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Conspiracy beliefs in the context of a comprehensive rationality assessment

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ABSTRACT

The recent intense interest in conspiratorial thinking is fuelled by the perception that belief in conspiracies is highly irrational. However, there have been few studies that have examined the associations of conspiracy belief with a comprehensive battery of rational thinking tasks that tap both epistemic and instrumental rationality. The Comprehensive Assessment of Rational Thinking (CART) provides an opportunity to do just that because one of the subtests on the CART assesses the tendency to believe false conspiracies. That subtest is in the part of the CART that measures the presence of contaminated mindware—stored declarative knowledge that embodies poorly justified beliefs. Converging analyses ($N=747$) using the 18 subtests and four thinking dispositions measured on the CART indicated that three variables were key predictors of conspiratorial thinking: superstitious thinking, actively open-minded thinking, and probabilistic reasoning. Theoretical consideration of these best predictors, and of the variables that predict the endorsement of *true* conspiracies, led us to rethink the classification of conspiracy belief as contaminated mindware and move instead towards a conception of conspiratorial thinking as a cognitive style.

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KEYWORDS Conspiracy beliefs; rationality; contaminated mindware; actively open-minded thinking

Introduction

A rapidly growing body of research has linked the tendency towards conspiratorial thinking to various personality dimensions (Bowes et al., 2021, 2023; Stasielowicz, 2022), thinking dispositions (Bowes et al., 2023), and intelligence (Bowes et al., 2023; Ståhl & van Prooijen, 2018). Nevertheless, the recent intense interest in conspiratorial thinking, among

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scientists and the public alike, largely comes about because people perceive (rightly or wrongly, see Basham, 2012; Dentith, 2019, 2023; Poth & Dolega, 2023) belief in conspiracies to be irrational. How then, does conspiratorial thinking relate to measures of rationality? Studies have examined isolated components of rationality, such as the tendency to commit conjunction errors in probability assessment (Brotherton & French, 2014; Dagnall et al., 2017; Enders & Smallpage, 2019). However, no extant studies have examined conspiracy belief in the context of a comprehensive assessment of the many components of rational thinking. Our work on the development of the Comprehensive Assessment of Rational Thinking (CART; Stanovich et al., 2016) provides an opportunity to do so.

The CART contains 20 subtests and four supplemental thinking dispositions scales. Across the subtests, both instrumental rationality (the rationality of decision and action) and epistemic rationality (the rationality of belief and knowledge calibration) are assessed. The CART contains subtests that stress the *process* of rationality (e.g., avoiding miserly processing) but also contains subtests that tap knowledge (e.g., probabilistic numeracy and financial literacy)—the so-called mindware of rationality (Pinker, 2021; Stanovich et al., 2016).

In the category of mindware, the CART differentiates mindware that facilitates rational thinking from mindware that actually impedes rational thinking (Stanovich, 2004, 2009, 2011). In the CART, the declarative knowledge bases that represent irrational rather than rational thinking are termed *contaminated mindware*. One of the CART subtests tapping contaminated mindware assesses the tendency to endorse specific conspiracy beliefs that are known to be false. Thus, in the CART, conspiracy belief is *part* of the rationality assessment. In the present paper, we employ conspiratorial thinking as a *criterion* variable—looking at which components of rational thinking predict variation in the extent of conspiracy belief.

Two main methods have been used to measure conspiracy beliefs (Imhoff et al., 2022; Swami et al., 2017; see also Wood, 2017). One is to measure conspiracy belief in generic terms without mentioning a specific conspiracy, as is done in the much-used Conspiracy Mentality Questionnaire (CMQ; Bruder et al., 2013); American Conspiracy Thinking Scale (ACTS; Uscinski & Parent, 2014; Uscinski et al., 2022); and Generic Conspiracist Beliefs scale (GCB; Brotherton et al., 2013). The other method is to measure belief in a sample of conspiracies known to be false and aggregate the responses across numerous such conspiracies (Swami et al., 2017). The CART employs the latter method.

These two different methods (generic conspiracy beliefs *vs.* specific false conspiracy beliefs) operationalise conspiratorial thinking differently. The first defines a general thinking disposition not necessarily tied to false beliefs and one that is not necessarily irrational. The second operationalises a concept that is tied to unjustified beliefs that are likely to be irrational. The two different concepts that are operationalised by these different

methods seem to follow from two different ways that conspiracy belief has been defined in the literature. The first type of definition—more consistent with generic measures of conspiracy belief—is more neutral (e.g., "a set of beliefs that are used to explain how a group of individuals is covertly seeking to influence or cause certain events", p. 168, Leman & Cinnirella, 2013) in that it does not load the definition of conspiracy belief with extraneous components that tie the concept to irrational thinking. It allows that some conspiracy beliefs may be justified and that some nonzero degree of conspiratorial thinking may well be adaptive. In contrast, the second type of definition adds to the basic notion of undetected actors features that are more strongly associated with conspiracy beliefs that are unjustified (that the actors be powerful; that the belief be epistemically risky; that the conspiracy belief contradict received views of events; that the concealment be conscious, etc.).

The Conspiracy Beliefs subtest of the CART reflects the second class of definition because it focuses on specific conspiracy beliefs known to be false. This emphasis reflects the fact that the subtest was conceived in an era (2008–2014) when the field was dominated by what some have pointed out was an "I know it when I see it" attitude when it came to defining the phenomenon of interest (Bost, 2019; Hagen, 2018; Uscinski & Enders, 2023). During this period, researchers tended to assemble their scales by presenting subjects with examples of some of the most outlandish conspiracy beliefs they could think of (e.g., "the Apollo moon landings were faked") because it was just assumed from the outset that conspiratorial thinking reflected irrational thinking. Although seemingly following the field in its "I know it when I see it" attitude, the construction of the Conspiracy Beliefs subtest of the CART does signal some awareness of generic dispositional views of conspiracy belief because our subtest did contain filler items (that is, cases of conspiracies that actually occurred). This aspect of the subtest reflects some awareness of the two different definitions of conspiracy belief, but in the construction of our subtest we did not follow through on the insight because we did not actually score the filler items in the original CART. In the present study, we score them in two different ways. First, we specifically examine the similarities and differences between the correlates of conspiracy beliefs that are false and those that are true. Additionally, we examine the correlates of the ability to discriminate between these two types of conspiracy beliefs.

The predictors of conspiracy beliefs in our study were the other subtests in the CART (which assess aspects of rationality as varied as probabilistic reasoning, knowledge calibration, temporal discounting, miserly processing, scientific reasoning, and many others) as well as the four thinking dispositions assessed as supplementary measures (actively open-minded thinking; deliberative thinking; future orientation; and the differentiation of emotions). Additional predictors included measures of cognitive ability, political ideology, and religiosity.

Methods

Participants

The study involved two groups of participants, one run in a laboratory at James Madison University (hereafter termed the Lab sample) and the other run using the Amazon Mechanical Turk (hereafter termed the Turk sample). The 350 subjects in the Lab sample (109 males and 241 females) were paid $60 for their participation over two sessions (separated by two days), and the 397 subjects in the Turk sample (231 males and 166 females) were paid $50 for their participation in a single session. The mean age of the sample was 26.6 years (20.1 in the Lab sample and 32.4 in the Turk sample). The Lab sample was 76.6% white (14.9% Black and Hispanic) and the Turk sample was 74.3% white (16.6% Black and Hispanic). The demographics questionnaire filled out by each subject contained one-item measures of political ideology and religious belief. Ideology was measured on a six-point scale ranging from very conservative (scored 1) to very liberal (scored 6). Religious belief was assessed by asking the subject to respond to the prompt "My feelings concerning the existence of God are" with a multiple-choice response ranging from "I am certain that God does not exist" (scored as 1) to "I am certain that God exists" (scored as 7).

Tasks

Comprehensive Assessment of Rational Thinking (CART)

The conspiracy beliefs subtest of the CART. The CART, as published, was composed of 20 subtests and four thinking disposition scales (Stanovich et al., 2016). One of the 20 main subtests was the Conspiracy Beliefs subtest. There are twenty-four false belief items on the Conspiracy Beliefs subtest of the CART (see the Supplementary Materials for the wording of each conspiracy and for the mean response on each item). In the construction of the subtest, we drew on a large number of conspiracies that have been studied in the literature (Goertzel, 1994; Lewandowsky et al., 2013; Oliver & Wood, 2014), and added a few new ones of our own. Our subtest covered a wide range of conspiratorial beliefs, such as those involving the assassination of President John F. Kennedy, the 9/11 attacks, fluoridation, the moon landing, pharmaceutical industry plots, the spread of AIDS, oil industry plots, and Federal Reserve conspiracies. Five filler items (true conspiracies) were included that actually did involve collusion on the part of corporations and government ("U.S. tobacco companies conspired to hide evidence that smoking tobacco was addictive").

The items on the Conspiracy Beliefs subtest were all presented together. The response scale was a six point scale with no neutral point that was

scored as follows: strongly disagree (1), disagree moderately (2), disagree slightly (3), agree slightly (4), agree moderately (5), agree strongly (6). The mean total score on the 24 false conspiracy items was 62.4 ($SD = 22.2$). This represents an average score of 2.60 on each of the individual conspiracies, which is a response scale location between disagree moderately and disagree slightly. The reliability of the total score on the 24 conspiracy items was high (Cronbach's alpha = 0.94). Exploratory factor analysis of the Conspiracy Beliefs subtest revealed a dominant factor with an eigenvalue of 9.85 that explained 83.9% of the variance. The second factor displayed an eigenvalue (1.17) not very far over the >1 criterion. The mean total score on the 5 filler (true belief) items was 20.6 ($SD = 4.9$). This represents an average score of 4.12 on each of the individual conspiracies, which is a response scale location slightly above slightly agree.

The remaining subtests of the CART. Table 1 lists the remaining subtests on the CART, minus one subtest, on anti-science beliefs, which we now believe does not validly measure its construct.[1] The reasons for dropping this subtest are discussed in Stanovich (2023). Also listed in Table 1 are the four thinking dispositions scales used in the CART as supplementary measures. A copy of the CART including all of its items is available at this link: https://osf.io/4v6ud/. The history of each subtest and additional details are described in Stanovich et al. (2016). The three subtests and scales that proved to be potent predictors of false conspiracy beliefs in this study (the Superstitious Thinking subtest, Probabilistic Reasoning subtest, and Actively Open-Minded thinking disposition scale) are presented in full in the Supplementary Materials.

Cognitive ability measures

Three measures of cognitive ability were completed by all subjects: a 19-item analogy task, a 30-item antonym task, and a 60-item vocabulary checklist task. All three load heavily on verbal cognitive ability. The analogy task examined the ability to understand the underlying conceptual relationship between a pair of related words and to identify another pair of words that best reflected a parallel relationship (example: ESSAY: NONFICTION: : (A) journalism: investigation; *(B) sonnet: poetry; (C) word: definition; (D) novel: plot; (E) dramatist: play). The 19 items on the analogy task were previously used items from SAT Examinations before March 2002. The antonym task examined the ability to select a word or short phrase with the opposite meaning to a target word [e.g., LOQUACIOUS (A) tranquil (B) sceptical (C) morose *(D) taciturn (E) witty]. The 30 items in the antonym task were previously used items from Graduate Record Examinations

[1] Although our anti-science subtest was nowhere near as biased as previous scales of this type, we now believe that the scope for bias on such measures is just too large (see Stanovich, 2021, 2023).

Table 1. Correlations between performance on the conspiracy belief subtest and the other subtests on the CART, thinking dispositions on the CART, and other predictors.

	Conspiracy belief subtest
General predictors	
Cognitive ability composite	−0.343
Political ideology	−0.124
Religious belief	.259
CART subtests	
Probabilistic reasoning subtest	−0.370
Scientific reasoning subtest	−0.313
Reflection *vs.* intuition subtest	−.258
Syllogistic reasoning subtest	−0.240
Ratio bias subtest	−0.193
Disjunctive reasoning subtest	−0.131
Framing subtest	−0.153
Anchoring subtest	−.181
Preference anomalies subtest	−0.164
Argument evaluation subtest	−0.230
Knowledge calibration, part 1	−0.257
Knowledge calibration, part 2	−0.135
Temporal discounting, part 1	−0.142
Temporal discounting, part 2	−0.060
Temporal discounting, part 3	−0.063
Probabilistic numeracy subtest	−0.211
Financial literacy subtest	−0.268
Sensitivity to expected value	.001
Risk knowledge subtest	−0.226
Superstitious thinking subtest	.491
Dysfunctional personal beliefs	.051
CART thinking disposition scales	
Actively open-minded scale	−0.412
Deliberative thinking scale	−0.158
Future orientation scale	−0.208
Differentiation of emotions scale	−0.218

Correlations >.072 significant at the .05 level two tailed.
Correlations >.121 significant at the .001 level two tailed.

administered before 1995. The reliability (Cronbach's alpha) of the analogy task was .72 and the reliability (Cronbach's alpha) of the antonym task was .78.

The vocabulary checklist measure employed the checklist-with-foils format that has been shown to be a reliable and valid way of assessing individual differences in verbal cognitive ability (Anderson & Freebody, 1983; Baddeley et al., 1993; Scott et al., 2006; Stanovich et al., 1995). The stimuli for the task were 40 words (e.g., absolution, irksome, purview) and 20 pronounceable nonwords (e.g., disler, potomite, seblement) taken largely from the stimulus list of Zimmerman et al. (1977). The words and nonwords were intermixed *via* alphabetisation. The subjects were told that some of the letter strings were actual words and that others were not words and that their task was to read through the list of items and to put a check mark next to those that they knew were words. Scoring on the task was determined by taking the proportion of the target words that were checked and subtracting the proportion of nonword foils checked. The

split-half reliability (odd/even, Spearman-Brown corrected) of the word checklist measure was .86.

Performance on the analogy task correlated .61 and .56 with performance on the antonym task and word checklist task, respectively. Performance on the latter two tasks displayed a correlation of .67. A composite cognitive ability score was created by summing the z-scores on each of the three tasks.

Procedure

The Turk and Lab samples were both run online using Qualtrics. The Turk sample completed the CART unsupervised, whereas the Lab study was supervised in a university laboratory setting. The two groups were otherwise run in the same manner, a short demographics questionnaire preceding the administration of the CART and cognitive ability measures. A majority of subjects finished in under 135 min and most finished in under 3 h. However, Turk times were harder to determine because, unlike in the Lab sample, the Turk subjects were not directly monitored by an experimenter.

The CART subtests and cognitive ability measures were administered in the following order: Probabilistic and Statistical Reasoning, Reflection *vs.* Intuition, Probabilistic Numeracy, Belief Bias Syllogisms, Knowledge Calibration, Sensitivity to Expected Value, Temporal Discounting, Framing Part 1, Argument Evaluation Test Part 1 (Prior Opinions), Anchoring, Preference Anomalies Part 1, Risk Knowledge, Cognitive Ability measures (Analogies, Antonyms, Word Checklist), Scientific Reasoning, Disjunctive Reasoning, Ratio Bias, Conspiracy Beliefs, Financial Literacy and Economic Knowledge, Framing Part 2, Argument Evaluation Test Part 2 (Evaluation), Preference Anomalies Part 2, and Questionnaire (Actively Open-Minded Thinking scale, Deliberative Thinking scale, Future Orientation scale, Differentiation of Emotions scale, Dysfunctional Personal Beliefs subtest, and Superstitious Thinking subtest, intermixed).

Results and discussion

Table 1 presents the correlations between performance on the Conspiracy Beliefs subtest and the remaining subtests on the CART, plus the four thinking dispositions assessed on the CART. Three general predictors—cognitive ability, political ideology, and religious belief—are also included in the table.

Best predictors of false conspiracy beliefs

The strongest predictor of conspiracy belief was performance on the Superstitious Thinking subtest, followed by performance on the Actively

Open-Minded Thinking (AOT) disposition measure. Further variables displaying correlations larger than .30 in absolute magnitude were the cognitive ability composite, Probabilistic Reasoning subtest, and Scientific Reasoning subtest. To examine which of these variables are explaining unique variance, we used these five as predictors in a stepwise regression, with the Conspiracy Beliefs subtest as the criterion variable. The Superstitious Thinking subtest entered first into the regression equation, followed by the Probabilistic Reasoning subtest, followed by the AOT measure. No other predictor entered after those three [final equation R-squared = .290; $F(3,743) = 101.10$]. In the final equation, all three beta weights were significant at the .001 level, and superstitious thinking was the dominant predictor (beta weights = .340, −0.167, and −0.148, respectively).

These three variables were remarkably consistent predictors of each of the 24 false conspiracies included in this CART subtest as well. Table 2 presents the correlations between each false conspiracy on the subtest and these three variables. The fourth column indicates whether any of the other 22 variables (the 19 remaining subtests/dispositions on the CART and the three general variables: cognitive ability, ideology, and religiosity) displayed correlations that were significant at the .001 level and also higher than at least one of the three best predictors. The consistency of the three variables identified by the total score regression analysis is indicated by the fact that they were the strongest three correlates for 14 of the 24 conspiracies. In seven of the ten cases where they were not, cognitive ability nudged out the Probabilistic Reasoning subtest as the third strongest correlate. In one case (the Pharma cure conspiracy), the Scientific Reasoning subtest barely nudged out the Probabilistic Reasoning subtest and AOT to be the second strongest correlate. In another case (the marijuana suppressed by the alcohol companies conspiracy), a temporal discounting measure and cognitive ability were the second and third strongest correlates.

The pattern of the global warming conspiracy belief was different because this is a conspiracy belief that is markedly driven by partisan/political factors. AOT is the strongest predictor (probably because this version of the AOT contains items that carry a substantial amount of ideological association, see Stanovich & Toplak, 2019). Political ideology has the next strongest correlation. There are three other correlates (superstitious thinking, religiosity, and cognitive ability) with correlations above .30. However, this was the only item of the 24 that was so strongly associated with ideology/religiosity. In none of the other 23 items were these variables one of the top three predictors.[2]

Overall, as indicated in Table 1, ideology had a significant but fairly weak −0.12 correlation with the Conspiracy Beliefs subtest—subjects with

[2]The global warming item was also an outlier when the item characteristics of the Conspiracy Beliefs subtest were examined. The item-rest correlations of the other 23 items ranged from .53 to .73. The global warming item was an outlier on the low end, having an item-rest correlation of only .39.

Table 2. The top three correlates of each of the 24 false conspiracy items.

	Superstitious thinking	AOT	Probabilistic reasoning	Other
New world order	.414	−0.422	−0.332	−.362 Cognitive ability
SARS biological weapon	.403	−0.371	−0.370	—
Pearl Harbor known in advance	.254	−0.226	−0.206	—
Government assassinated MLK	.320	−0.253	−0.269	—
Government knew about 9/11	.235	−0.176	−0.172	—
Government covered up JFK	.311	−0.238	−0.236	—
Diana death a conspiracy	.366	−0.345	−0.298	−0.305 Cognitive ability
Alien aircraft have been recovered	.469	−0.301	−0.272	−0.276 Cognitive ability
Global warming a hoax	.362	−0.473	−0.290	−0.314 Cognitive ability −0.403 Ideology −0.325 Religiosity
AIDS spread by US agencies	.421	−0.399	−0.310	—
False flag operations by US military	.119	−0.057	−0.010	—
Harmful vaccinations covered up	.417	−0.409	−0.355	−0.398 Cognitive ability
Fluoridation harms covered up	.380	−0.304	−0.301	—
Corporations cover up harmful effects of GMOs	.305	−0.199	−0.192	—
Efficient carburetor development suppressed	.133	−0.075	−0.100	—
Highly secret weather controlling devices	.392	−0.360	−0.273	−0.306 Cognitive ability
Alternative medicine is suppressed	.314	−0.252	−0.264	—
Pharma conspires to suppress cures	.333	−0.276	−0.282	−0.283 Scientific reasoning
Federal Reserve controlled by elites	.275	−0.178	−0.177	—
Marijuana suppressed by alcohol companies	.190	−0.103	−0.122	−0.133 Cognitive ability −0.154 Temporal Dis P1
Moon landings were a hoax	.406	−0.385	−0.272	−0.345 Cognitive ability
CIA distributed crack in the inner cities	.207	−0.113	−0.152	—
Television signals contain mind controlling technology	.466	−0.387	−0.330	−0.352 Cognitive ability
Pharma and medical industries fabricate new diseases	.344	−0.303	−0.301	—

conservative ideological views showed a slightly stronger belief in false conspiracies. Political ideology did not explain additional variance on the Conspiracy Beliefs subtest after the three primary predictors had been entered into the regression equation. Indeed, political ideology was not a unique predictor when entered into the regression equation with any *one* of our three primary predictors. Across the individual items, 19 of the 24 correlations between political ideology and conspiracy belief were <.15 in absolute value.

These results converge with much of the literature in showing that ideology/partisanship is not a strong predictor of false conspiracy belief *in general* (Enders et al., 2022, 2023; Enders & Uscinski, 2021; Imhoff et al., 2022). However, there are a few specific conspiracy beliefs that are quite strongly related to political ideology and these have had disproportionate attention in the media and in the scientific literature (climate change conspiracies, that Trump was a Russian agent, QAnon, election fraud in 2020, election fraud in 2016; see Enders & Uscinski, 2021; Enders et al., 2022).

Religious belief had a somewhat stronger correlation with conspiracy belief than did ideology. As indicated in Table 1, stronger belief in God had a significant .26 correlation with scores on the Conspiracy Beliefs subtest. Belief in God did not explain additional variance on the Conspiracy Beliefs subtest after the three primary predictors had been entered into the regression equation. Across the individual items, nine of the 24 correlations between belief in God and conspiracy belief were >.20. It is important to note, however, that larger correlations tend to be found with measures of specific false conspiracy beliefs—like that used in our subtest—as opposed to measures of generic conspiracy belief (Frenken et al., 2023).

Paranormal/superstitious beliefs have been found to correlate with belief in conspiracies in previous research (Bensley et al., 2022; Čavojová et al., 2019; Enders & Smallpage, 2019; Pennycook et al., 2020; Rizeq et al., 2021; Šrol, 2022; Ståhl & van Prooijen, 2018), but it is significant that it was the dominant predictor here, when pitted against 17 other components of rationality, in addition to cognitive ability and four thinking dispositions. That superstitious thinking was a predictor of every single one of the 24 specific false conspiracies on the subtest is analogous to previous research that has found that a conspiracy mentality saturates all specific conspiracy beliefs. Paranormal/superstitious thinking is, however, a stronger correlate of responses on specific false conspiracy belief scales than it is of responses on conspiracy mentality scales (van Prooijen et al., 2022).

It might appear that this result—the substantial contribution of superstitious thinking as a predictor for each of the 24 conspiracies—is just a replication of Uscinski et al. (2022), who showed that the American Conspiracy Thinking Scale (ACTS) was a significant correlate of each of the 39 specific conspiracies that they studied (see parallel findings in Bruder et al., 2013; Enders et al., 2022; Enders & Smallpage, 2019). However,

our finding here is a conceptual advance in that superstitious thinking is one step distal from a specific conspiracy belief itself than is the ACTS.

The ACTS contains items, such as "the people who really 'run' the country are not known to the voters". These items require endorsing the general tenets of what a conspiracy is (undetected agents colluding to bring about an outcome that satisfies their own goals without the public knowing the true cause of the outcome). Superstitious thinking items do not do this. Instead, they focus on paranormal explanations of events (mindreading, dreams, luck, astrology, just world beliefs). They do not, unlike the ACTS, have items containing any of the components of conspiracy beliefs, such as undetected agents acting for their own benefit (such as ACTS item: "Much of our lives are being controlled by plots hatched in secret places"). Thus, superstitious thinking is importantly distal from a generic conspiracy mentality.

With superstitious thinking in our battery of best predictors, the 29.0% variance explained is higher than most other attempts to explain conspiracy belief that does not include conspiracy mentality itself as a predictor (e.g., Barron et al., 2014; Šrol, 2022; Ståhl & van Prooijen, 2018; Swami et al., 2014). However, the variables studied in the present study are strong predictors even *without* the inclusion of superstitious thinking. Just three variables—AOT, the Probabilistic Reasoning subtest, and the cognitive ability composite—can predict 22.1% of the variance in conspiracy beliefs. The beta weights in the final equation (−0.272, −0.200, and −0.102, respectively) indicated that AOT was the dominant predictor. Because cognitive ability is the weakest predictor of these three, we can construct an even simpler model using just *two* components of the CART, the AOT and the Probabilistic Reasoning subtest (one a supplementary thinking disposition measure and one a subtest), and have a model that explains 21.4% of the variance in conspiracy beliefs (the respective beta weights of −0.309 and −0.235 were both significant at the .001 level).

Best predictors of true conspiracy beliefs and true/false discrimination

The total score on the true conspiracy items (the five filler items) displayed much weaker correlations with the components of the CART than did the total score on the false conspiracy items. The strongest CART correlate with the true conspiracy total score was the Financial Literacy subtest ($r = .289$). No other component of the CART displayed a correlation higher than .22. Outside of the CART, the cognitive ability composite displayed a correlation of .265 with the true conspiracy total score. Importantly, the strongest correlate of the true conspiracy total score was the *false* conspiracy total score ($r = .376$). In short, the subjects who were most prone to believe in true conspiracies were those who were more prone to believe false conspiracies, and no other variable in the CART could predict true conspiracy belief better.

To examine which of these variables are explaining unique variance, we used cognitive ability and false conspiracy beliefs as well as all of the components of the CART as predictors in a stepwise regression, with the true conspiracy total score as the criterion variable and a $p < .001$ entry criterion. False conspiracy belief entered first into the regression equation, followed by the cognitive ability composite, followed by the AOT, and then the Financial Literacy subtest. No other predictor entered after those four [final equation R-squared = .383; $F(4,742) = 115.17$]. In the final equation, all four beta weights were significant at the .001 level (false conspiracy belief = .597; cognitive ability composite = .235; AOT = .209; Financial Literacy subtest = .203), with the beta weight for false conspiracy belief indicating that some statistical suppression is occurring.

We also conducted a signal detection analysis of the ability to discriminate between true and false conspiracy beliefs. After converting the item responses from our six-point scale into a 1/0 (believe/not believe) scoring scheme, our analysis followed the steps described by Batailler et al. (2022) to calculate a d' discrimination index for each subject. This index was correlated with the other variables in the study and the strongest correlate was the cognitive ability composite (.478). Five other components of the CART displayed correlations higher than .400: Superstitious Thinking subtest (−0.451); AOT (.430); Financial Literacy subtest (.427); Scientific Reasoning subtest (.427); and the Probabilistic Reasoning subtest (.422). To examine which of these variables are explaining unique variance, we used these six as predictors in a stepwise regression, with the d' discrimination index as the criterion variable. Only the Financial Literacy subtest failed to enter the regression equation [final equation R-squared = .334; $F(5,741) = 74.24$]. In the final equation, all five beta weights were significant (cognitive ability composite = .205; Superstitious Thinking subtest = −0.202; AOT = .100; Scientific Reasoning subtest = .107; Probabilistic Reasoning subtest = .133).

Theoretical discussion

Three components of the CART (the Superstitious Thinking subtest, Probabilistic Reasoning subtest, and AOT scale) were able to predict 29.0% of the variance in belief in false conspiracies. These three predictors, plus cognitive ability and the Scientific Reasoning subtest, predicted 33.4% of the variance in the ability to discriminate true from false conspiracy beliefs. Belief in true conspiracies (variance explained = 38.3%) was predicted most strongly by belief in false conspiracies; but cognitive ability, AOT, and the Financial Literacy subtest contributed to explaining some unique variance. Some of these variables (superstitious thinking, probabilistic reasoning, cognitive ability) have been much discussed in the conspiratorial thinking literature, whereas others (AOT, financial literacy) have been the focus of much less attention.

Superstitious/paranormal thinking has been examined in previous investigations and consistently is one of the strongest predictors of false conspiracy beliefs (Stasielowicz, 2022). Superstitious/paranormal thinking is often paired with conspiracy beliefs in studies that have focused on "epistemically unwarranted beliefs" as a broad category (Bensley et al., 2022; Lobato et al., 2014; Ståhl & van Prooijen, 2018). The Superstitious Thinking subtest of the CART was very similar to previous measures used and achieved a typical correlation of .49 (Bensley et al., 2022; Enders & Smallpage, 2019; Newton et al., 2023; Pennycook et al., 2020; Ståhl & van Prooijen, 2018).

Probabilistic reasoning has been studied before in the conspiratorial thinking literature, but attention has focused on one particular effect from the probabilistic reasoning literature—the conjunction effect (Brotherton & French, 2014; Enders & Smallpage, 2019; Šrol, 2022). The Probabilistic Reasoning subtest of the CART does contain conjunction items, but this subtest of the CART is much broader than that, encompassing items tapping susceptibility to the gambler's fallacy, suboptimal probability matching tendencies, sensitivity to base rates, and sensitivity to sample size considerations. If there is a broader range of probabilistic errors being made by the conspiratorially inclined, then this CART subtest will pick up that variance in addition to any conjunction problems characteristic of that group.

Cognitive ability displayed a correlation (−0.34) with false conspiracy belief that was somewhat higher than that obtained in previous investigations (Bowes et al., 2023). We conjecture that this is because our measure of intelligence/cognitive ability was more comprehensive than that used in previous investigations. The literature on the correlates of conspiracy beliefs has so many variables of potential concern that investigators have been prone to use extremely brief measures of intelligence.

The fact that the AOT scale employed in the CART has been much less studied in the literature takes on added importance given that it was a unique predictor of all the conspiratorial belief indices in this study: belief in false conspiracies,[3] belief in true conspiracies, and the ability to discriminate true from false conspiracies. The component of actively open-minded thinking that is linked to conspiratorial tendencies is difficult to discern, however, because actively open-minded thinking has been shown

[3]The actively open-minded thinking scale taken from the supplemental dispositional measures of the CART, displayed a correlation with false conspiracy belief (−.41) higher in absolute value than the roughly .20–.30 observed in previous investigations (Bowes et al., 2023; Pennycook et al., 2020; Stanovich & Toplak, 2019). Newton et al. (2023) found a correlation (−.48) that was more similar to what we found in the present study (−.41). We conjecture that the correlation that we observed here, as well as that in Newton et al. (2023), is higher because both studies used conspiracy scales that amalgamated the endorsements of many specific false conspiracies. In contrast, when Pennycook et al. (2020) used the generic GCB scale of Brotherton et al. (2013), they found lower correlations of −.36, −.20, and −.25. Additionally, Stanovich and Toplak (2019) demonstrated how the word "belief" in AOT items leads to misleadingly high correlations of AOT scales with political ideology and religiosity. It is possible to construct versions of the scale without this problem (Pennycook et al., 2020; Stanovich & Toplak, 2019, 2023).

to be a complex and multifarious concept[4] (Baron et al., 2023; Newton et al., 2023; Stanovich & Toplak, 2019, 2023; Stanovich & West, 1997, 2007; Svedholm-Häkkinen & Lindeman, 2018).

Stanovich and Toplak (2019, 2023) have speculated that in addition to whatever else it might measure, the AOT scale functions most importantly as an indicator of a modernist mindset (see Stanovich, 2004 for a more comprehensive discussion of the cognitive requirements of modernity). One of the key modernist cognitive styles that AOT scales are capturing is whether people are willing to decouple from strong default responses and consider new and/or conflicting evidence (AOT item: "People should revise their conclusions in response to relevant new information")—or, for those responding on the other end of the scale, to be more comfortable with natural responses and accumulated knowledge (AOT item: "It is important to stick to your opinions even when evidence is brought to bear against them"—reverse scored).

Modernity is the result of long historical trends that have replaced local/particular traditions with science and rationality as the arbiters of truth claims. This shift coincides with an increase in environments for thinking that are hostile rather than benign for those sticking with intuitive choices (Stanovich, 2004). When we must respond by overriding natural defaults, it is hard because this requires overcoming what Stanovich (2003, 2004) has termed the fundamental computational biases of human cognition, several of which contribute to the allure of conspiratorial thinking: the tendency towards narrative modes of thought; the tendency to infer agency and intentionality; the tendency to "socialize" problems; the tendency to contextualise in situations where content-free rules provide the conclusion. Many of these, especially the strong human propensity to infer intentionality and the tendency to rely on a narrative mode of thought, have been discussed in the literature on conspiracy belief (Douglas et al., 2016; Oliver & Wood, 2014; Shermer, 2022; van Prooijen, 2018).

Conspiracy belief may be one of those cases in psychology where it is better to reverse the question—to ask not why some people are prone to jump to the conclusion that there are hidden forces acting to produce a certain outcome, but instead to ask why *everyone* doesn't adopt the natural defaults discussed above. In fact, some people do not default this way because they are prone to adopt the attitudes and defaults of modernity instead and have the tendency to look for a safe explanation grounded in converging evidence from established institutions. The Actively Open-Minded Thinking scale of the CART taps styles related to that choice and to the rejection of superstitious/paranormal explanations as well (the two variables displayed a -.56 correlation in our sample).

[4]It is important to note that the AOT is not the same concept as openness in the Big Five model of personality (nor does it map on to openness to experience in the HEXACO model). The AOT, as conceptualized in the rational thinking literature, is much more specifically focused on belief revision and the treatment of new evidence. It does not tap facets such as openness to fantasy, aesthetics, feelings, and actions that are measured on more broad-based scales of general openness.

Rethinking conspiracy belief as contaminated mindware

Confidence in conspiratorial beliefs is often viewed as irrational by both the public and psychologists alike, although philosophically this is a more complicated issue than many seem to realise (see Basham, 2012; Coady, 2007; Dentith, 2019, 2021, 2023; Hagen, 2018; Stojanov & Halberstadt, 2019; Swami et al., 2017). The Conspiracy Beliefs subtest was included in the CART because we were looking for samples of contaminated mindware that we thought had some domain generality. The present results cause us to rethink this emphasis on conspiracy belief as stored declarative knowledge and move towards a conception of conspiratorial thinking as a cognitive style.

The continuity displayed across true and false conspiracy beliefs is suggestive of a dispositional component underlying both types of belief. The dominant predictor of whether a person accurately identified real-life conspiracy events as actually true was the extent to which they were prone to identify *false* conspiracies as true. This suggests an underlying disposition to believe that world events are caused by hidden collusion. The thinking disposition actively open-minded thinking was a predictor of both the "bad response" of affirming that phantom plots had occurred and the "good response" of correctly identifying actual historical conspiracies. Indeed the AOT scale was consistently related to all of our conspiracy belief indices: belief in false conspiracies, belief in true conspiracies, and the ability to discriminate between true and false conspiracies. Likewise, the cognitive ability variable was fairly strongly related to all three indices.

In the CART, the AOT scale was treated as a supplementary measure and not part of the score on the test because it was a measure of thinking style. In contrast, the Conspiracy Beliefs subtest was actually part of the test and scored as such, but perhaps it too would have been better treated as a style measure. Thinking dispositions are not primary measures of rationality themselves, because they are not maximising concepts like the other constructs on the CART. Optimal functioning does not result from maximising cognitive styles. Instead, rationality, plotted against most thinking dispositions, is an inverted U-shaped function. One does not maximise rationality by maximising the reflective end of the reflectivity/impulsivity dimension for example, because a person doing so might get lost in interminable pondering and never make a decision. One would not want to maximise the dimension of belief flexibility either, because such a person might end up with a pathologically unstable personality. Reflectivity and belief flexibility are "good" cognitive styles only in the sense that most people are too low on both dimensions. Most people would be more rational if they increased their degrees of reflectivity and belief flexibility. But this does not mean that either of these thinking dispositions should always be maximised.

We can import this insight into the study of conspiracy belief by considering a continuum of conspiracy belief measurement techniques. We

could start on one end of the continuum by imagining the isolation of a single clearly false conspiracy belief—say, belief in QAnon—and then coding belief in this particular conspiracy as a specific example of irrational thought. However, once we amalgamate a couple of dozen such conspiracies into a scale of the type used in our study and many others (that is, studies using the methodology of deriving a composite score from a large sampling of particular beliefs; see Stojanov & Halberstadt, 2019; Swami et al., 2010; Swami et al., 2017), it is a little less clear that the optimal response is *maximum* disagreement with *all* the conspiracies in the set (the content dependence problem in making such a default assumption would be severe). Most Americans believe in *some* conspiracies (Oliver & Wood, 2014; van Prooijen & van Vugt, 2018), and many composite scales contain conspiracy theories that are endorsed by 30–50% of the population (40% of the public believes that "the dangers of genetically-modified foods are being hidden from the public" and 35% believe that "the Food and Drug Administration is deliberately preventing the public from getting natural cures for cancer and other diseases because of pressure from drug companies", see Uscinski et al., 2022). In this context, it is more of a theoretical leap to assume that it is rational to disagree to the maximum extent with every posited conspiracy.

There is a trade-off between how preposterous and disproven the false conspiracies are on such scales and how representatively the scales measure conspiratorial mentality. As Dentith (2019, 2021) has noted, most aggregate specific scales in the literature include almost entirely conspiracies that are highly dubious and easily falsified, so in essence when we use them we are studying the causes and correlates of the conspiracy mentality *gone wrong*. The specific belief scales are not capturing the full range of conspiracy mentality correlates in that they are missing instances where this type of mentality is *efficacious*, or at the very least is not deleterious. Instead, such scales, because they choose a highly unrepresentative set of conspiracies, tend to pathologize conspiracy belief if used as a proxy measure of general conspiratorial mentality (Dentith, 2023). Our construction of the CART subtest in this manner no doubt inadvertently contributed to this tendency in the literature to pathologize the concept.

It would be possible to build more representative scales. Some conspiracy beliefs that are currently being examined in studies but that are less preposterous are: "The one percent (1%) of the richest people in the U.S. control the government and the economy for their own benefit" (believed by 52% of the American public; Uscinski et al., 2022); "Jeffrey Epstein, the billionaire accused of running an elite sex trafficking ring, was murdered to cover-up the activities of his criminal network" (believed by 48% of the American public; Uscinski et al., 2022) and "There is a 'deep state' embedded in the government that operates in secret and without oversight" (believed by 44% of the American public; Uscinski et al., 2022). No conspiracies of this type appear on the commonly used scales, however,

because the specific conspiracy belief scales overwhelmingly focus on the more unlikely and easily falsified ones.

If the specific conspiracy belief scales were to become less preposterous, such scales would be more continuous with, and closer to, the methodologies that try to measure conspiracy mentality or conspiracist predispositions by asking directly, but generically, about the tendency to believe in undetected plots and hidden causal influences. These scales are now widely used and include the Brotherton et al. (2013) GCB scale, the Bruder et al. (2013) CMQ, and the Uscinski and Parent (2014) ACTS. But such scales are measuring conspiracy mentality as a disposition to be suspicious of hidden plots, and now we have a new problem of, as Stojanov and Halberstadt (2019) put it in their title, "distinguishing between rational and irrational suspicion" (see also, Shermer, 2022). Since causes unknown because they are concealed from the public *do* in fact determine some important actual outcomes in the world, conspiracy mentality measures of this type should not be conceptualised and discussed as if the optimal score on them is zero. Optimality is now, like other thinking dispositions, somewhere to the right of zero on an inverted U function.

This admonition seems especially true in the case of generic conspiracy belief measures that often contain items that seem to reflect perfectly reasonable opinions about the socio-political world in which we live. For example, the much-used Conspiracy Mentality Questionnaire of Bruder et al. (2013) contains items such as: "I think that many very important things happen in the world, which the public is never informed about" and "I think that politicians usually do not tell us the true motives for their decisions". These seem to be eminently reasonable beliefs about the bureaucratic, corporate, and politicised world in which we live. Surely *some* degree of agreement with such items should not be conceptualised as an "irrational" response.[5] Indeed, failure to agree at least somewhat would seem to indicate excessive credulity (Coady, 2007; Shermer, 2022; Stojanov & Halberstadt, 2019).

Conspiratorial thinking seems most disposition-like when derived from the broadest and most neutral definitions (see Dentith & Orr, 2018; Duetz, 2022) of what a conspiracy belief is, such as: A conspiracy involves at least two agents having coordinated or colluded, undetected by the public, towards a goal of significant public interest. Our definition is broad in that it does not restrict the conspiracy to just a few actors, as some definitions do. It does not require conscious agency and direct contact among the conspirators but instead allows for the belief in tacit collusion among a large number of actors to be defined as a conspiracy belief. Likewise, because this definition allows tacit collusion among a large number of actors to be defined as a conspiracy, it does not require

[5]Another potential problem with the widely used CMQ scale is that two of the five items refer to undetected plotting in the government/political domain, but none refer to secret agendas in corporations, the military, or the police. This imbalance in the items may explain the small but significant tendency for this scale to correlate positively with conservative ideology (Imhoff et al., 2022).

that the conspirators be powerful, as do some definitions (see Douglas & Sutton, 2023 for a discussion of many of the different definitions in the literature). It does not require that there be malevolent intent behind the conspiracy nor does it require *intentional* secrecy (Dentith & Orr, 2018). The conspiratorial goal, in this definition, is empirically opaque to the public, but not necessarily due to intentional secrecy. Finally, our definition does not stipulate that the conspiracy belief must be irrational or false.

This more neutral definition—a group of actors coordinating or colluding, undetected by the public, towards a goal of significant public interest—comes closer towards treating conspiracy belief as a mental style, or as a thinking disposition rather than as a measure of irrationality that optimally would be minimised. It is also consistent with warnings against "weaponizing" (see Douglas et al., 2019, p. 5; Husting, 2018; Uscinski, 2018) the term conspiracy by allowing it to become a tool of politicians in power who deflect criticism by labelling opponents conspiracists. It may also help to vitiate the tendency to use "conspiracy" as an epithet to suppress unpopular views or those opposed to elite narratives, as happened in the case of the lab leak hypothesis for the origins of COVID-19 (Jilani, 2021; Stanovich, 2023; Taibbi, 2021; Zweig, 2023). It thus leaves open the possibility of being *too* credulous about official narratives (Coady, 2007; Imhoff & Bruder, 2014; Shermer, 2022; Stojanov & Halberstadt, 2019). For example, one survey of Chinese citizens found that over 60% of the respondents thought that COVID-19 originated in the United States or Europe (Zhu et al., 2023).

In a world of increasing complexity and global interaction[6]—and increasing potential conflicts among fractious and polarised interest groups—why *wouldn't* you think that some of the groups were colluding and coordinating to advance a goal that remains empirically opaque to the public? Treating conspiracy belief as a cognitive style following from the generic definition given here would put the study of conspiracy belief on a more generic and theoretically neutral ground than has been the case heretofore (see Coady, 2023, for an even stronger recommendation). Assuming that avoiding conspiracy beliefs entirely is the maximally rational response—as we did in the CART—burdens the concept with too much prejudged theory.

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[6]Dentith (2021) points to the culturally contingent aspects of our evaluation of the rationality of particular levels of conspiracy mentality. The former communist polities such as Romania provide a stark example, as the population has lived through a litany of government-led conspiracies and corruption. It would seem less than rational for a Romanian then, not to display a considerable amount of conspiratorial mentality as a cognitive style.

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