Epistemic vice predicts acceptance of Covid-19 misinformation

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Epistemic vice predicts acceptance of Covid-19 misinformation

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Abstract
Why are mistaken beliefs about COVID-19 so prevalent? Political identity, education and other demographic variables explain only part of the differences between people in their susceptibility to COVID-19 misinformation. This paper focuses on another explanation: epistemic vice. Epistemic vices are character traits that interfere with acquiring, maintaining, and transmitting knowledge. If the basic assumption of vice epistemology is right, then people with epistemic vices such as indifference to the truth or rigidity in their belief structures will tend to be more susceptible to believing COVID-19 misinformation. We carried out an observational study (US adult sample, $n = 998$) in which we measured the level of epistemic vice of participants using a novel Epistemic Vice Scale that captures features of the current competing analyses of epistemic vice in the literature. We also asked participants questions eliciting the extent to which they subscribe to myths and misinformation about COVID-19. We find overwhelming evidence to the effect that epistemic vice is associated with susceptibility to COVID-19 misinformation. In fact, the association turns out to be stronger than with political identity, educational attainment, scores on the Cognitive Reflection Test, personality, dogmatism, and need for closure. We conclude that this offers evidence in favor of the empirical presuppositions of vice epistemology.

1. Introduction

Are hand dryers effective in killing the novel coronavirus? Do houseflies transmit the disease? Should you spray your body with or drink bleach to make sure you don't get infected? Certainly not. But some people think so – in fact, sufficiently many people have believed these and other myths that the World Health Organization (WHO) decided to launch a campaign in order to make people aware of the dangerous and potentially lethal effects of believing them.[1] Yet 18% of US residents in our sample endorse the statement that hand dryers are effective in killing the novel coronavirus. Likewise, 15% endorse the claim that COVID-19 can be transmitted through houseflies.

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[1]https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters (accessed June 24, 2020).

And 19% endorse the claim that spraying and introducing disinfectant into your body will protect you against COVID-19.

Why would people believe that hand dryers kill the novel coronavirus? One reason is that social media are rife with misinformation about COVID-19. Fact-checking organization *AFP Fact Check* says that the hand dryer myth can be traced back to a video posted on Facebook on March 13, 2020, and shared hundreds of thousands of times.[2]

Yet the prevalence of misinformation does not provide a complete explanation for why people endorse myths about the novel coronavirus. Not everyone who is exposed to misinformation about COVID-19 ends up believing it. This raises the question whether we can identify differences between people that explain why some are more susceptible to COVID-19 misinformation than others.

Emerging research suggests that someone's political identity is a key predictor of the extent to which they *believe* COVID-19 myths, with Republican-leaning US residents more likely and Democrat-leaning US residents less likely to believe them, as a Reuters/Ipsos poll suggests.[3] Moreover, it's not just about beliefs. The poll also investigated *behavior*, and showed, for instance, that Republicans had changed their daily lives less extensively in response to news about the spreading pandemic than Democrats.

The partisan divide explains only a small part of individual differences in the susceptibility to COVID-19 myths and misinformation, though. In fact, our research suggests that demographic variables including political affiliation, educational achievement, age, gender, ethnicity, religiosity, income, and marital status together explain only about one third of the variance in susceptibility to COVID-19 myths.

What explains the remaining differences in susceptibility to COVID-19 misinformation? This paper explores whether epistemic vice can explain why people believe COVID-19 myths. Epistemic vices are character traits and other dispositions that interfere with acquiring, maintaining, and transmitting knowledge. An epistemically vicious person might be fooled by a video about hand dryers and COVID-19 to believe that hot air protects against the disease, without evaluating the evidence and counter-evidence, or without seeking out a second opinion. We explore the extent to which people's beliefs can be explained by epistemic vices such as indifference to the truth and rigidity in their belief structures.

The *philosophical* literature on virtue and vice epistemology is broad, including theoretical work as well as applications to such domains as medical and business ethics, education, and law, with vice epistemology as a recent burgeoning line of inquiry. The *empirical* literature on virtue and vice epistemology is much smaller, and almost none of it focuses on vice.[4] Yet, without empirical corroboration, theoretical work on vice epistemology remains uncertain, and its relevance to applied fields such as education dubious.

The motivation of the present paper is that the COVID-19 pandemic offers an opportunity to study the role of epistemic vice in belief formation. More speculatively, we think that this type of research may be relevant to policymakers: if epistemic vice turns out to be relevant to health beliefs and behaviors, and if epistemic vice can be

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[2]https://factcheck.afp.com/hot-air-saunas-hair-dryers-wont-prevent-or-treat-COVID-19 (accessed June 24, 2020).

[3]https://www.reuters.com/article/us-health-coronavirus-usa-polarization/americans-divided-on-party-lines-over-risk-from-coronavirus-reuters-ipsos-poll-idUSKBN20T2O3 (accessed June 24, 2020).

[4]Scales that measure the intellectual virtue of humility are also relevant to measure intellectual vice (e.g. Krumrei-Mancuso and Rouse 2016; Alfano *et al.* 2017). Haggard *et al.* (2018) develop a scale to measure intellectual humility as a mean between the vices of intellectual arrogance and intellectual servility.

countered using educational or other interventions, then the public health response to COVID-19 may be bolstered by this line of research.

If the basic assumption of vice epistemology is right, then people with higher degrees of epistemic vice will tend to be more susceptible to COVID-19 myths. This is what we set out to study. We introduce the Epistemic Vice Scale (EVS), a self-assessment survey to measure epistemic vice, and show that the scale captures features of the current competing analyses of epistemic vice in the literature. We carried out an observational study (adult US sample, $n = 998$) in which we measured the level of epistemic vice of participants using a novel Epistemic Vice Scale that we developed and validated. We also asked participants questions eliciting whether they subscribe to myths and misinformation about the coronavirus disease that were sufficiently widespread at the moment of data gathering (May 8–10, 2020).

We find overwhelming evidence to the effect that a person's degree of epistemic vice is associated with the extent to which they believe COVID-19 myths and misinformation. In fact, the association turns out to be stronger than with political identity, educational attainment, and the other demographic factors mentioned above. Adding our EVS scale to the mentioned demographic variables increases the explained variance in individual differences in susceptibility to COVID-19 misinformation from about one third to two thirds. Epistemic vice is also more strongly associated with endorsement of COVID-19 misinformation than other psychological measures, including personality, dogmatism, the Cognitive Reflection Test, and need for closure. We conclude that this offers evidence in favor of the empirical presuppositions of vice epistemology.

Here is the plan for this paper. Section 2 introduces the EVS, our scale, as well as relevant background about vice epistemology. Section 3 discusses the measurement of COVID-19 misinformation. Section 4 presents the results of the study exploring the relationship between epistemic vice and susceptibility to COVID-19 misinformation. Section 5 discusses these results and concludes.

2. Theoretical background to the Epistemic Vice Scale

This section introduces the Epistemic Vice Scale as the instrument we use to measure epistemic vice and discusses how the scale relates to the main views in the philosophical literature. We also detail how we measure COVID-19 misinformation.

2.1. What is epistemic vice?

Epistemic vices are character traits that interfere with gaining, keeping, or sharing knowledge. They include close-mindedness, intellectual arrogance, and prejudice.[5] Before we get to nuances of the concept that are controversially discussed in vice epistemology, let's first distinguish epistemic vice from low intelligence and from cognitive biases.

Epistemic vice differs from cognitive defects such as the notorious example of lowered IQ as a result of prenatal exposure to lead. Unlike such cognitive defects, epistemic vices are always reprehensible, and sometimes blameworthy (Cassam 2019). The bearers of epistemic vices are open to criticism for displaying epistemically vicious traits,

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[5]See for instance Battaly (2017), Crerar (2018), Tanesini (2018) and Cassam (2019). We note that this definition of epistemic vice is in line with the "responsibilist" view of epistemic vice (Battaly 2015). Responsibilists maintain that epistemic vices are character traits or dispositions to act in characteristic ways. By contrast, reliabilists maintain that epistemic vices are faculties such as perception, induction, and memory. For the purposes of this project, we leave the reliabilist position to one side.

because they are responsible either for acquiring these vices or for continuing to display them.

Epistemic vices are also considered to be different from cognitive biases (Cassam 2019: 24ff.). Consider the availability heuristic as an example of a cognitive bias. The availability heuristic is the tendency to overestimate the likelihood of events with greater "availability" in memory. More recent and more emotionally charged memories tend to be more readily available to people. The availability heuristic gets in the way of knowledge; for how recent or emotionally charged a memory is does not predict the likelihood of similar events well.[6] However, in contrast to explanations based on epistemic vices, explanations based on cognitive biases operate at a 'sub-personal' level (Elton 2000). Sub-personal explanations appeal to how the human brain operates. By contrast, epistemic vices relate to character traits operating at a personal level.

It is important to realize, however, that there are other cognitive biases that are either modulated by epistemic vice or can even be regarded as epistemic vices in their own right. The confirmation bias may be a case in point, which is the tendency to search for and accept information that confirms your preconceptions (Klayman 1995). Confirmation bias can be checked by conscious effort. Genuinely curious and open-minded people should therefore be less likely to undermine knowledge acquisition and maintenance by falling into confirmation bias.

2.2. Development of the Epistemic Vice Scale

To study epistemically vicious tendencies of respondents, we administered the Epistemic Vice Scale (EVS). The EVS consists of ten items, which are listed in Table 1.

Before we delve into a discussion about how the scale relates to different conceptions of epistemic vice, it is important to appreciate key features of the development and validation process. We have developed and validated the scale in separate work according to psychometric standards (Meyer *et al.* Forthcoming).

While we started the validation process with items covering five different aspects of epistemic vice, we found that items clustered around just two aspects: rigidity and indifference. We came to this result by testing items based on the taxonomy below. The taxonomy below is our attempt to capture some of the paradigmatic epistemic vices discussed in the literature. Drafting items based on the taxonomy ensures that the scale addresses the paradigmatic aspects of epistemic vice as currently discussed in the literature, rather than just some particular aspects.

- *Closed-mindedness* is the disposition to ignore certain standpoints, and to be partial in appraising the reliability of sources of information.
- *Sloppiness* is the disposition to consider evidence haphazardly, shallowly, and carelessly.
- *Obstinacy* is the disposition to stick to your view even though evidence you encounter suggests otherwise.
- *Apathy* is the disposition to lack curiosity and thus fail to seek knowledge and understanding.
- *Diffidence* is the disposition to avoid social embarrassment even at the expense of shirking from the pursuit of knowledge and understanding.

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[6]Note that, in a suitably constructed environment, the availability heuristic and its close counterpart, the recognition heuristic, can be quite reliable. However, in environments where exposure does not systematically track prevalence, the heuristic goes haywire. For an empirical investigation of this phenomenon, see Alfano and Skorburg (2018).

Table 1. Items of the Epistemic Vice Scale.

Item	Description
Indifference	
1	I am not very interested in understanding things.
2	I am not so interested in the reasons why.
3	I am not particularly curious to learn new things.
4	I do not much enjoy gaining knowledge.
Rigidity	
5	It's more important to have a stable worldview than to be open-minded.
6	I make up my mind without much fuss about the many factors that may affect an issue.
7	I tend to make decisions based on my gut feeling.
8	I tend to be too confident in my opinions.
9	I often have strong opinions about issues I don't know much about.
10	I tend to feel sure about my views even if I don't have much evidence.

We do not claim that this taxonomy comprehensively covers the domain of epistemic vice. Kidd has argued that what is considered an epistemic vice is subject to considerable change in time (Kidd 2017, 2018). For instance, he argues that curiosity is an example for a trait that is considered an epistemic virtue today but had the reputation of a vice before the Age of Enlightenment. Therefore, we may never arrive at a consensus on a taxonomy of epistemic vice. However, we believe that our taxonomy covers a large part of the domain as it is discussed in the current vice epistemology literature.

During the scale development phase, we drafted more than 300 items originally. Revised versions of 80 items – 16 for each epistemic vice listed above – survived after a review with experts from philosophy and psychology as well as pilot studies. We arrived at the ten items and two subscales that constitute the ultimate EVS scale through a process of item selection using exploratory and confirmatory factor analysis from this pool of 80 items. We found that responses to most of the items were very strongly correlated with each other. That allowed us to reduce the length of the scale considerably without losing much information about the degree of epistemic vice of respondents, as responses to one item are highly predictive of responses to many other items. We found that reducing the scale to ten items provided a good compromise between maximizing information and minimizing scale length. As a result of this procedure, the EVS consists of items that cover the domain of epistemic vice as defined by our taxonomy. In terms of face validity, some parts of the domain are covered directly by the items. Other parts of the domain are covered by items that we removed from the scale because they were highly correlated with the remaining items. Hence the remaining items also provide information about the parts of the taxonomy seemingly not covered as well.

The item selection process also revealed that not all conceptual distinctions from the taxonomy have a psychological counterpart. Items did not cluster together according to the epistemic vice they pertain to, as defined in the taxonomy above. Rather, they formed just two clusters, which we call Indifference and Rigidity. The Indifference subscale consists of items that relate to bad epistemic motivations. Thus, indifference manifests itself in a lack of motivation to find the truth. The Rigidity subscale comprises

items that pertain to bad evidential dispositions.[7] The Rigidity items were originally drafted under the heading of a number of different epistemic vices. What they have in common is that they express insensitivity to evidence.

2.3. The Epistemic Vice Scale and current debates in vice epistemology

In developing the EVS, we had to contend with the fact that there are fundamental disagreements in vice epistemology that have profound implications for measurement. First, whether epistemic vices are real or "factitious." Second, whether epistemic vice requires bad motives. Third, we will discuss whether the EVS really measures dispositions, given that they are not directly observable. It is not our aim here to settle these disagreements, even though the scale may be used to address some of them. Rather, our general strategy was to stay neutral by developing a scale that is consistent with any position in these debates. We will discuss these issues in turn.

First, are epistemic vices real or "factitious"? Realists maintain that epistemic vices are properties of individuals, located in a person's character. By contrast, Alfano believes that epistemic vices are "factitious" (Alfano 2013). They are *fictional* in the sense that epistemic vices are attributions people make towards others and themselves, rather than properties of individuals. Yet epistemic vices are also *factive*, because they can nonetheless influence behavior, because attributions may stimulate certain forms of behavior, and function as a kind of self-fulfilling property.

We have administered the EVS as a self-report questionnaire, even though it can easily be adapted to elicit information about attributions of epistemic traits to other people. This methodology is appropriate on the realist view of epistemic vice. If epistemic vices are character traits, and their bearers have at least some self-knowledge about their character traits, they can report on their epistemic vice or lack thereof. Whether bearers of epistemic vices have appropriate self-knowledge has however been questioned in the philosophical literature on epistemic vice. Cassam has suggested that some epistemic vices may be stealthy, in the sense that having them prevents people from realizing that they do (2019). Stealthy vices are less of a concern on the factitious view. Proponents of this view may also embrace measurement using the EVS. Self-report surveys are well-suited to capture the readiness of people to attribute epistemic vices to themselves, and these self-attributions of epistemic vice are an important driver of behavior on the view of epistemic vice as factitious and "self-fulfilling." Both on the realist and on the factitious view, the EVS needs to contend with the general challenge of self-report measures to attract socially desirable responses. Given that the EVS asks respondents to reveal negative traits, there is a particular challenge to truthful responding. To the extent that the challenges to self-reporting apply, we expect them to lead to underestimating the relationship between epistemic vice and misinformation.

The second point concerns the question of whether epistemic vice requires bad motives. Zagzebski (1996), Battaly (2015, 2017) and Tanesini (2018), have argued that bad motives are necessary for epistemic vice. On this view, just as epistemic virtue is always accompanied by the motivation to seek truth non-instrumentally, so epistemic vice is always accompanied by deficient epistemic motives. Cassam (2016, 2019) and Crerar (2018), by contrast, have argued that bad motives are neither necessary nor sufficient for epistemic vice. According to Cassam, epistemic vices are "consequentialist" in the sense that whatever obstructs epistemic goods such as knowledge and understanding counts as a vice. According to Crerar, epistemic vices, in contrast to epistemic

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[7]We are grateful to an anonymous reviewer for kindly suggesting this term.

virtues, are not characterized by motivational states, neither the presence of bad motivational states, nor the absence of good motivational states.

The disagreement has a clear connection to measurement. If bad motives are neither necessary nor sufficient for epistemic vice, any trait that systematically get in the way of knowledge and that their bearers are responsible for would count as vicious. By contrast, if epistemic vice is characterized by bad or lack of good motives, at least some items in the scale should specifically query motives.

The EVS sidesteps this disagreement by way of two subsets of the items of the scale. The Indifference subscale captures *motivation*, while the Rigidity subscale captures *dispositions*. Proponents of both views agree that epistemic vice may and often in fact is accompanied by bad motives, or the absence of good motives. As we will see below in more detail, this is also what we find empirically: there is a strong correlation between scores on the Indifference subscale and scores on the Rigidity subscale. Hence the way we constructed the EVS can assure proponents of the view that epistemic vice is characterized by motivational states that the scale can identify genuine epistemic vice (as they define it), rather than its dispositional component only.

Yet if bad or deficient motives are required for epistemic vice, the question arises whether respondents scoring high on Rigidity yet low on Indifference should be considered as genuinely epistemically vicious. We maintain that they can be. Scoring low on the motivational subscale of the EVS does not imply lack of bad motivations altogether. Rather, the vicious dispositions reflected in high scores on the Rigidity subscale may be accompanied by bad motivations other than those captured by the Indifference scale. We consider it a feature of the EVS that it allows for differentiated interpretation that can also shed some light on the role of the salient motivations included in the Indifference subscale, but we should admit that our scale should not be expected to measure all types of bad motivation that non-consequentialists might find relevant.

Does this method also provide a list of items that proponents of the view that motivational states are not required can accept? From this perspective, what matters is to find traits that obstruct epistemic goods such as knowledge and understanding. Therefore, the test of whether the items we identify capture epistemic vice comes when we study associations of the EVS with knowledge and understanding. As we will see below, Indifference is in fact very strongly associated with bad epistemic outcomes, such as susceptibility to COVID-19 misinformation. What matters for now is that the item selection process is valid from the perspective of the view that epistemic vice is not characterized by bad motives. This is because the selection process aims at identifying a small number of items that contain a high amount of information about the whole domain of epistemic vice, as defined by the initial list of items.

The third point concerns whether the EVS can really measure epistemic vices, given that epistemic vices are character traits, and given that character traits have an important dispositional element. The challenge is how character traits can be measured given that dispositions are not directly observable. To address this challenge, we rely on *latent-trait theory* (Steyer *et al.* 1999). According to this theory, which is well-established in the discipline of psychology, character traits are "latent" traits. Latent traits are unobservable characteristics that can be measured by measuring associated observable characteristics. An example of a latent trait is what psychologists call *openness to experience*. To measure openness to experience, researchers ask subjects to consider to what extent they agree with items such as "I am sophisticated in art, music, or literature", and "I like to play with ideas." The assumed relationship between the answers to such items and the trait is that the answers "reflect" the trait: to the extent that respondents agree with the items they are more likely to possess the underlying latent trait.

We rely on the latent-trait approach to infer that respondents possess epistemic vice from their responses to the items of the EVS. These items capture observable characteristics reflective of epistemic vice. For instance, if respondents agree to the item "I tend to feel sure about my views even if I don't have much evidence," we infer that they are more likely to be epistemically rigid. To make this inference credible, we took care to ensure that our items have two features.

First, they should clearly reflect the associated latent trait. To test whether an item reflects an epistemic vice, we reviewed items with experts on epistemic vice from philosophy and psychology, and asked a convenience sample of non-experts to map items to definitions (see Meyer *et al.* Forthcoming). Second, items should not reflect other latent traits. To test whether items reflect other latent traits, we calculated correlations between, on the one hand, responses to the EVS, and on the other hand, existing psychological scales measuring related constructs such as dogmatism, the so-called Big Six personality traits, and trust in experts. Given that the EVS meets these two requirements, we conclude that the EVS measures epistemic vices with its dispositional components.

3. Measuring susceptibility to COVID-19 misinformation

To study the propensity of respondents endorsing COVID-19 misinformation, we administered a 12-item measure of COVID-19-related misinformation. It measures to what extent respondents endorse misinformation about COVID-19. Ten items are based on the "myth-busting" page of the World Health Organization (Table 2).[8] We added two control items with *true* claims about COVID-19 that at the moment of conducting the survey were commonly agreed among experts to be true, and widely shared with the US population. The COVID-19 misinformation score is calculated as the mean of the responses to the first ten items (i.e., the WHO myth-busting items).

We think that susceptibility to COVID-19 misinformation is a suitable test case for studying the effects of epistemic vice because at the time we conducted the study, knowledge about COVID-19 was highly relevant, while at the same time misinformation was rampant. Knowledge about COVID-19 was universally relevant for US residents because the virus was rapidly spreading in the country. It was relevant for personal reasons, for reasons of protecting others in the community, but also for political reasons. Falling prey to misinformation about COVID-19 is therefore a good test case for the obstruction of knowledge that epistemic vice might explain.

Yet it is important to reflect on the limitations of our measurement approach. As with most self-report surveys, an answer to our survey question is one step removed from measuring whether respondents actually *believe* the misinformation, as respondents might answer items for reasons other than that they believe or disbelieve the misinformation. For instance, they might select responses randomly. However, as we will report below, we find very high levels of agreement to the control items, which indicates that respondents are not answering at random. Respondents may also agree with items for social reasons, for instance because they want to align themselves with or signal membership in a certain group (Hannon Forthcoming). However, such alignment and signaling can also result in behavior (e.g., wearing vs. not wearing a face covering), so to the extent that we want our scale to help predict relevant behaviors the question of whether participants genuinely believe or merely pretend to believe may be moot. It may also be important to include a disclaimer to the effect that our scale does not assess

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[8]https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters (accessed May 8, 2020).

Table 2. Items of the COVID-19 misinformation instrument.

Item	Description	Endorsement
1	Adding pepper to your meals prevents COVID-19.	16%
2	COVID-19 can be transmitted through houseflies.	15%
3	Spraying and introducing disinfectant into your body will protect you against COVID-19.	19%
4	Drinking methanol, ethanol or bleach prevents COVID-19.	13%
5	5 G mobile networks spread COVID-19.	11%
6	Exposing yourself to the sun or to temperatures higher than 77°F prevents the coronavirus disease.	22%
7	Catching COVID-19 means you will have it for life.	15%
8	Being able to hold your breath for 10 seconds or more without coughing or feeling discomfort means you are free from the coronavirus disease.	23%
9	Hand dryers are effective in killing coronavirus.	18%
10	Regularly rinsing your nose with saline helps prevent infection with COVID-19.	22%
11*	Some people infected with coronavirus experience no symptoms.	91%
12*	Older people are more likely to die due to an infection with COVID-19.	90%

Endorsement: if respondents replied "probably true" or "definitely true". *Control items not included in calculation of mean score.

the extent to which respondents actually behave in accordance with their beliefs. Moreover, while we expect that if respondents come to believe misinformation such as "Drinking bleach cures COVID-19", this is reflected in their lowering their credence in such things as that drinking bleach does *not* cure COVID-19, our instrument does not allow us to distinguish between beliefs, credences, or degrees of confidence, and neither does it have an explicit measure for suspension of judgment. While we acknowledge these potential limitations, we leave addressing them to future research. We are confident that our study follows standard practices in psychology, and therefore interpret an answer to a given COVID-19 item as a reasonable indicator of whether participants believe the claim or not.

4. Study

This section presents the results of the study we conducted to explore the relationship between epistemic vice and susceptibility to COVID-19 misinformation.

4.1. Method

4.1.1. Data

A total of 998 participants were recruited and compensated using Amazon's Mechanical Turk platform.[9] The data collection was part of a pre-registered observational study.[10] The eligibility criteria were living in the United States and being 18 years or older. Ages ranged from the bracket 18–29 years to the bracket 74 years and up, with the median

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[9]The dataset and the code to generate the analyses cited in this article is available on the CJO platform.
[10]Pre-registered with Open Science Foundation: osf.io/yzj3g.

respondent falling in the age bracket 30–39 years, consistent with the most recent US census data. 63% of participants were male, as compared with 49% in the general population. 68% had a bachelor's or higher level of education, as compared with 32% in the general population. Median household income was in the bracket between $50,000 and $74,999 per year, consistent with the median income of $63,000 in the general population. 55% of respondents were married; 34% had never married; 7% were divorced; 2% separated; and 2% widowed. 38% of respondents identified as Republican to various degrees; 47% as Democrats; and 15% as Independent. 74% of respondents were White/Caucasian; 12% were Black or African American; 5% Hispanic; 7% Asian or Pacific Islander; and 2% American Indian or Alaskan Native. 49% of respondents rated religion as not at all important or not very important; 18% as moderately important, and 33% as important or extremely important.

Our sample is more male and more highly educated than the US as a whole, and probably also slightly less religious and less Republican, although different ways of eliciting this information make comparisons difficult. In order to check the robustness of our results, we conducted the correlation and regression analyses described below on several split samples: only female respondents; only Republicans; only respondents with less formal education than a bachelor's degree; only respondents in whose life religion plays an important role. All results are qualitatively the same as reported below.

4.1.2. Measures

Epistemic Vice Scale. To study potential epistemically vicious tendencies of respondents, we administered the Epistemic Vice Scale (EVS), as described in section 2. Items were administered in random order. Participants were asked to respond to the items on a five-point, fully anchored Likert scale (1 = "strongly disagree"; 2 = "somewhat disagree"; 3 = "neither agree nor disagree"; 4 = "somewhat agree"; 5 = "strongly agree"). The indifference score is calculated as the mean of items 1–4; the rigidity score as a mean of items 5–10. The scale has been rigorously validated and has good psychometric properties. Structural equation modeling meets Hu and Bentler's (2009) standards of fit ($\chi^2(34) = 150$, CFI = 0.98, RMSEA = 0.06, SRMR = 0.03). Cronbach's Alpha is 0.90 for the whole scale, 0.90 for the Indifference subscale, and 0.83 for the Rigidity subscale, which suggests good fit.

COVID-19 misinformation. To study the propensity of respondents to endorse COVID-19 related misinformation, we administered the 12-item measure of COVID-19-related misinformation, as described in the previous section. Items were administered in random order. Participants were asked to respond on a fully anchored five-point Likert scale (1 = "Definitely false"; 2 = "Probably false"; 3 = "Don't know"; 4 = "Probably true"; 5 = "Definitely true"). We randomly inserted two control items with claims about COVID-19 that were commonly known to be true, at the moment of conducting the survey, as described above. The high endorsement scores of 90% for the item "Some people infected with coronavirus experience no symptoms" and 91% for "Older people are more likely to die due to an infection with COVID-19" suggest that responses are of high quality. The COVID-19 misinformation score is calculated as the mean of the responses to the first ten items (the "myths"). "Don't know" responses were excluded from the analysis on a per-item basis, so if a respondent replied "Don't know" on one or more items, the COVID-19 misinformation score was the mean of the responses to the remaining items.

Demographic information and other scales. In order to evaluate to what extent epistemic vice explains variation in the tendency to endorse misinformation, we elicited demographic information and other relevant psychological constructs.

We elicited demographic information about age, educational attainment, income, gender, ethnicity, religiosity, and marital status. In addition, we measured political partisanship by asking participants whether respondents "consider themselves a Republican, a Democrat, an Independent, or what?" Responses were "Strong Democrat," "Moderate Democrat," "Lean Democrat," "Lean Republican," "Moderate Republican," "Strong Republican," "Independent," "Other," and "Prefer not to say." We replaced "Independent" with missing rather than placing Independents in-between Republican and Democratic responses. For robustness we also ran analyses with dummies for Democrats, Republicans, and Independents respectively, which did not affect our results.

We elicited related psychological constructs by administering nine scales. First, we measured all dimensions of the Big Six personality model using the 24-item QB6, measuring Honesty, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience (Thalmayer and Saucier 2014). Second, we administered a seven-item version of the Cognitive Reflection Test, measuring the tendency to override an incorrect "gut" response and engage in further reflection to find a correct answer (Sirota and Juanchich 2018). Third, we administered Rosenberg's 10-item self-esteem scale, measuring feelings of self-worth (Rosenberg 1965). Fourth, we administered a 15-item scale of need for closure, measuring aversion toward ambiguity (Roets and Van Hiel 2011). Fifth, we administered an 18-item scale of need for cognition, measuring tendency to engage in and enjoy activities that require thinking (Cacioppo *et al.* 1984). Sixth, we administered a 15-item scale of faith in intuition, measuring the tendency to rely on intuitive information processing (Alós-Ferrer and Hügelschäfer 2012). Seventh, we administered the general version of a 6-item scale of open-minded cognition, measuring willingness to consider a variety of intellectual perspectives (Price *et al.* 2015). Eighth, we administered a 20-item dogmatism scale, measuring the tendency to consider views as undeniably true (Altemeyer 2002). Ninth and finally, we administered a 6-item scale of trust in experts, measuring the tendency to trust experts over lay people, adapted from Imhoff *et al.* (2018).

Hypotheses. Before conducting the study, we recorded our hypotheses in the process of pre-registration. We expected EVS and its subscales to be (1) strongly positively correlated with endorsement of COVID-19 misinformation; (2) positively correlated with the scales measuring faith in intuition, dogmatism, and need for closure; and (3) negatively correlated with all other scales: personality, cognitive reflection, self-esteem, need for cognition, open-minded cognition, and trust in experts. In addition, we expected (4) religiosity to be positively correlated with endorsement of COVID-19 misinformation; and (5) Republican political identity to be positively correlated with endorsement of COVID-19 misinformation. Our most important hypothesis was, however, this:

> Epistemic vice explains susceptibility to COVID-19 misinformation, over and above the demographic information and the other psychological scales.

The type of explanation we are after is operationalized by accounting for variance in individual differences in COVID-19 misinformation using regression models. Note that this notion of explanation falls short of, but is consistent with, establishing causation. Given the observational data we have collected, we can only establish association between variables.

Table 3. Accuracy of classification based on EVS score.

	COVID-19 misinformation score			
EVS score	Low (0–1)	Medium (2–5)	High (5–10)	Observations
Low ($\leq$ 3)	89%	9%	2%	751
Medium (> 3, $\leq$ 4)	27%	43%	30%	169
High (> 4)	5%	15%	80%	78

4.2. Analysis and results

The analysis proceeded in three steps. First, in order to test whether more epistemically vicious respondents are more likely to endorse COVID-19 misinformation, we analyzed the relationship between their scores on the Epistemic Vice Scale, as well as on the rigidity and indifference subscales, and the COVID-19 misinformation score. Second, to put the strength of the associations between epistemic vice and misinformation in context, we analyzed correlations of misinformation with epistemic vice, demographic variables, and other psychological scales. Third, to understand whether epistemic vice explains variance in endorsement of COVID-19 misinformation over and above that explained by demographic variables and other psychological measures, we conducted a hierarchical regression.

4.2.1. Epistemic vice and COVID-19 misinformation

Table 3 gives an overview of how well the EVS score works as a predictor of susceptibility to COVID-19 misinformation. Respondents are classified according to their mean EVS score and their COVID-19 misinformation score. 751 respondents had an EVS score of 3 or less. We categorized these respondents in the low epistemic vice group, as they strongly disagreed, disagreed, or responded "neither agree nor disagree" on average across the ten EVS items. 89% of respondents in this group have a low COVID-19 misinformation score, indicating that they endorsed at most one of the coronavirus myths. Just 11% of respondents in this group had higher misinformation scores, with the overwhelming majority in the "medium" group, endorsing 2–5 COVID-19 myths.

169 respondents fell into the medium epistemic vice category, defined by an EVS score between 3 ("neither agree or disagree") and 4 ("somewhat agree"). 43% of respondents in this group fell into the medium category on COVID-19 misinformation, 30% into the high category endorsing 5–10 COVID-19 myths. 27% of respondents had low susceptibility to COVID-19 misinformation despite their medium EVS score.

78 respondents had an EVS score greater than 4. 80% or respondents in this group were highly susceptible to COVID-19 misinformation. That leaves just 20% with lower misinformation scores, which the overwhelming majority in the medium, rather than the low, category.

Figure 1 illustrates the strength of the relationship between epistemic vice and susceptibility to COVID-19 misinformation. The position of the tiles on the heatmap is determined by the indifference score (*y*-axis) and the rigidity score (*x*-axis). For instance, tiles representing respondents scoring high on indifference and rigidity are situated in the top-right quadrant. The shade of each tile is determined by the average COVID-19 misinformation score for respondents with the respective scores. Darker shade means that respondents endorsed misinformation items on average as true. Lighter shade means that respondents rejected misinformation items on average.
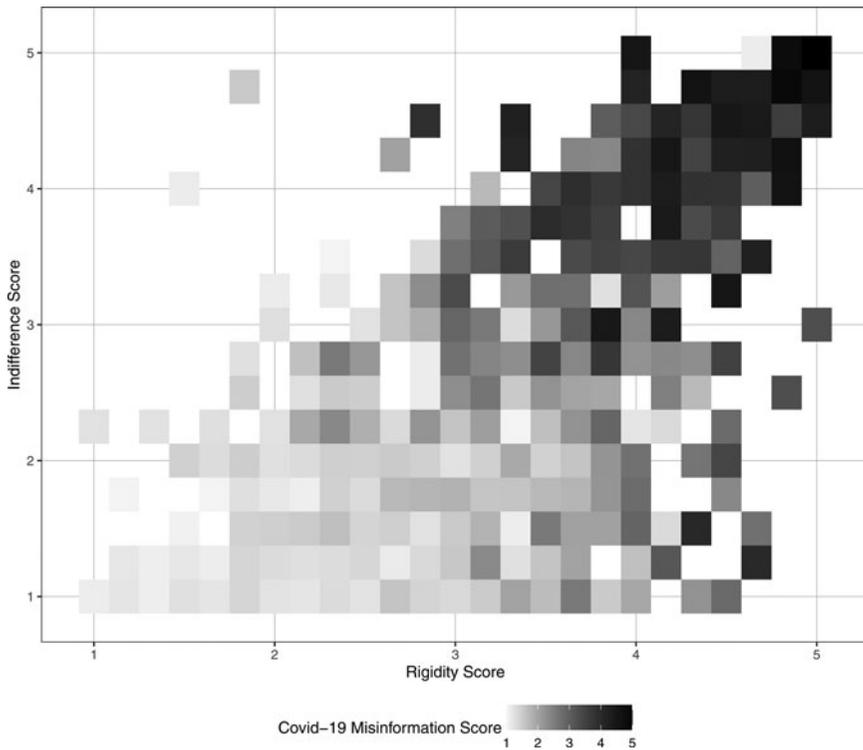
Figure 1. Heatmap of COVID-19 misinformation score in relation to the Indifference and Rigidity dimensions of the Epistemic Vice Scale, based on 998 observations. Higher indifference and rigidity scores are both associated with a higher misinformation score.

The top-right quadrant of the graph represents 184 individuals whose indifference and rigidity scores are both greater than or equal to 3. This part of the graph is overwhelmingly darker, indicating that high scores on both dimensions of epistemic vice are associated with endorsement of misinformation (mean COVID-19 misinformation score = 3.48, SD = 1.1). By contrast, the lower-left quadrant of the graph is overwhelmingly lighter (536 observations), indicating rejection of misinformation (mean COVID-19 misinformation score = 1.31, SD = 0.4). To determine whether the difference is significant, we performed a two-sided, two-sample Welch's t-test, testing against the alternative hypothesis that the true mean COVID-19 misinformation score by respondents in the lower-left quadrant is not different from the true mean COVID-19 misinformation score in the top-right quadrant. The result strongly suggests to reject the alternative hypothesis, indicating that the COVID-19 misinformation mean for responses in the bottom-left quarter is indeed lower than for responses in the top-right quarter ($t(196) = -26.0$, $p < 0.0001$, Welch-Satterthwaite).

Respondents represented in the bottom-right quadrant of the graph are motivated to gain knowledge but are also rigid in their thinking (264 observations). They have on average lower COVID-19 misinformation scores than in the top-right quadrant, but higher scores than respondents in the bottom-left quadrant (mean COVID-19 misinformation score = 1.94, SD = .9). Differences between the COVID-19 misinformation scores of respondents in the bottom-right quadrant to misinformation scores both of respondents in the top-right quadrant and in the bottom-left quadrant are highly

Table 4. Epistemic vice scores by COVID-19 misinformation score.

COVID-19 misinformation score	Observations (%)	EVS score (SD)	Rigidity score (SD)	Indifference score (SD)
Low (0–1)	714 (71%)	2.11 (0.62)	2.47 (0.73)	1.57 (0.68)
Medium (2–5)	153 (16%)	3.07 (0.68)	3.46 (0.69)	2.48 (1.01)
High (5–10)	131 (13%)	3.87 (0.66)	4.06 (0.57)	3.59 (1.06)

significant ($t(335) = -15.6$, $p < 0.0001$, and $t(311) = -10.7$, $p < 0.0001$, respectively). We speculate that respondents in the bottom-right quadrant might be particularly open to interventions to address rigidity in their thinking, because they are already properly motivated.

The top-left quadrant of the graph has few observations (18). This indicates that few respondents indicated that they were indifferent to knowledge yet were not rigid in their thinking.

Table 4 summarizes the epistemic vice scores of respondents "at risk" of endorsing COVID-19 misinformation, compared with respondents with a low susceptibility to COVID-19 misinformation. 71% of respondents showed low susceptibility to misinformation. That leaves 29% of respondents in our sample susceptible, almost half of whom are highly susceptible.

EVS scores as well as scores for the indifference and rigidity subscales increase with rising susceptibility. Two-sided Welch's t-tests for each of the differences suggest that each is highly statistically significant ($p < 0.0001$).

On the EVS as well as rigidity subscale, medium or highly susceptible respondents scored above 3 on average. Mean indifference scores were somewhat lower across the board, indicating that people are more reluctant to describe themselves as indifferent than as rigid.

Correlation analysis. Figure 2 shows correlation coefficients between the COVID-19 misinformation score (column 1) and all other measures (rows). The correlations between the EVS and COVID-19 misinformation is strongest, at 0.76 (all correlations are pairwise Pearson correlations). Correlations of misinformation with the two subscales are similarly strong: 0.72 for indifference and 0.68 for rigidity. These high correlations hold as well on subsamples that we selected to test the robustness of our results (see the "Data" subsection above on the representativeness of our sample for the US population). On these subsamples, we find: among female respondents, the correlation between the EVS and COVID-19 misinformation is 0.75 ($n = 371$); among republicans it is 0.75 ($n = 343$); on the subsample containing only respondents with less formal education than a bachelor's degree it is 0.48 ($n = 288$); among respondents in whose life religion plays an important role it is 0.76 ($n = 505$). The further results reported below are qualitatively the same for the split samples.

Measures for competing explanations such as political affiliation and the Cognitive Reflection Test are less strongly associated with COVID-19 misinformation. The measure with the next-highest correlation, dogmatism, shows a substantially lower correlation with COVID-19 misinformation than epistemic vice. The correlation of political affiliation with COVID-19 misinformation is less than a third of the correlation between epistemic vice and COVID-19 misinformation (note that in our measure of political affiliations, higher values indicate greater identification with Republican positions).
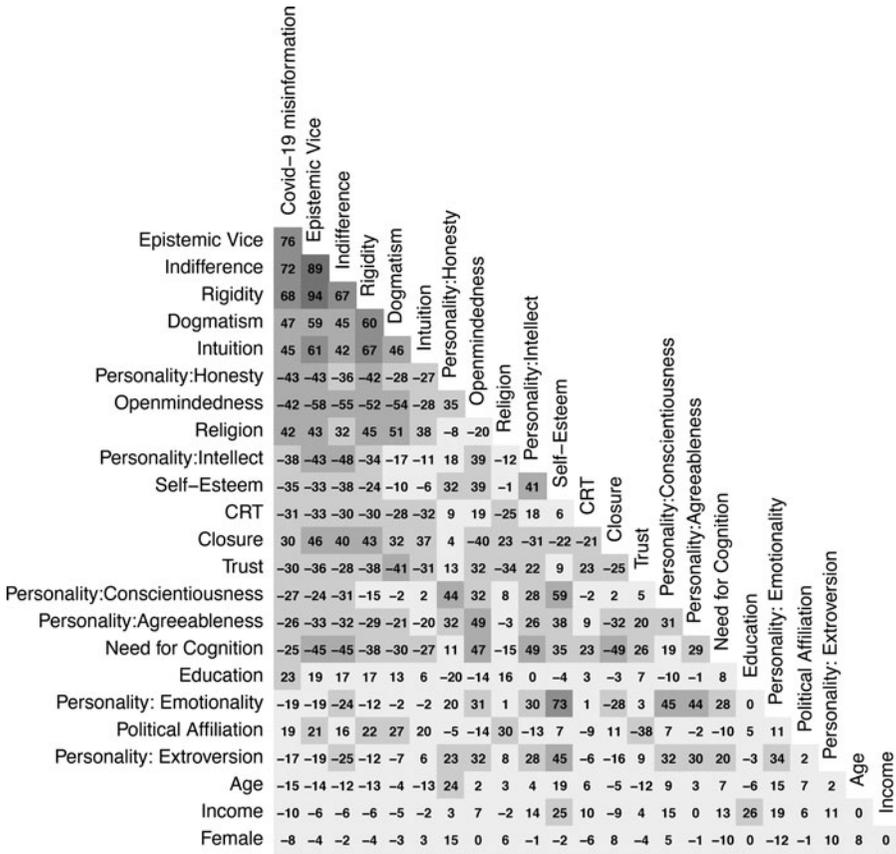
Figure 2. correlation matrix:

	Covid–19 misinformation	Epistemic Vice	Indifference	Rigidity	Dogmatism	Intuition	Personality:Honesty	Openmindedness	Religion	Personality:Intellect	Self–Esteem	CRT	Closure	Trust	Personality:Conscientiousness	Personality:Agreeableness	Need for Cognition	Education	Personality: Emotionality	Political Affiliation	Personality: Extroversion	Age	Income
Epistemic Vice	76																						
Indifference	72	89																					
Rigidity	68	94	67																				
Dogmatism	47	59	45	60																			
Intuition	45	61	42	67	46																		
Personality:Honesty	−43	−43	−36	−42	−28	−27																	
Openmindedness	−42	−58	−55	−52	−54	−28	35																
Religion	42	43	32	45	51	38	−8	−20															
Personality:Intellect	−38	−43	−48	−34	−17	−11	18	39	−12														
Self–Esteem	−35	−33	−38	−24	−10	−6	32	39	−1	41													
CRT	−31	−33	−30	−30	−28	−32	9	19	−25	18	6												
Closure	30	46	40	43	32	37	4	−40	23	−31	−22	−21											
Trust	−30	−36	−28	−38	−41	−31	13	32	−34	22	9	23	−25										
Personality:Conscientiousness	−27	−24	−31	−15	−2	2	44	32	8	28	59	−2	2	5									
Personality:Agreeableness	−26	−33	−32	−29	−21	−20	32	49	−3	26	38	9	−32	20	31								
Need for Cognition	−25	−45	−45	−38	−30	−27	11	47	−15	49	35	23	−49	26	19	29							
Education	23	19	17	17	13	6	−20	−14	16	0	−4	3	−3	7	−10	−1	8						
Personality: Emotionality	−19	−19	−24	−12	−2	−2	20	31	1	30	73	1	−28	3	45	44	28	0					
Political Affiliation	19	21	16	22	27	20	−5	−14	30	−13	7	−9	11	−38	7	−2	−10	5	11				
Personality: Extroversion	−17	−19	−25	−12	−7	6	23	32	8	28	45	−6	−16	9	32	30	20	−3	34	2			
Age	−15	−14	−12	−13	−4	−13	24	2	3	4	19	6	−5	−12	9	3	7	−6	15	7	2		
Income	−10	−6	−6	−6	−5	−2	3	7	−2	14	25	10	−9	4	15	0	13	26	19	6	11	0	
Female	−8	−4	−2	−4	−3	3	15	0	6	−1	−2	−6	8	−4	5	−1	−10	0	−12	−1	10	8	0

Figure 2. The table shows correlations between covariates in percentages (pairwise Pearson correlations). The shade captures the size of the correlation.

We conceptually replicate the findings of Stanley *et al.* (2020) and Pennycook *et al.* (2020) that the Cognitive Reflection Test predicts acceptance of COVID-19 misinformation (their outcome variable was measured slightly differently, but the headline result is the same). Yet the absolute value of the correlation coefficient of cognitive reflection with COVID-19 misinformation (−0.39) in our study is only about half of the correlation coefficient of epistemic vice with COVID-19 misinformation (0.76). This gives epistemic vice a fairly strong lead over alternative measures.

The associations between the EVS subscales and other measures all have the expected sign, with the exception of education. We expected that higher levels of formal education are associated with lower readiness to endorse fake news, but the opposite turns out to be the case. We do not think we are in a position to account for this finding.

None of the correlations between the epistemic vice subscales and other measures is so high as to suggest that the EVS is tapping into a construct for which a measure already exists. Moreover, the correlation of epistemic vice with COVID-19 misinformation is stronger than the association of any of the other measures with either of the epistemic vice subscales. The closest correlates of epistemic vice are dogmatism, faith in

Table 5. Results of hierarchical regression analysis.

Measures	R^2 without EVS	R^2 with EVS	ΔR^2
All demographic variables*	0.37	0.63	0.26
Dogmatism	0.22	0.59	0.37
Faith in intuition	0.21	0.59	0.38
All six personality traits	0.29	0.60	0.31
Importance of religion	0.17	0.60	0.43
Open-mindedness	0.18	0.59	0.41
Cognitive reflection	0.15	0.59	0.44
Self-esteem	0.12	0.59	0.47
Need for closure	0.09	0.59	0.50
Trust in experts	0.09	0.59	0.50
Need for cognition	0.06	0.60	0.54
Political affiliation	0.09	0.60	0.51
All of the above	0.58	0.67	0.09

*Included demographic variables: education, political affiliation, importance of religion, age, gender, income, marital status, ethnicity.

intuition, and open-mindedness, each with coefficient absolute values above 0.5. Yet none of these measures is as closely associated with COVID-19 misinformation as epistemic vice is. This lends support to the vice epistemological supposition that epistemic vice is a distinct theoretical and empirical construct.

Regression analysis. The results so far indicate that epistemic vice is more strongly associated with COVID-19 misinformation than other measures, and that epistemic vice is a distinct construct from all of the other measures considered. Yet our central hypothesis remains to be tested. Does the EVS predict endorsement of COVID-19 misinformation above and beyond what already established measures can predict? So far, while we have found that the EVS correlates more strongly than other *individual* measures with COVID-19 misinformation, we have not yet shown that the force of the EVS is also more than that obtained by using a *combination* of other measures.

To study this, we performed a hierarchical regression with the COVID-19 misinformation score as dependent variable. We tested how much variance of the COVID-19 misinformation scores the Indifference and Rigidity subscales predicted above and beyond other measures for individuals and combined. Table 5 summarizes the results. Each row compares two ordinary least squares regression models with the COVID-19 misinformation score as dependent variable. The first model includes the measure(s) listed in the "Measures" column. The second model includes additionally the indifference and rigidity scores of the Epistemic Vice Scale. The columns "R^2 without EVS" and "R^2 with EVS" show the explained variance of the respective models; the column "ΔR^2" is the difference between these two figures. Positive values for ΔR^2 indicate that the model with the epistemic vice subscales predicts more variance as measured by R^2 than the corresponding model without the epistemic vice scores.[11] The difference

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[11]R^2 is a statistical measure that represents the proportion of the variance for a variable (in our case the COVID-19 misinformation score) that is explained by the variables included in the regression model. It ranges between 0 (no variance explained) and 1 (all variance explained).

that adding the epistemic vice subscales makes is substantial. For each individual measure, adding epistemic vice to the regression at least doubles the variance explained, increasing R^2 in every case to above 0.5.

In particular, we find that epistemic vice explains additional variance of 0.09 even when we *combine* all other measures, that is, include *all* other measures in the regression. Table 6 in the Appendix provides the detailed results of this final hierarchical regression. Both models are ordinary least square regressions with the COVID-19 misinformation score as dependent variable. All continuous predictors as well as the dependent variable are mean-centered and scaled by one standard deviation. The two epistemic vice subscales have the largest coefficients (0.39 for indifference and 0.19 for rigidity) and are significant at the 1% level. This result strongly supports our hypothesis that the EVS explains additional variance with regard to COVID-19 misinformation, over and above the demographic information and the other psychological scales, also when these scales are all combined.

5. Conclusion

This paper demonstrates that a compact and easily administered self-report questionnaire (the Epistemic Vice Scale, EVS) greatly outperforms existing measures, including the Cognitive Reflection Test, in predicting susceptibility to COVID-19 misinformation.

We have argued that proponents of different views on the nature of epistemic vice can all accept the EVS as a measure of epistemic vice. Hence the study result provides evidence for the claim that epistemic vice obstructs knowledge, regardless of which of these contending definitions will prevail.

People who accept COVID-19 misinformation may be more likely to put themselves and others at risk, to strain already overburdened medical systems and infrastructures, and to spread misinformation to others. Of particular concern is the prospect that a vaccine for the novel coronavirus will be rejected by a sizeable proportion of the population because they have been taken in by misinformation about the safety or effectiveness of the vaccine. Conspiracy theories about possible treatments have already spread online and even led to protests calling for the arrest of Bill Gates, whose foundation is funding research into potential vaccines.[12] Sullivan *et al.* (2020) have found that anti-vaccine accounts on Twitter have both greater reach and greater receptivity than pro-vaccine accounts, which should make public health officials and policymakers alert to the possibility that, even if a vaccine for the novel coronavirus is found, widespread immunity may remain out of reach due to vaccine hesitancy and resistance.

We believe that the results reported in this paper show that policymakers may benefit from paying attention to the role epistemic vice plays in the uptake of information and misinformation. Policy might be developed to help people overcome vice, and we believe that emerging research may be useful here. Pennycook *et al.* (2020), for instance, found that simply nudging people to think about accuracy led to their accepting and sharing less misinformation about COVID-19, so it may be possible to contain the spread of misinformation with relatively anodyne interventions rather than, for instance, censorship. More ambitiously, we might hope to develop interventions that help people overcome their epistemic rigidity or indifference. Whether such interventions would need to be longitudinal and embedded in elementary and higher education,

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[12] https://www.theguardian.com/media/2020/may/12/vaccines-5g-bill-gates-why-are-australians-gathering-to-spread-coronavirus-conspiracy-theories (accessed June 24, 2020).

or could be one-off training sessions for adults, remains to be seen. Future research should investigate the extent to which epistemic vice can be prevented or overcome.[13]

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/epi.2021.18

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Appendix

Table 6. Detailed regression results with the corona misinformation score as dependent variable, comparing the full model without epistemic vice (Model 1) to the full model including epistemic vice (Model 2). Numbers in parentheses are standard errors. All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

	Model 1	Model 2
Epistemic vice: Indifference		0.39***
		(0.03)
Epistemic vice: Rigidity		0.19***
		(0.04)
Education	0.11***	0.08***
	(0.02)	(0.02)
Religion	0.12***	0.08***
	(0.03)	(0.02)
Age	−0.07**	−0.05*
	(0.03)	(0.02)
Female	−0.14**	−0.10*
	(0.05)	(0.04)
Income	−0.08**	−0.08***
	(0.03)	(0.02)
Political Affiliation		
Strong Democrat (Dummy)	0.27	0.10
	(0.17)	(0.15)
Modertate Democrat (Dummy)	0.16	0.00
	(0.17)	(0.15)
Lean Democrat (Dummy)	0.13	−0.02
	(0.17)	(0.15)
Independent (Dummy)	0.13	0.00
	(0.17)	(0.15)
Lean Republican (Dummy)	0.16	0.03
	(0.18)	(0.15)
Moderate Republican (Dummy)	0.11	0.00
	(0.17)	(0.15)
Strong Republican (Dummy)	0.38*	0.14
	(0.17)	(0.15)
Marital Status		
Married (Dummy)	0.50*	0.35
	(0.24)	(0.21)

(Continued)

Table 6. (*Continued.*)

	Model 1	Model 2
Widowed (Dummy)	0.46	0.36
	(0.29)	(0.26)
Divorced (Dummy)	0.28	0.15
	(0.26)	(0.23)
Separated (Dummy)	0.50	0.43
	(0.29)	(0.25)
Never Married (Dummy)	0.15	0.12
	(0.24)	(0.21)
Ethnicity		
American Indian or Alaskan Native (Dummy)	0.33	−0.04
	(0.24)	(0.22)
Asian or Pacific Islander (Dummy)	0.06	−0.06
	(0.19)	(0.17)
Black or African American (Dummy)	0.20	0.09
	(0.18)	(0.16)
Hispanic (Dummy)	0.09	−0.01
	(0.20)	(0.17)
White/Caucasian (Dummy)	−0.05	−0.08
	(0.17)	(0.15)
Personality		
Honesty	−0.16***	−0.09***
	(0.03)	(0.03)
Agreeableness	−0.01	−0.02
	(0.03)	(0.02)
Emotionality	0.10**	0.05
	(0.03)	(0.03)
Extroversion	−0.01	0.01
	(0.03)	(0.02)
Conscientiousness	−0.08**	−0.03
	(0.03)	(0.03)
Intellect	−0.15***	−0.06**
	(0.03)	(0.02)
Need for cognition	0.11***	0.15***
	(0.03)	(0.03)

(*Continued*)

Table 6. (*Continued.*)

	Model 1	Model 2
Self-esteem	−0.20***	−0.14***
	(0.04)	(0.03)
Cognitive reflection	−0.12***	−0.07**
	(0.02)	(0.02)
Need for closure	0.09**	0.02
	(0.03)	(0.03)
Faith in intuition	0.12***	0.02
	(0.03)	(0.03)
Open-mindedness	−0.04	0.06*
	(0.03)	(0.03)
Dogmatism	0.08**	0.03
	(0.03)	(0.03)
Trust in experts	−0.04	−0.04
	(0.03)	(0.02)
Constant	−0.51	−0.20
	(0.33)	(0.29)
Observations	973	973
R2	0.58	0.67
ΔR2		0.09