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Don't believe it! A global perspective on cognitive reflection and conspiracy theories about COVID-19 pandemic

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ABSTRACT

The COVID-19 pandemic increased the saliency of an old phenomenon – conspiracy theories. In times of a global crisis and an unprecedented access to information, fake news seems to spread as fast as the virus. A global pandemic requires more than ever self-compliance. Only behavior change and vaccination on a large scale can bring us to normality. Yet believing in conspiracy theories about COVID-19 is expected to undermine such compliance. What determines susceptibility to believing in misinformation? In this study, using data on mostly representative samples of 45 countries around the world (38,113 participants), we found evidence that people with more deliberate thinking are less likely to believe in conspiracy theories. Furthermore, on the individual level people who are more prone to believe in conspiracy theories are less likely to comply with behavior change. We are in the midst of the biggest coordination game and such insights in social psychology can inform policymakers.

1. Introduction

From theories that present G5 networks as the source of the virus (Van Prooijen, 2020) to claims that vaccines are just a pretext to inject microchips (Carmichael & Goodman, 2020; Lee, 2021), conspiracy theories about COVID-19 seem to have spread almost as fast as the virus itself. While not a new phenomenon in itself (Van Prooijen & Douglas, 2017), the spread of misinformation and its negative consequences seem to be especially salient during this world pandemic. During such a pandemic, compliance with mitigation measures (such as social distancing) is essential for managing the virus until a sufficient number of people are vaccinated. Such compliance can save lives. Yet because this virus can affect anyone, relying on external enforcement of rules is prohibitively costly. Accordingly, self-compliance is essential: pandemic mitigation requires that people change their behavior to comply with mitigation measures. However, belief in conspiracy theories may impede self-compliance.

Therefore, it is critical to gain insight into what shapes belief in COVID-19 conspiracy theories, and how this may impact compliance and support for pandemic mitigation policies. Moreover, given this is a

global phenomenon which is not restricted to one country, it is important to understand how these processes may manifest themselves across the globe, in different communities and cultures, where belief in such conspiracies may differ. To do so, the current research focuses on the role of analytical thinking, which has been shown to predict belief in conspiracy theories in Western societies (Swami et al., 2014; in context of COVID-19, see Pummerer et al., 2022; Erceg et al., 2020; Pennycook et al., 2020; Stanley et al., 2021; Swami & Barron, 2020; Imhoff & Lamberty, 2020). We examine whether across a broad range of communities and cultures, people who use more deliberative thinking may be less susceptible to believing in COVID-19 related conspiracy theories. Furthermore, we examine if due to their lower conspiracy belief, people who use more deliberative thinking may show greater (self-reported) compliance with behavior changes, and greater support of pandemic mitigation policies (such as closure of public institutions). We examine these questions in 45 countries from around the world, in mostly representative samples with a total of nearly 40,000 participants.¹ By doing so, we firstly assess how the relationship between deliberative thinking, conspiracy belief, and compliance may apply to individuals across different communities and cultures from around the world.

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¹ Despite the initial plan to collect data on representative samples, in some countries, convenience samples were used. Nevertheless, the majority of samples are still representative (33 out of 45). For more details see Table S1 in the Supplementary Materials.

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Moreover, we examine how these processes may vary between these settings, in communities and cultures where there may be relatively stronger or weaker tendencies toward deliberative thinking, COVID-19 related conspiracy belief, and self-compliance or support for mitigation measures.

In an era of proliferation of fake news, and especially when it has such a critical impact on human lives, it is crucial to understand the determinants and consequences of susceptibility to follow misinformation. Furthermore, it is key to understand how these may vary across different communities and cultures around the globe. By examining the role of deliberative reasoning, the present research may help to identify possible avenues that could help people to screen out false information – such as improving reasoning skills or activating more deliberative modes of thinking. In this way, the present research may also point at possible strategies for public policy to promote and sustain compliance (recommendation versus mandatory rules; communication strategies).

The data used in this study is part of a larger set of data collected in a large-scale comparative project on COVID-19 social and moral psychology titled “International Collaboration on the Social & Moral Psychology of COVID-19 (ICSMP)”, led by Jay Van Bavel, Mark Alfano, Paulo Sérgio Boggio, Valerio Capraro, Aleksandra Cichočka, Aleksandra Cislak and Hallgeir Sjøstad, measuring general attitudes as well as related to the COVID-19 pandemic, and different personality traits. The initial analysis was exploratory where we have examined our predictions on 10% of the collected data and pre-registered our predictions to examine on the full sample.²

2. Analytical thinking, conspiracy theories and compliance

During times of crisis, which are often characterized by high levels of uncertainty, conspiracy theories emerge to help people to make sense of the situation (Van Prooijen & Douglas, 2017, p. 324). However, belief in conspiracy theories can have harmful consequences, for example by affecting related health behaviors (Oliver & Wood, 2014). In the context of COVID-19 pandemic, this implies that widespread conspiracy belief may have substantial harmful consequences for society as a whole. From the initial waves of the pandemic, behavioral change such as social distancing, hand washing, and disinfection of items, has been crucial for containing the spread of the virus – and this will remain the case until a critical mass of people can be vaccinated. Moreover, belief in conspiracy theories may even undermine the latter outcome, as studies on COVID-19 and other vaccines have shown that such beliefs can also reduce willingness to vaccinate oneself (e.g., Jolley and Douglas, 2014a; Bertin et al., 2020). Initial evidence for such negative outcomes has been already demonstrated in different studies. For example, Marinho et al. (2020) conducted several studies in France to examine the effects of “conspiracy mentality”, i.e., the higher tendency to believe in conspiracy theories. In one of their studies, they have found that people with conspiracy mentality were less willing to obey the confinement rule installed by the government during the first wave. Similar results were found in the UK (Allington & Dhavan, 2020), and in Croatia (Banai et al., 2021). The latter study found that the link between belief in conspiracy theories and compliance was partially mediated by trust in government officials. In the context of vaccines against COVID-19, Earnshaw et al. (2020) found negative correlation between belief in conspiracy theories and intentions to vaccinate against COVID-19 among a sample of U.S.

² The information about the ICSMP project and the leading team is available at <https://icsmp-covid19.netlify.app/index.html>. We did not have access to the full dataset when doing the exploratory analysis. This was reassured by the organizing team. The subsample (10% of the data) on which we have performed our initial analysis is available at <https://osf.io/k7s9p/>, and our pre-registered predictions are available at https://osf.io/pmn47/?view_only=3fd1dea29a884e4db27591132d7f15c9. The full data used for this article can be found here <https://osf.io/8nhzr/>.

participants. Similar results were found in Israel and in the UK (Kantorowicz-Reznichenko et al., 2021).³

In sum, conspiracy beliefs about COVID-19 may undermine self-compliance, and more widespread conspiracy belief thus may constrain the ability of public policy to contain the pandemic. But what predicts people's tendency to believe in COVID-19 conspiracy theories? Does such conspiracy belief indeed undermine self-compliance, as well as support for COVID-19 mitigation policies? And how do these tendencies differ between different communities and cultures? These questions are the center of this study.

In the present research, we focus on the role of analytical thinking, in line with previous research that has associated this with conspiracy belief (Swami et al., 2014). By doing so, we follow dual-process theories of cognition (Evans & Stanovich, 2013), which separate two modes of processing information. Type 1 process is intuitive, automatic, less effortful but more prone to biased responses. Type 2 process, on the other hand, is slower, more reflective, requires more effort, but can reduce biases in judgment (Evans & Stanovich, 2013, p. 225). Following this theory, it can be expected that people who engage in more reflective (Type 2) processing when judging incoming information might be better equipped to avoid decisional biases than people who engage in less reflective (Type 1) processing. Therefore, upon reflection such people can for example identify inconsistencies in the theories, or its implausibility. Furthermore, more reflective people might seek for additional proof for the theories before adjusting their behavior accordingly. In turn, they might be more likely to detect misinformation and challenge it. Since COVID-19 related conspiracy theories are considered to be misinformation, we predict that *people who are more deliberate and reflective in their processing of information will be less likely to believe in COVID-19 conspiracy theories than people who are less reflective (H1)*. This prediction is in line with previous research on Western samples, which has found generally that analytical thinking reduces belief in conspiracy theories (Swami et al., 2014), also in the context of COVID-19 (e.g., Erceg et al., 2020; Pennycook et al., 2020; Stanley et al., 2021; Swami & Barron, 2020). However, the present study examines this relationship across a broad range of communities and cultures from around the globe and explores how the role of analytical thinking in conspiracy belief may vary between these.

Secondly, we predict that in the context of COVID-19 pandemic *people who believe in conspiracy theories to a larger extent (especially the denial theories)⁴ will comply less with behavior change/support less anti-corona policies than people who believe such theories to a lesser extent (H2)*. This prediction also aligns with findings obtained in specific (Western) samples, which have found that acceptance of COVID-19 conspiracy theories was associated with lower levels of compliance (Swami & Barron, 2020, e.g., in the UK), behavior change (Pennycook et al., 2020), and social distancing and handwashing (Erceg et al., 2020; Pummerer et al., 2022; Stanley et al., 2021). In the present study, we examine this association across a broad range of mostly representative samples, for a fixed set of behaviors (compliance with behavior change and support for anti-corona policies).

Finally, given H1 and H2, we predict that *the effect of deliberative*

³ Despite the evidence suggesting negative correlation between belief in conspiracy theory and support and/or compliance with governmental rule in the context of COVID-19 prevention, a few studies found different results. For example, Peitz et al., 2021, conducting a study on a UK sample found that the relationship is not straightforward. The effect of believing in a conspiracy theory, depends on the emotion it evokes (e.g., while anger led to higher perceived importance of governmental restrictions, anxiety achieved just the opposite). Alper et al. (2021) did not find evidence that belief in conspiracy theories is associated in any way with levels of preventive measures.

⁴ With denial theories we mean those theories that challenge the mere existence or the danger of the pandemic. This can be contrasted with other conspiracy theories which accept the fact there is a pandemic but misinform about the source of it (for example, that the government is responsible for this).

thinking on compliance and support of anti-corona policies will be mediated by the belief in conspiracy theories (H3). As such, we examine whether there is an indirect effect of deliberative thinking on self-compliance by reducing conspiracy belief about COVID-19. This firstly will demonstrate whether at the individual level, more deliberative thinking may promote compliance by reducing conspiracy belief. Moreover, this will also illuminate whether at the superordinate level (i.e., communities and cultures), settings where conspiracy beliefs are generally more common may also show lower rates of analytical thinking and compliance.

By doing so, the present research further deepens and extends our understanding of the psychological processes which lead to increased belief in conspiracy theories in the context of COVID-19 pandemic, which so far has still been limited in focus (e.g., by focusing on Western, and often nonrepresentative samples; see Sternisko et al., 2021; Jolley & Douglas, 2017; Pennycook et al., 2020; Stanley et al., 2021; Erceg et al., 2020; Swami & Barron, 2020). In this study, we look whether such links exist across communities. Moreover, given that COVID-19-related conspiracy theories are part of a general problem of misinformation spread through social media (Vosoughi et al., 2018), we also contribute to this more general literature on the susceptibility to fake news (Bago et al., 2020; Pennycook & Rand, 2019; Pennycook & Rand, 2020).

3. Method

The present study was conducted as part of a large-scale international collaboration project conducted in 69 countries in April and May 2020 (Van Bavel et al., 2022). In each of these countries, a team administered an identical survey to (in majority of cases) a representative sample of at least 500 participants. The total sample consisted of 51,916 participants, nested within 69 countries. The study has been approved by the University of Kent (UK) Research Ethics Committee. Written consent has been obtained from the participants.

In some countries (i.e., 24), less than 400 cases with complete data on our focal variables were collected. These countries were excluded from our analysis. Our final sample therefore consisted of 38,113 participants (49.1% male, 50.6% female, 0.3% other, $M_{age} = 43.91$, $SD = 16.01$) nested in 45 countries. For the countries which were included in the analysis see Fig. 1. Furthermore, detailed information about the participating countries and characteristics of the samples can be found in Table S1 in the Supplementary Materials.

For the purpose of this study, we first focused on the two variables of interests – analytical thinking and belief in conspiracy theory. These variables were measured through two sets of questions. (1) Performance on three questions of Cognitive Reflection Test (CRT) as a measurement of analytical versus intuitive thinking (Frederick, 2005; Pennycook

et al., 2015; Pennycook et al., 2020; Toplak et al., 2011). An index of cognitive reflection was constructed by computing the proportion of correct answers (out of 3). (2) The level of agreement with five statements reflecting different conspiracy theories (e.g. “The coronavirus (COVID-19)... is a hoax invented by interest groups for financial gains”). Responses were provided on a 11-point Likert scale (0 = “Strongly disagree”, 5 = “Neither agree nor disagree”, 10 = “Strongly agree”), and were aggregated into a scale measure ($\alpha = 0.92$), with higher scores indicating greater belief in COVID-19 conspiracy theories. For the specific questions see variables 1 and 2 in the Supplementary Materials.

Second, in order to investigate the relationship between cognitive deliberation, belief in conspiracy theories and compliance and support for COVID-19 related policies, we used in addition a set of questions measuring compliance and policy support (see variables 3 and 4 in the Supplementary Materials).

Self-compliance was measured by means of five items (e.g., “During the days of the coronavirus (COVID-19) pandemic, I have been... Staying at home as much as practically possible”). Responses were provided on a 11-point Likert scale (0 = “Strongly disagree”, 5 = “Neither agree nor disagree”, 10 = “Strongly agree”). All items revealed good internal consistency, except for item 2 - “Visiting friends, family, or colleagues outside my home” (reverse coded) (item-total $r = 0.30$). As such, items 1 and 3–5 were aggregated into a scale measure ($\alpha = 0.78$), with higher scores indicating greater physical distancing.

Policy support was measured by means of five items (e.g., “During the days of the coronavirus (COVID-19) pandemic, I have been in favor of... closing all schools and universities”). Responses were provided on a 11-point Likert scale (0 = “Strongly disagree”, 5 = “Neither agree nor disagree”, 10 = “Strongly agree”) and were aggregated into a scale measure ($\alpha = 0.87$), with higher scores indicating greater support for COVID-19 mitigation policies.

Given the literature on other relevant features for belief in conspiracy theory, we also controlled for the level of collective narcissism (Sternisko et al., 2021), and political ideology (Pennycook et al., 2020; Van Prooijen et al., 2015). Collective narcissism was assessed by means of three questions (e.g., “My national group deserves special treatment”). Responses were provided on a 11-point Likert scale (0 = “Strongly disagree”, 5 = “Neither agree nor disagree”, 10 = “Strongly agree”), and were aggregated into a scale measure ($\alpha = 0.87$), with higher scores indicating greater collective narcissism. Participants' political ideology was assessed by asking them to indicate “what would be the best description of your political views?” Responses were provided on a 11-point Likert scale (0 = “Very left-leaning”, 5 = “Centre”, 10 = “Very right-leaning”).

We also controlled for risk perception. The level of risk itself can determine the level of compliance and support for restrictive policies.



Fig. 1. Countries included in the analysis.

Besides being an intuitive presumption, this is also supported by empirical evidence (e.g., Pennycook et al., 2020). Risk perception was assessed by means of two questions to assess participants' perceived risk of being infected with COVID-19 themselves, and the likelihood an average person in their country would be infected. Responses were provided on a 11-point Likert scale (0% = Impossible, 100% = "Certain"). Answers were highly correlated ($r = 0.69$, $p < .001$) and hence were aggregated into a scale measure, with higher scores indicating greater perceived COVID-19 infection risk. For the full set of questions measuring the control variables see the Supplementary Materials.

3.1. Analysis strategy

To confirm the structure of our focal measures, factor analysis was conducted (for a full description, see Supplementary Materials, Tables S2–S8 and Fig. 6). For this purpose, the sample was split randomly into two groups, and exploratory factor analysis (EFA) was conducted on the former, and confirmatory factor analysis (CFA) on the latter. The EFA revealed that the items indeed separated into four dimensions, which corresponded with our measures of physical distancing, policy support, collective narcissism, and conspiracy belief. The CFA confirmed that this four-factor solution showed adequate to good model fit. Thus, we proceeded with our planned analyses, in which the relationship between these constructs was assessed.

To test Hypotheses H1–H2, we relied on linear mixed-effects models conducted in Stata. We compare three models: a model with fixed effects only (Model 0), a model with fixed effects and random (country-level) intercepts (Model 1), and a model with fixed effects and random (country-level) intercepts and slopes (with unstructured covariance structure; Model 2). All models control for collective narcissism, risk perception, and political ideology at the individual level, and utilize robust (Huber-White) standard errors.

To test Hypothesis H3, two multilevel mediation models were estimated by means of the MLMED macro (Hayes & Rockwood, 2020) in SPSS. These models utilized maximum likelihood estimation (10,000 Monte Carlo resamples) and unstructured covariance and residual covariance matrices. In these models, CRT score was the independent variable (X), physical distancing or policy support the dependent variable (Y), and conspiracy belief the mediator (M), and observations were clustered by country. The models included all random effects, including random intercepts and random slopes for each path (i.e., effect of X on M [path a], effect of M on Y [path b], and effect of X on Y [path c]), except when models failed to converge in this fashion. In such instances, we follow the recommendations of Bates et al. (2015) and Barr et al. (2013) and decrease the complexity of the maximally specified random effects structure by eliminating random slopes that prevented the model from converging (here typically that for path c).

4. Results

4.1. The effect of CRT score on conspiracy belief

Results are displayed in Tables 1a and 1b. Relative to Model 0, which included fixed effects only, Model 1 added the country-level intercepts as a random effect. The intra-class correlation was 0.13, such that 13% of the total variance in conspiracy belief was explained by country differences (when controlling for all individual-level variables). A likelihood ratio test indicated that compared to Model 0, the -2 log likelihood of Model 1 was significantly lower (by 4605.05, exceeding the Chi Square(1) threshold value of 10.83 at $\alpha = 0.001$). However, by adding the country-level slopes in Model 2 as a random effect, the fit was improved even further (by 102.41, exceeding the Chi Square(2) threshold value of 13.82 at $\alpha = 0.001$).

Fixed effects (Table 1b) for Model 2 indicated that conspiracy belief was significantly lower at higher levels of CRT score, such that for every

Table 1a

Model summaries, conspiracy belief.

	Model 0 (no random effects)	Model 1 (random intercept only)	Model 2 (random intercept and slope)
Residual variance	6.88***	6.06***	6.04***
Intercept variance (country)		0.89***	1.12***
Slope variance			0.20***
Slopes and intercepts covariance			-0.31***
Intra-class correlation		0.13	0.17
Log pseudolikelihood	-90,835.42	-88,532.89	-88,481.69

* $p < .05$; ** $p < .01$; *** $p < .001$.

problem that participants solved correctly, their reported belief in COVID-19 conspiracy theories was 1.26 scale points lower. This confirms H1. Also, belief in conspiracy theories was significantly greater among participants with higher collective narcissism or more right-leaning political ideology.

The effect of CRT score on conspiracy belief was found to vary significantly by country, however (Table 1a). For an overview of this variation see scatterplot in the Supplementary Materials (Fig. S1). Firstly, Model 2 revealed significant variance in intercepts, such that there were significant differences between countries in average conspiracy belief. Moreover, the model revealed significant variance in slopes, such that countries differed in the degree to which higher levels of CRT score reduced conspiracy beliefs. Last, the model revealed significant negative covariance between intercepts and slopes, such that slopes of the relationship between CRT score and conspiracy beliefs were dependent on the average national level of conspiracy belief. More specifically, for countries where average conspiracy belief was high, higher levels of CRT score more strongly reduced belief in conspiracy theories (i.e., slopes are more negative) than for countries where average conspiracy belief was lower (i.e., slopes are less negative). As such, higher CRT score especially reduces conspiracy belief in countries where average belief in COVID-19 conspiracies is relatively high.

4.2. The effect of conspiracy belief on physical distancing

Tables 2a and 2b display the results for physical distancing. Relative to Model 0, which included fixed effects only, Model 1 (adding country-level intercepts) revealed an intra-class correlation of 0.07; i.e., 7% of the total variance in physical distancing was explained by country differences (controlling for individual-level variables). A likelihood ratio test indicated that relative to Model 0, the log likelihood of Model 1 was significantly lower (by 2152.23, exceeding the Chi Square(1) threshold value of 10.83 at $\alpha = 0.001$). The fit was improved even further by adding the country-level slopes as a random effect in Model 2 (by 185.44, exceeding the Chi Square(2) threshold value of 13.82 at $\alpha = 0.001$).

When examining the fixed effects (Table 2b) for Model 2, the results revealed that physical distancing was significantly lower at higher levels of conspiracy belief. More specifically, for an increase of one scale point in conspiracy belief, participants reported 0.11 scale point less physical distancing. Reported distancing was greater among participants with higher collective narcissism and risk perception. This confirms H2.

The relationship between conspiracy belief and physical distancing differed between countries, however (Table 2a). For an overview of this variation see scatterplot in the Supplementary Materials (Fig. S2). Specifically, Model 2 revealed significant variance in intercepts, such that there were significant differences between countries in average physical distancing. Furthermore, the model indicated significant variance in slopes, such that countries differed in the strength with which higher

Table 1b
Estimates of fixed effects, conspiracy belief.

Predictors	Model 0		Model 1		Model 2	
	B	RobustSE	B	Robust SE	B	Robust SE
Intercept	1.30***	0.05	1.47***	0.29	1.47***	0.29
CRT (% correct)	-1.41***	0.04	-1.22***	0.08	-1.26***	0.07
Collective narcissism	0.33***	0.00	0.26***	0.02	0.26***	0.02
Risk perception	0.00	0.00	0.00	0.00	0.00	0.00
Political ideology	0.14***	0.05	0.13***	0.03	0.13***	0.03

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2a
Model summaries, physical distancing.

	Model 0 (no random effects)	Model 1 (random intercept only)	Model 2 (random intercept and slope)
Residual variance	2.94***	2.76***	2.74***
Intercept variance (country)		0.20***	0.17***
Slope variance			0.00***
Slopes and intercepts covariance			0.00
Intra-class correlation		0.07	0.06
Log pseudolikelihood	-74,604.15	-73,528.04	-74,435.32

* $p < .05$; ** $p < .01$; *** $p < .001$.

conspiracy beliefs reduced physical distancing. No significant covariance between intercepts and slopes was observed, however. Thus, it was not the case that higher conspiracy belief especially reduced physical distancing in countries where average physical distancing was relatively high (or low).

4.3. The effect of conspiracy belief on policy support

Tables 3a and 3b display the results for policy support. Relative to Model 0 (fixed effects only), Model 1 (adding country-level intercepts) showed an intra-class correlation of 0.15, such that 15% of the total variance in policy support was explained by country differences (controlling for individual-level variables). Furthermore, a likelihood ratio test indicated that the log likelihood of Model 1 was significantly lower than that of Model 0 (by 6097.48, exceeding the Chi Square(1) threshold value of 10.83 at $\alpha = 0.001$). The fit was improved even further in Model 2 (by 493.33, exceeding the Chi Square(2) threshold value of 13.82 at $\alpha = 0.001$), where the country-level slopes were included.

Results for the fixed effects (Table 3b) revealed that policy support was significantly lower at higher levels of conspiracy belief. More specifically, in Model 2, for an increase of one scale point in conspiracy belief, policy support decreased by 0.17 scale points. This confirms H2. Policy support was greater among participants with higher collective narcissism and risk perception.

The relationship between conspiracy belief and policy support also

Table 2b
Estimates of fixed effects, physical distancing.

Predictors	Model 0		Model 1		Model 2	
	B	Robust SE	B	Robust SE	B	Robust SE
Intercept	8.42***	0.03	8.44***	0.12	8.39***	0.12
Conspiracy belief	-0.12***	0.00	-0.11***	0.01	-0.11***	0.01
Collective narcissism	0.07***	0.00	0.05***	0.01	0.06***	0.01
Risk perception	0.00***	0.00	0.00***	0.00	0.00***	0.00
Political ideology	-0.02***	0.00	-0.00	0.01	-0.00	0.01

* $p < .05$; ** $p < .01$; *** $p < .001$.

differed between countries (Table 3a). For an overview of this variation see scatterplot in the Supplementary Materials (Fig. S3). Model 2 indicated significant variance in intercepts; thus, there were significant differences between countries in average support for COVID-19 mitigation policies. Furthermore, the analysis revealed significant variance in slopes between countries; i.e., the negative effect of conspiracy belief on policy support differed in strength between countries. However, no significant covariance between intercepts and slopes was observed. It was not the case, therefore, that higher conspiracy belief especially reduced policy support in countries where average support for COVID-19 mitigation policies was relatively high (or low).

4.4. Mediation analysis

4.4.1. Physical distancing

For physical distancing, the multilevel mediation model that included all random intercepts and slopes did not converge. To resolve this, we decreased the complexity of the maximally specified random effects structure (see Barr et al., 2013; Bates et al., 2015). To do so, we omitted the random slope for the path between CRT score and physical distancing (path c), which showed a high correlation ($r = 0.94$) with the slope for the path between CRT score and conspiracy belief (path a). Doing so enabled the model to converge successfully; hence, these results are reported here.

Fig. 2 displays the multilevel mediation model. At Level 1

Table 3a
Model summaries, policy support.

	Model 0 (no random effects)	Model 1 (random intercept only)	Model 2 (random intercept and slope)
Residual variance	4.84***	4.10***	4.04***
Intercept variance (country)		0.73***	0.78***
Slope variance			0.01***
Slopes and intercepts covariance			-0.02
Intra-class correlation		0.15	0.16
Log pseudolikelihood	-84,144.59	-81,095.85	-80,849.19

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3b
Estimates of fixed effects, policy support.

Predictors	Model 0		Model 1		Model 2	
	B	Robust SE	B	Robust SE	B	Robust SE
Intercept	7.24***	0.04	7.59***	0.20	7.49***	0.20
Conspiracy belief	-0.15***	0.00	-0.18***	0.02	-0.17***	0.01
Collective narcissism	0.19***	0.00	0.12***	0.01	0.13***	0.01
Risk perception	0.01***	0.00	0.01***	0.00	0.01***	0.00
Political ideology	-0.05***	0.01	-0.02	0.01	-0.02	0.01

* $p < .05$; ** $p < .01$; *** $p < .001$.

(individuals), the indirect effect of CRT on physical distancing via conspiracy belief was significant, $IND_{CB} = 0.29$, $SE = 0.02$; $z = 14.00$, $p < .001$, 95% CI = [0.25; 0.33]. Accordingly, at the level of individuals, CRT predicted greater physical distancing by reducing conspiracy belief. The effect of CRT on physical distancing was significant and negative when the effect of conspiracy belief was controlled for, $c' = -0.19$, $SE = 0.03$, $t(1429.66) = -7.44$, $p < .001$, 95% CI = [-0.24; -0.14]. As such, CRT continued to predict physical distancing when the effect of conspiracy belief was controlled for.

At Level 2 (countries), the indirect effect of CRT on physical distancing via conspiracy belief was not significant, $IND_{CB} = 0.26$, $SE = 0.29$; $z = -0.91$, $p = .36$, 95% CI = [-0.20; 0.94]. Accordingly, there were no indications that countries where (average) CRT was higher displayed greater (average) physical distancing due to lower (average) conspiracy belief. For a graphical illustration, please see Fig. S4 in the Supplementary Materials.

4.4.2. Policy support

For physical distancing, the multilevel mediation model that included all random intercepts and slopes also did not converge. Here too, we omitted the random slope for path c (between CRT score and policy support), which did allow the model to converge successfully.

The multilevel mediation model is displayed in Fig. 3. At Level 1 (individuals), the indirect effect of CRT on policy support via conspiracy belief was significant, $IND_{CB} = 0.47$, $SE = 0.03$; $z = 14.57$, $p < .001$, 95% CI = [0.41; 0.54]. Thus, at the level of individuals, CRT predicted greater policy support by reducing conspiracy belief. Furthermore, the effect of CRT on policy support was significant and negative when the effect of conspiracy belief was controlled for, $c' = -0.60$, $SE = 0.03$, $t(578.92) = -10.05$, $p < .001$, 95% CI = [-0.66; -0.54]. Therefore, CRT also continued to predict policy support when the effect of conspiracy belief

was controlled for.

At Level 2 (countries), the indirect effect of CRT on policy support via conspiracy belief was not significant, $IND_{CB} = 0.26$, $SE = 0.34$; $z = 0.75$, $p = .45$, 95% CI = [-0.26; 1.11]. Accordingly, countries where (average) CRT was higher did not display greater (average) policy support due to lower (average) conspiracy belief. For a graphical illustration, please see Fig. S5 in the Supplementary Materials.

5. Conclusions and discussion

In this study, we sought to examine some of the determinants of people's susceptibility to believe in conspiracy theories regarding COVID-19, and the consequences of doing so, in terms of their (self-reported) compliance with, and support for, pandemic mitigation policies. To do so, we utilized a cross-national perspective, which examined these questions in representative samples from 45 countries from around the world. By doing so, our findings provide unique insight into the relationship between analytical thinking, belief in conspiracy theories, and self-compliance, and its robustness across communities and cultures.

Our findings revealed that across communities and cultures, individual deliberative thinking was associated with lower belief in COVID-19 conspiracy theories. Furthermore, our findings revealed that belief in such conspiracy theories was associated with lower compliance, and lower support for mitigation measures. Thus, our findings also confirmed the expected mediating relationship, such that more deliberative thinking predicted greater compliance and support, by reducing belief in conspiracy theories. Our findings also contribute to prior research on belief in conspiracy theories (in relation to COVID-19 as well as more generally) by providing a cross-national perspective on these processes. Whereas prior research has studied these processes mostly in a select set of Western countries, the present research provided a cross-

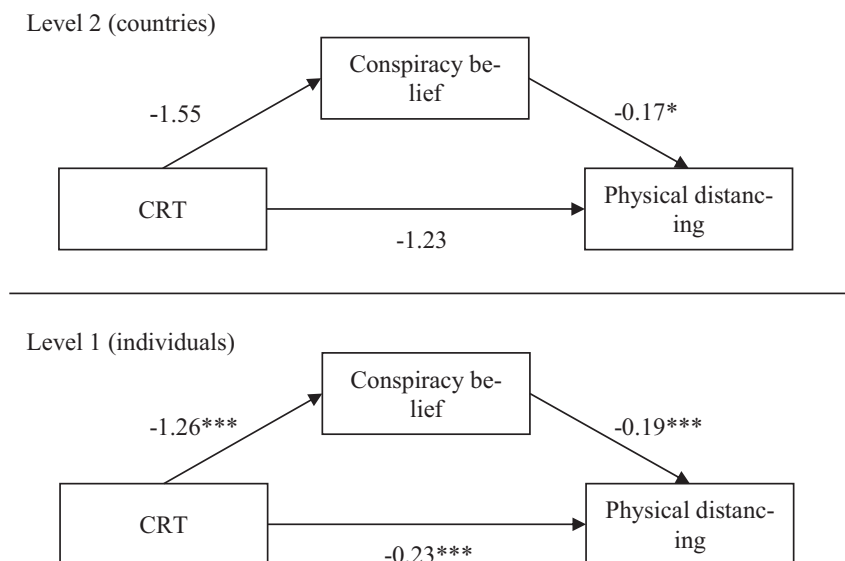


Fig. 2. Multilevel mediation model, physical distancing.

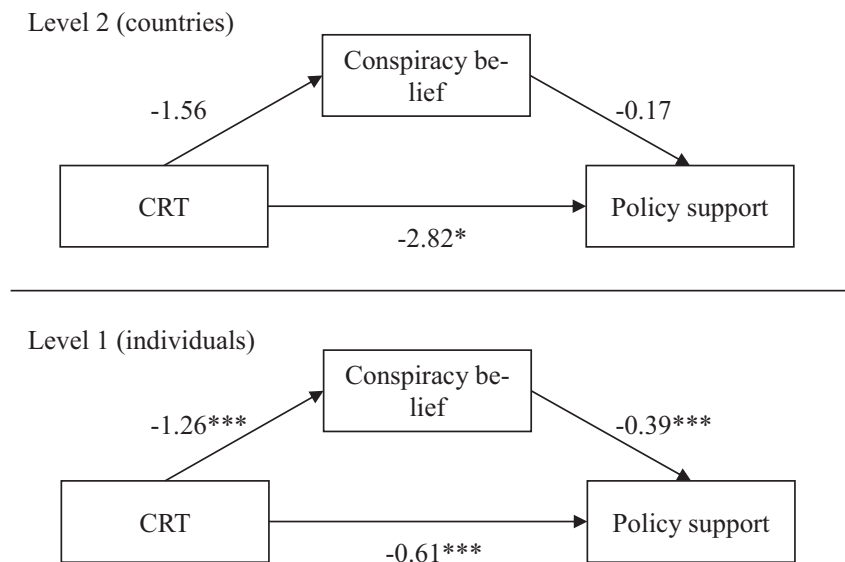


Fig. 3. Multilevel mediation model, policy support.

national perspective based on mostly representative samples from more than 40 countries.

Belief in conspiracy theories differed considerably between countries; however, the indirect effect of analytic thinking on compliance and support via conspiracy belief was robust, and occurred regardless of local differences in e.g. culture, spread of the pandemic, or approach toward mitigating it. There were indications, however, that the relationship between analytic thinking and conspiracy belief varies between countries and was stronger in countries where belief in conspiracies was more widespread.

Our study aimed to evaluate whether the indirect effect via conspiracy belief applied beyond the narrow subset of countries in which it has previously been studied. We indeed confirmed those previous findings. Our results also provided some indications that the strength of this indirect effect may differ between countries (see Figs. S4–S5 in the Supplementary Materials). Our study was not designed to deeply explore the reasons why the influence of conspiracy belief might differ between particular communities. Indeed, the observed clusters do not seem to align with existing typologies of national culture (e.g., Hofstede, 2001; Schwartz, 2006; also see Beugelsdijk & Welzel, 2018), since similar countries according to these typologies nevertheless showed notable differences in the strength of the indirect effect. Further research therefore is needed to understand why the indirect effects of CRT via conspiracy belief may be relatively more or less pronounced within particular countries. Moreover, future research could move beyond our present cross-sectional approach by dynamically examining the relationship between deliberative thinking, conspiracy beliefs and compliance behavior in a longitudinal design.

Our findings are important for public authorities all around the world who are currently struggling in managing the COVID-19 pandemic. By highlighting the importance of deliberative thinking, our findings imply that activating more deliberative forms of thinking – for example in communication and campaigns – could be an important instrument for countering conspiracy belief and promoting compliance. This may apply not just to self-compliance with social distancing, as in the present research, but perhaps also to vaccination. Here too, misinformation may reduce people's willingness to follow governmental instructions to vaccinate, and thereby jeopardize authorities' ability to control the pandemic, and to render the costly mitigation measures on which the present research focused obsolete. Further research is needed to understand these questions, but the present findings underline that people's susceptibility to be influenced by misinformation should not be

ignored or underestimated. The problem of misinformation is growing in recent times, and leads to negative effects in many areas, of which health related behavior is one. Even though we have focused on the context of COVID-19 pandemic, we believe our findings can be relevant to other fields as well. Previous research has demonstrated the negative association between belief in conspiracy theories and welfare-enhancing behavior, for example, in the context of climate change (Jolley and Douglas, 2014b), or measures to reduce HIV infections (Bogart & Thorburn, 2005; Grebe & Natrass, 2012). Therefore, building on such results as presented in this study, future research can also empirically investigate mechanisms to appeal to people's deliberative thinking. This in turn, may improve people's decisions in different areas.

CRedit authorship contribution statement

Elena Kantorowicz-Reznichenko took part in running the survey, has conducted the research in the field, and pre-registered the study. She has also prepared and written the theoretical framework and the predictions for the study. She has significantly contributed to the writing of the discussion. Finally, this author contributed to the final editing of the paper.

Chris Reinders Folmer conducted the statistical analysis, has written the results section and prepared the supplementary materials. He has also contributed to the other parts of the paper. Finally, this author contributed to the final editing of the paper.

Jaroslav Kantorowicz took part in running the survey, conducted the pre-analysis which served as the basis for the predictions of the core analysis in this paper. Finally, this author contributed to the final editing of the paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2022.111666>.

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