspiracy theories. It was only after those specific COVID-19 conspiracy theories that these behaviours became relevant. Similarly, while studies were reporting a correlation between a conspirational worldview and a conservative/

right-wing attitude before (see e.g., van der Linden et al., 2021), COVID-19 conspiracy beliefs were unique in the sense that they were propagated by the leader of the conservative party of the United States during that time, consequently spreading through conservative websites and social media worldwide.

This review shows that there can be conspiracy beliefs that centre on the same topic (here: COVID-19 conspiracy beliefs) which nonetheless differ in their outcomes. Overall, a division was found between *questioning* COVID-19 conspiracy theories, which question the severity of the virus and pandemic, such as hoax conspiracy theories or those suggesting COVID-19 is like the flu, and *blaming* COVID-19 conspiracy theories, which assume a purposeful origin/spread of the virus (though the cause or powerful actors behind it may be hidden), such as bioweapon, political control, or Bill Gates/5G theories (honing in on the threat aspect of conspiracy theories). Differences between those theories were especially visible in effect sizes for safeguarding behaviours, showing that the content of a conspiracy theory indeed matters for the different outcomes. Thus, this systemic review provides evidence of how different behaviours related to conspiracy belief - or even a conspirational mindset - are context-dependent and time-sensitive. As such, it raises the question which other widely accepted consequences of a general conspiracy belief or a belief in other conspiracy theories are also dependent on the specific contexts. Thus, it should inspire further research on other conspiracy theories and their context-dependent outcomes. Often, in psychological research, we aspire generalisability. However, the pandemic shows that it can be just as essential to be able to predict the unique outcomes of a conspiracy theory, such as to design preventive measures: whether in the current pandemic or future threats, such as those linked to climate change.

Author contributions

VVM: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration. **LJP**: Conceptualization, Investigation, Writing – original draft, Writing – review & editing, Supervision. **All remaining authors**: Investigation, Writing – original draft, Writing – review & editing.

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Declaration of interest statement

The authors declare no conflict of interest.

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Appendix A. Supplementary data

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