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"Knowing what I don't know" – belief in conspiracy theories relates to lower metacognitive sensitivity: a signal detection theoretic approach

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ABSTRACT

Beliefs in conspiracy theories are seemingly hard to dispute through facts. Researchers have partly attributed this resistance to certain information processing styles that are associated with conspiracy beliefs. Previous research therein has extensively examined the role of object-level information processing, for instance, intuitive (vs. analytic) thinking and cognitive reflection. However, research has so far has not considered that conspiracy beliefs might also be related to different ways of metacognitive information processing. In two studies, one sample from Germany, one quota-based sample from the US (total $N = 1{,}231$), we show that a generic belief in conspiracy theories as well as the belief in specific conspiracy theories such as those surrounding vaccinations and QAnon (but less so conspiracy mentality) is related to lower metacognitive sensitivity – i.e. a lower ability to accurately evaluate one's knowledge. Results hold when controlling for object-level knowledge, cognitive reflection, and intuitive thinking.

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Introduction

Conspiracies do happen from time to time. However, many (though not all, Pummerer et al., 2025) of the conspiracy theories circulating in the public are implausible (Douglas & Sutton, 2023) and can have harmful consequences for society, such as a reduced trust in scientific institutions (Pummerer, Böhm, et al., 2022), or violence (Imhoff et al., 2021; Jolley & Paterson, 2020); and is related to lower vaccination intentions (Hornsey et al., 2018). Because of that, there has been an increasing interest among scientists to understand causes and correlates of conspiracy beliefs specifically regarding theories that are scientifically implausible.

In search for the cognitive underpinnings of the belief in scientifically implausible beliefs, many researchers have focused on how individuals deal with object-level information, that is, how they deal with information about their environment. The idea here is that if individuals believe in scientifically implausible theories, this might be grounded in a non-optimal way to acquire and process information, for example a higher reliance on debatable rather than valid sources and lower use of analytic thinking styles. And indeed, previous research has uncovered that conspiracy beliefs are related to science rejection (Rutjens & Većkalov, 2022), more frequent use of social media (Enders et al., 2023), and a tendency to use fast and unreflecting processing styles that impede more analytical, elaborative thinking (Pummerer, Ditrich, et al., 2022; Swami et al., 2014; van Prooijen, 2019).

But what if that is not the whole story? We here offer a new perspective on the relation between conspiracy beliefs and thinking styles which does not rely on tendencies of object-level information processing, but processes of evaluating internal knowledge. Specifically, we highlight and test the role of metacognitive sensitivity – the ability to correctly evaluate one's own knowledge. Metacognitive sensitivity describes how much individuals are aware of their knowledge and knowledge gaps by assigning appropriate levels of confidence to the varying accuracy of their knowledge. Thus, our studies advance the existing literature in examining cognitive processes underlying conspiracy beliefs that so far have not been considered.

Conspiracy beliefs and thinking styles

Conspiracy theories are explanations for societal events that allege secret and malevolent actions of

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powerholders (see e.g. Dentith, 2014; Nera & Schöpfer, 2023; Sassenberg et al., 2023). Believing in one conspiracy theory is correlated with believing in other conspiracy theories, which is why several scales (Brotherton et al., 2013; Lewandowsky et al., 2015) measure a *generic conspiracy belief* by assessing the agreement to different popular conspiracy theories. The idea of such scales is to not only measure the belief in one singular or a specific set of conspiracy theories, but to rather assess a more generic tendency to believe in conspiracy theories. While there are also plausible conspiracy theories that receive more and more scientific attention (see e.g. Pummerer et al., 2025; Frenken et al., 2024), measures for generic conspiracy beliefs typically comprise implausible conspiracy theories (Alper & Yilmaz, 2023), as some scholars argue that implausibility is a typical feature of conspiracy theories spreading in (at least Western) societies (Douglas & Sutton, 2023). Existing research has uncovered several ways in which such a generic conspiracy belief is related to differences in object-level information processing (for an overview, see Figure 1). Among these are a heightened tendency for intuitive and lower tendency for analytical thinking (Imhoff & Bruder, 2014; Swami et al., 2014; but see Većkalov et al., 2024) – either due to a lower ability or lower motivation to think analytically (Ståhl & Van Prooijen, 2018), less cognitive reflection (Jedinger et al., 2023) as well as a lower willingness to consider evidence and opinions contradicting one's own beliefs, known as actively open-minded thinking (Petrović & Žeželj, 2022). Generic conspiracy belief is also related to a heightened susceptibility for cognitive biases such as to rate nonsensical sentences as holding some truth (i.e. "bullshit receptivity", van Prooijen et al., 2022), to estimate the occurrence of two events as more probable than the occurrence of one (i.e. conjunction fallacy, Brotherton and French, 2014), jumping to conclusions (Pytlik et al., 2020), or to perceive agency (i.e. hypersensitive agency detection) and patterns in randomness (Douglas et al., 2016; van Prooijen et al., 2018). All these thinking styles concern the acquisition, storing, and critical reflection of pieces of external information – they relate to object-level knowledge.

We contend, however, that conspiracy beliefs may also relate to differences in the ability to assess the accuracy of one's *own* knowledge, the ability to metacognitively reflect upon what one knows and does not know. Studies so far have shown that conspiracy beliefs are negatively related to self-reported intellectual humility – a concept also including social-behavioral aspects of valuing other people's beliefs and expressing humility in interpersonal situations (e.g. Bowes & Tasimi, 2022) and whose measurement through self-reports recently has being questioned in its validity (Costello et al., 2024). No studies so far have measured the purely cognitive aspect of metacognitive sensitivity using objective measures.

Metacognition

Metacognition, the ability to assess and reflect critically on the validity of one's own cognitions, is a fundamental skill: It enables individuals to reflect on the soundness of their own cognitions (Frith & Frith, 2012). Understanding the reliability and fallibility of one's own cognitions is key for a wide range of tasks, including problem-solving, information search, learning from errors, dealing with uncertainty, forming evidence-based beliefs, and

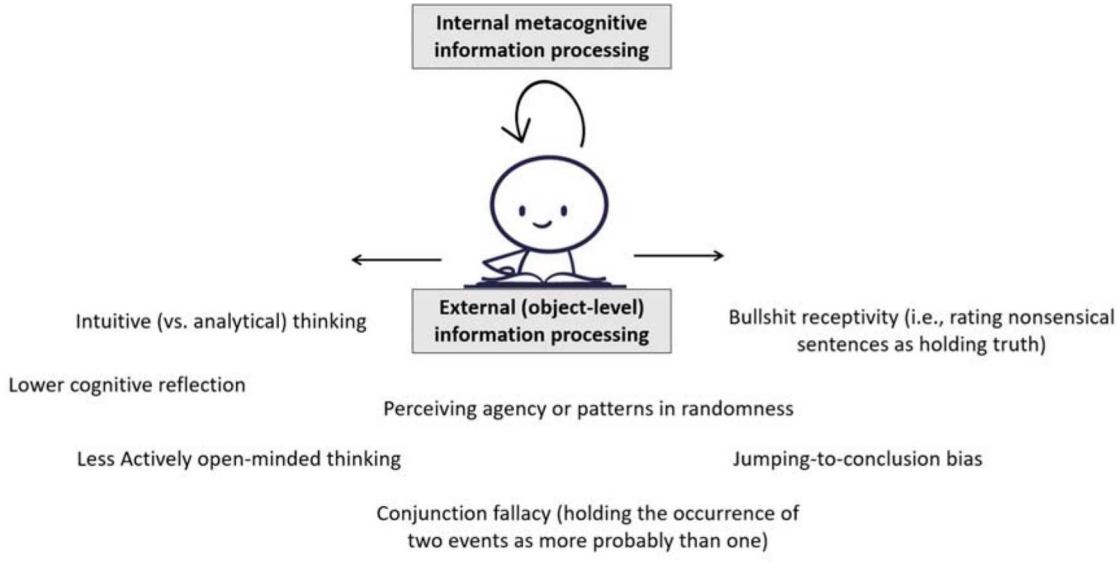

Figure 1. Thinking styles related to generic conspiracy belief.

guiding behaviour (Davidson et al., 1994; Desender et al., 2018; Fischer et al., 2019, 2023; Fischer & Said, 2021; Meyniel et al., 2015; Said et al., 2022; Schulz et al., 2020). As metacognitive sensitivity is a trait-like skill, it is content-independent. Critically, metacognition allows individuals to distance themselves from their knowledge by assigning due weight (confidence) to the varying accuracy of their knowledge. This critical self-assessment can be more or less accurate, which is reflected in varying *metacognitive sensitivity*. Individuals have high metacognitive sensitivity when they have high confidence in knowledge that is correct, and low confidence in knowledge that is incorrect; conversely, individuals have low metacognitive sensitivity when they have high confidence in knowledge that is incorrect, and low confidence in knowledge that is correct. Metacognitive sensitivity might also play an important role in the forming and sustainment of conspiracy beliefs: A high metacognitive sensitivity should facilitate reflection, self-criticism and, ultimately, correction of knowledge that is uncertain, thereby preventing or decreasing beliefs in scientifically unwarranted conspiracy theories. Low metacognitive sensitivity, on the other hand, means having high certainty even in cases where doubts or uncertainty are appropriate, for example, in situations where information has only been processed fleetingly. Thus, we hypothesised that a generic conspiracy belief is related to a lower metacognitive sensitivity.

Conspiracy mentality

In addition to the generic conspiracy belief, there is a related concept called *conspiracy mentality* which has been described as the propensity to believe in (any) conspiracy theories (Imhoff & Bruder, 2014). Different to scales measuring a generic conspiracy belief, measures of conspiracy mentality include sentences expressing global suspicion, and include scientifically plausible as well as scientifically implausible suspicion to powerholders (Stojanov & Halberstadt, 2019). Typically, generic conspiracy belief and conspiracy mentality are highly correlated. Therefore, one might expect that if a generic conspiracy belief is related to lower metacognitive sensitivity, this might also apply to conspiracy mentality. This reasoning is reflected in our preregistered hypothesis described below. On the other hand, there is also the possibility that the subtle differences between the scales (e.g. in examining mostly scientifically implausible theories vs. a more general skepticism) nonetheless might relate differently to thinking styles, as a recent meta-analysis showed that generic conspiracy belief relates to lower cognitive abilities, while conspiracy mentality did not (Biddlestone et al., 2022). Therefore, it might also be possible that these different types of conspiracy beliefs (generic conspiracy belief, conspiracy mentality) relate differently to metacognitive sensitivity.

The current study

The present work provides two independent empirical tests of the preregistered hypothesis that a generic conspiracy belief and conspiracy mentality are related to a lower metacognitive sensitivity, the metacognitive insight into the accuracy and fallibility of own knowledge. We use methods from Signal Detection Theory (SDT) to objectively index the extent to which individuals' confidence matches the accuracy of their underlying knowledge. SDT offers a unified theoretical and methodological framework to measure both object-level knowledge (d′), that is, the ability to distinguish true from false pieces of external object-level information, and metacognitive sensitivity (meta-d′), that is, the ability to accurately assess one's internal knowledge (Fleming & Lau, 2014). Crucially, we assessed object-level and metacognitive sensitivity by asking participants 30 general knowledge questions that were *unrelated* to the content of any popular conspiracy theories (e.g. "The Mont Blanc is the highest mountain in the world" [false], or "In India, payments are made with Rupees" [correct]). For each question, participants first indicated whether the statement is correct or incorrect, and then indicated the confidence in their judgment on a scale ranging from "50% – just guessing" to "100% – absolutely certain".

We also assessed participants' belief in five (Study 1) or six (Study 2) popular conspiracy theories as measure of generic conspiracy belief. Additionally, we assessed participants' conspiracy mentality, as well as the belief in two specific conspiracy theories (i.e. vaccination and QAnon with five and six items, respectively, Study 2). Correlations between the concepts are provided in the Supplement (Table S1 and S2). We then predicted the different kinds of conspiracy belief by metacognitive sensitivity, controlling for differences in object-level knowledge, thinking styles, and a wide range of demographic variables including political attitudes.

Method

Transparency and openness

Studies were conducted in line with the ethical guidelines for psychological research of the American Psychological Association and the German Research

Foundation and received ethical approval by the institutional ethics board of the Leibniz-Institut für Wissensmedien (Tübingen, Germany; LEK 2023/039). We preregistered our key hypotheses of Study 1 and Study 2, together with the study designs, and analysis plans under https://aspredicted.org/ZPR_KGF and https://aspredicted.org/4BV_G1Q. We report how we determined our sample size, all measures, conditions, and data exclusions. Our primary hypotheses were that a generic belief in conspiracy theories and conspiracy mentality are related to a lower metacognitive sensitivity. All participants provided informed consent. The data of this project and analysis code (R) are available at https://doi.org/10.23668/psycharchives.21255 (data) and https://doi.org/10.23668/psycharchives.21256 (code).

Participants

In Study 1, $N = 570$ individuals participated in the study. One individual reported being underage and was excluded. Based on preregistered exclusion criteria, participants were excluded for failing an attention check ($N = 20$), or for choosing a single confidence rating (e.g. 60% certain) more than 90% of all trials (Rollwage et al., 2018) ($N = 3$). Lastly, 5 participants with outlying meta-d′ values using the standard box-and-whiskers plot criterion (i.e. more than 1.5 times the interquartile range away from the first or third quartile) were excluded. The final sample was $N = 541$.

In Study 2, $N = 703$ individuals took part in the study, of which six participants were excluded for failing an attention check ($N = 5$), saying to have not answered honestly ($N = 1$), or after outlier analyses (see Study 1, $N = 7$), as specified in the preregistration. This resulted in a final sample of $N = 690$. For both studies, sample size was chosen as to be able to detect at least an effect of $f^2 = 0.023$ (corresponding to a minimum correlation of interest of $r = .15$ with 2 predictors) with a power of .90 and alpha-error of .025 (Bonferroni-correction). In Study 2, the sample was drawn by Prolific with quotas for a sample that is representative of the US population regarding age, gender, and ethnicity based on US census data. Demographic data of all participants are presented in Table 1.

Table 1. Demographic data of participants.

		N (Study 1)	N (Study 2)
Age	18–27	77	122
	28–37	168	122
	38–47	129	109
	48–57	97	122
	58+	70	215
Gender	Female	201	350
	Male	336	333
	Other	4	7
Political orientation	1 – liberal	16	126
	2	64	125
	3	134	101
	4	184	145
	5	110	78
	6	21	72
	7 – conservative	12	43
Education	Less than high school		2
	High school		86
	Some college		142
	Associate degree		62
	Bachelor's degree		286
	Master's degree		82
	Doctoral degree		14
	Professional degree		15
Ethnicity	White or Caucasian		492
	Black or African American		50
	Asian		32
	Other or missing		116

Measures

Actively open-minded thinking, the cognitive reflection task, and the belief in vaccination and QAnon conspiracy theories were only included in Study 2. All other measures were included in both studies. Unless noted otherwise, answers were assessed on a scale from "1 – Strongly disagree" to "7 – Strongly agree". Means, standard deviations and Cronbach's alpha (if applicable) are reported in Table 2.

General knowledge questions

Participants judged the truth values of thirty statements taken from the domains of literature (e.g. "The book '1984' was written by Ray Bradbury", wrong statement), arts (e.g. "The painting 'Guernica' was created by Picasso", correct statement), history (e.g. "Napoleon Bonaparte died in 1583", wrong statement), geography (e.g. "The longest river in the world is the Nile", correct statement), religion (e.g. "For Jews, Jesus is the Messiah", wrong statement), sports (e.g. "The highest number of points that can be scored with a single shot in basketball is seven points", wrong statement), science (e.g. "Marie Curie discovered radium", correct statement), and pop culture (e.g. "Michael Jackson died from an overdose of Propofol", correct statement). Statements were adapted to the specific countries (Germany vs. US) and participants responded to each statement with true/false.

Confidence in responses to general knowledge questions

Participants provided item-specific confidence judgments by indicating, after each general knowledge statement: "How certain are you that your assessment is correct?" on a 6-point scale ranging from "50% – completely guessing" to "100%-absolutely certain".

Table 2. Mean, Standard Deviation and Cronbach's alpha for all measures.

	Study 1			Study 2		
Scale	Mean	SD	Cronbach's alpha	Mean	SD	Cronbach's alpha
Intuitive thinking	4.39	0.78	.72	4.43	1.00	.84
Cognitive reflection test (Sum score)				1.55	1.23	–
Actively open-minded thinking				5.04	1.26	.91
Conspiracy mentality	3.66	1.57	.91	4.41	1.51	.89
Generic conspiracy belief	2.41	1.46	.90	2.74	1.57	.90
Vaccination conspiracy theory				2.16	1.36	.92
QAnon conspiracy theory				2.67	1.66	.92

Intuitive Thinking was measured with the scale from Norris and Epstein (2011) consisting of 10 items (e.g. "I often go by my instincts when deciding on a course of action").

Cognitive Reflection Test was measured with the test by Frederick (2005). This well-established measure consists of three tasks (e.g. "A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?") for which participants have to type in their answers. A correct answer is scored as 1, and participants then receive a sum score. This test has been shown to be robust even after multiple exposures (Bialek & Pennycook, 2018).

Actively open-minded thinking

We included a measure of Actively Open-minded Thinking, namely two subscales (dogmatism and fact-resistance) of the short scale by Svedholm-Häkkinen and Lindeman (2018) with overall 11 items (e.g. "People should always take into consideration evidence that goes against their beliefs"). We did not include the subscales of liberalism and belief personalisation, as these are more related to person variables rather than thinking styles.

Conspiracy Mentality was measured with the conspiracy mentality questionnaire developed by Bruder et al. (2013), which includes five items (e.g. "I think that many very important things happen in the world, which the public is never informed about").

Generic conspiracy belief is a scale consisting of five (Germany) or six (US) well-known conspiracy theories (e.g. "The Apollo moon landings never happened and were staged in a Hollywood film studio"), adapted from Lewandowsky et al. (2015). For an overview of all items that were used to measure conspiracy beliefs, see Table 3.

Vaccination conspiracy theory was measured with eight items (e.g. "Pharmaceutical companies, scientists and academics work together to cover up the dangers of vaccines") from a scale by Jolley and Douglas (2014).

QAnon conspiracy theory

While there are many different conspiracy beliefs spreading within the QAnon movement, we here focus on one conspiracy belief that is at the core of the movement (Enders et al., 2022; Uscinski, 2022), namely the belief that the government and media is being controlled by the so-called "deep state", which is being revealed by Q. This scale was self-developed with six items (e.g. "The mainstream media is controlled by the deep state and is spreading lies and propaganda"), some of them loosely connected to items by the Public Religion Research Institute (PRRI, 2021).

Other scales were included at the end of the questionnaire as exploratory measures (details see preregistrations) and are, thus, not reported here.

Procedure

Participants first saw the 30 general knowledge items. Each item was directly followed by the question of how confident participants were in their judgment. After that, participants answered the items assessing thinking styles (Study 1: Intuitive Thinking, Study 2: Intuitive Thinking, Actively Open-minded Thinking, Cognitive Reflection Test). These were followed by measures assessing conspiracy mentality, generic conspiracy belief and belief in the vaccination conspiracy theory (Study 2) and QAnon conspiracy theory (Study 2).

Analysis

Object-level knowledge

To measure object-level knowledge, the accuracy with which participants' responses accurately differentiated between true and false knowledge, we determined *d'* within Signal Detection Theory (SDT) as Z(Hit Rate) – Z(False Alarm Rate), where Hit Rate refers to answering TRUE to statements that are in fact TRUE, and False Alarm Rate refers to answering TRUE to statements that are in fact FALSE, and *Z* is the inverse of the cumulative normal distribution function. Object-level knowledge (d') hence measures participants' ability to distinguish TRUE from FALSE climate change statements. Values of zero denote performance at chance level. A loglinear approach was taken for edge corrections (Hit and False Positive rates of zero or one, Hautus, 1995).

Table 3. Overview of all Items measuring conspiracy beliefs.

Scale	Item
Generic conspiracy belief	The Apollo moon landings never happened and were staged in a Hollywood film studio.
	The assassination of John F. Kennedy was not committed by the lone gunman Lee Harvey Oswald but was rather a detailed organised conspiracy to kill the President.
	The U.S. government allowed 9–11 attacks to take place so that it would have an excuse to achieve foreign (e.g. wars in Afghanistan and Iraq) and domestic (e.g. attacks on civil liberties) goals that had been determined prior to the attacks.
	Princess Diana's death was not an accident but rather an organised assassination by members of the British royal family who disliked her.
	A powerful and secretive group known as the New World Order are planning to eventually rule the world through an autonomous world government which would replace sovereign governments.
	The assassination of Martin Luther King Jr. was the result of an organised conspiracy by U.S. government agencies such as the CIA and FBI. *(Item only included in US sample, Study 2)*
Vaccination conspiracy theory	Immunizations allow governments to track and control people.
	Vaccines are harmful, and this fact is covered up.
	Tiny devices are placed in vaccines to track people.
	Pharmaceutical companies, scientists and academics work together to cover up the dangers of vaccines.
	(R) Vaccines are not tampered with. *
	The government is trying to cover up the link between vaccines and autism.
	Tiny devices are implanted in vaccines for use in mind control experiments.
	The flu vaccine allows the government to monitor the elderly through the implantation of tiny tracking devices.
QAnon conspiracy theory	There is a deep state that controls the government and other institutions.
	Donald Trump is working to expose the truth about the deep state and the cabal.
	There is a group of powerful elites who are involved in child trafficking and other nefarious activities.
	The mainstream media is controlled by the deep state and is spreading lies and propaganda.
	There are coded messages from Q that reveal the truth about what is happening behind the scenes.
	There is a storm coming soon that will sweep away the elites in power and restore the rightful leaders
Conspiracy mentality	(I think that …) many very important things happen in the world, which the public is never informed about.
	(I think that …) politicians usually do not tell us the true motives for their decisions.
	(I think that …) government agencies closely monitor all citizens.
	(I think that …) events which superficially seem to lack a connection are often the result of secret activities.
	(I think that …) there are secret organisations that greatly influence political decisions.

Metacognitive sensitivity

To measure metacognitive sensitivity, we quantified meta-*d′* for each participant (Maniscalco & Lau, 2012). Meta-*d′* measures metacognitive sensitivity in a Signal Detection Theory framework and reflects the extent to which confidence judgments indicate accurate vs. inaccurate responses to the object-level task (here: discerning TRUE from FALSE knowledge statements). Meta-*d′* measures metacognitive sensitivity in the same signal-to-noise ratio units as *d′* uses to measure object-level performance, and hence allows for a straightforward comparison to and control of, object-level performance (*d′*). Indexing both object-level and metacognitive sensitivity within SDT therefore allows metacognitive performance to be directly compared against the benchmark of object-level performance.

Meta-*d′* values of zero indicate that participants just guess when placing confidence judgments (i.e. metacognitive performance at chance level), values > 0 indicate that participants place confidence judgments that are systematically higher for correct vs. incorrect responses (i.e. metacognitive performance above chance level), and values < 0 indicate that participants place confidence judgments that are systematically higher for incorrect vs. correct responses (i.e. metacognitive performance below chance levels).

To compute meta-*d′*, we used a Bayesian procedure developed by Fleming (2017; code at https://github.com/smfleming/HMeta-d).

Bayesian and frequentist regression

In accordance with our preregistered analysis plan, we conducted both frequentist and Bayesian regression analyses. As per frequentist regression, the following models were used:

> *conspiracy belief* ~ *metacognitive sensitivity (meta-d′)* + *object-level knowledge (d′)* + *political attitude* + *gender* + *age* (study 1) and *conspiracy belief* ~ *metacognitive sensitivity (meta-d′)* + *object-level knowledge (d′)* + *political attitude* + *gender* + *age* + *education* (study 2). All concepts were entered as continuous variables, except gender which was coded as 0 – female, 1 – male, and "Other" was coded as missing.

As per Bayesian regression, we used two approaches, selecting the *single-best model* and *Bayesian Model Averaging*. Selecting the single best model entails selecting the *one* regression model that optimally balances predictivity and parsimony out of all combinations of predictor variables. This Bayesian regression was conducted using the *regressionBF* function of the R package *BayesFactor* with default priors (Liang et al., 2008). Default priors are used because they possess properties that are theoretically desirable (location and scale invariance; consistency; and consistent in information, Rouder & Morey, 2012) and were developed to

minimise assumptions about effect sizes (Morey & Rouder, 2011).

Bayesian model averaging summarises posterior probabilities across *all* possible models, weighting each model by its posterior probability. In contrast to classical regression that specifies one more or less arbitrary model and relies on that model for inference, BMA is hence more robust against model misspecification, and produces lower false positive rates (Bergh et al., 2021; Hinne et al., 2020; Mu et al., 2019). Bayesian Model Averaging was conducted using the R package *BAS* with uniform priors.

Results

Belief in conspiracy theories

As hypothesised, the generic conspiracy belief, as measured by the average belief in five or six popular conspiracy theories, was predicted by lower metacognitive sensitivity (meta-d'), controlling for age, gender, and political attitude in Study 1 (see Table 4), and controlling for age, gender, political attitude and education in Study 2 (see Table 5). In addition to these frequentist analyses, this was also confirmed by Bayesian analyses (for details, see Supplement). Crucially, across both studies, metacognitive sensitivity predicted generic conspiracy belief when accounting for object-level knowledge (see Methods), the ability to distinguish true from false statements. Furthermore, metacognitive sensitivity was also predictive for the belief in a vaccination conspiracy theory and QAnon conspiracy theory measured in Study 2 (see Supplement, Table S3 and S4). These results suggest that a stronger conspiracy belief relates to a lower ability to assess the accuracy of one's own knowledge, rather than (only) the accuracy of the knowledge itself (see also Figure 2).

Controlling for object-level thinking styles

In a next step, we tested whether lower metacognitive sensitivity predicted generic conspiracy belief even when accounting for the relation between generic conspiracy belief and specific thinking styles, namely intuitive thinking, cognitive reflection and actively open-minded thinking.

We first predicted generic conspiracy belief by the respective thinking style, object-level knowledge and demographics (age, gender, political attitude, education), and then added metacognitive sensitivity in a second step. Indeed, adding metacognitive sensitivity into the regression predicting generic conspiracy belief by intuitive thinking increased explained variance (Study 1: $\Delta R2 = .008$, $F(\Delta R2) = 5.11$, $p = .024$, Study 2: $\Delta R2 = .010$, $F(\Delta R2) = 7.94$, $p = .005$). When including both in the model, intuitive thinking (Study 1: *b(SE)* = 0.22 (0.08), 95%CI [0.07, 0.38], $p = .004$, Study 2:*b(SE)* = 0.32 (0.06), 95%CI [0.21, 0.44], $p < .001$) as well as metacognitive sensitivity (Study 1: *b(SE)* = −0.21 (0.09), 95% CI [−0.39, −0.03], $p = .024$, Study 2: *b(SE)* = −0.25 (0.09), 95%CI [−0.42, −0.07], $p = .005$) predicted generic conspiracy belief (for details, see Supplement, Table S6 and S7). This was similar regarding cognitive reflection. Adding metacognitive sensitivity increased the explained variance by ΔR2 = .010, ($F(\Delta R2) = 7.64$, $p = .006$) such that in the full model, only metacognitive sensitivity (*b(SE)* = −0.25 (0.09), 95%CI [−0.43, −0.07], $p = .006$) but not cognitive reflection (*b(SE)* = −0.06 (0.05), 95%CI [−0.16, 0.04], $p = .262$) predicted generic conspiracy belief (for details, see Supplement, Table S8). This indicates that metacognitive sensitivity is able to explain generic conspiracy belief beyond intuitive thinking and cognitive reflection. The was not the case for actively open-minded thinking. Here, adding metacognitive sensitivity did not increase explained variance (ΔR2 = .002, $F(\Delta R2) = 1.96$, $p = .162$), and metacognitive sensitivity (*b(SE)* = −0.12 (0.09), 95%CI [−0.29, 0.05], $p = .161$) did not significantly predict generic conspiracy belief beyond actively open-minded thinking (*b(SE)* = −0.47 (0.05), 95%CI

Table 4. Predicting generic conspiracy belief by metacognitive sensitivity Study 1.

Predictor	*b (SE)*	*b* 95% CI	*beta*	*beta* 95% CI	*p*
(Intercept)	2.47 (0.30)	[1.88, 3.06]			<.001
Metacognitive sensitivity	−0.23 (0.09)	[−0.41, −0.05]	−0.12	[−0.22, −0.03]	.012
Object-level knowledge	−0.23 (0.09)	[−0.41, −0.04]	−0.12	[−0.22, −0.02]	.016
Political attitude (left to right)	0.27 (0.05)	[0.17, 0.37]	0.23	[0.15, 0.31]	<.001
Gender (0 – female, 1 – male)	−0.17 (0.13)	[−0.42, 0.07]	−0.06	[−0.14, 0.02]	.169
Age	−0.01 (0.00)	[−0.02, 0.00]	−0.05	[−0.13, 0.04]	.288

Table 5. Predicting generic conspiracy belief by metacognitive sensitivity Study 2.

Predictor	*b (SE)*	*b* 95% CI	*beta*	*Beta* 95% CI	*p*
(Intercept)	3.13 (0.26)	[2.62, 3.64]			
Metacognitive sensitivity	−0.27 (0.09)	[−0.44, −0.10]	−0.12	[−0.20, −0.04]	.002
Object-level knowledge	−0.10 (0.09)	[−0.28, 0.07]	−0.05	[−0.13, 0.03]	.246
Political attitude (left to right)	0.20 (0.03)	[0.14, 0.27]	0.24	[0.16, 0.31]	<.001
Gender (0 – female, 1 – male)	0.07 (0.12)	[−0.16, 0.29]	0.02	[−0.05, 0.09]	.578
Age	−0.01 (0.00)	[−0.02, −0.01]	−0.14	[−0.22, −0.07]	<.001
Education	−0.01 (0.04)	[−0.09, 0.07]	−0.01	[−0.08, 0.07]	.831

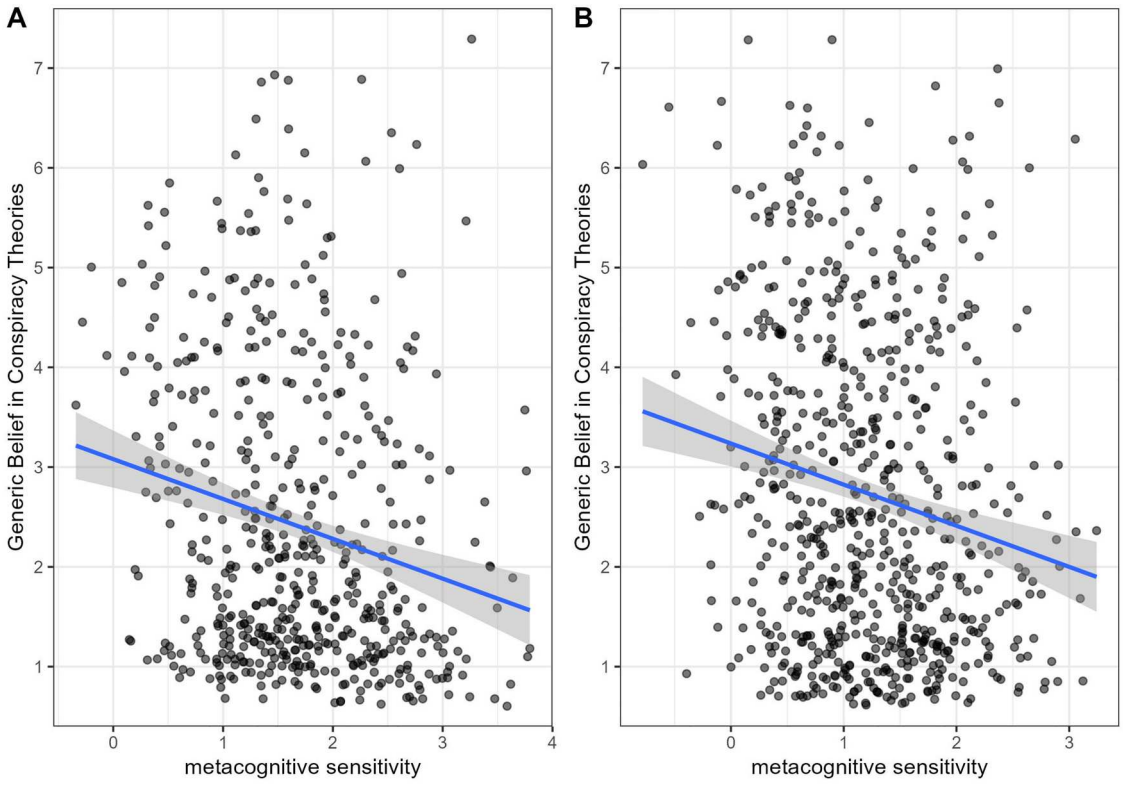

Figure 2. Correlation between Generic conspiracy belief and metacognitive sensitivity in Study 1 (A) and Study 2 (B).

[−0.57, −0.37], $p < .001$, for details see Supplement Table S9).

Overall, a lower metacognitive sensitivity predicted generic conspiracy belief even when controlling for intuitive thinking and cognitive reflection, but not when controlling for actively open-minded thinking.

Conspiracy mentality

We also hypothesised and preregistered that metacognitive sensitivity predicts conspiracy mentality, controlling for object-level knowledge and demographics. This was the case in Study 1 (see Table 6) – albeit only slightly below the corrected alpha-level of .025. While conspiracy mentality was significantly related to a lower metacognitive sensitivity in Study 2 when looking at zero-order correlations (see Supplement Table S2 and Figure 3), metacognitive sensitivity did not predict conspiracy mentality when controlling for object-level knowledge and demographics (see Table 7). For both studies, conspiracy mentality was not significantly predicted by metacognitive sensitivity when controlling for intuitive thinking (see Supplement, Tables S10 and S11), cognitive reflection or actively open-minded thinking (see Supplement, Tables S12 and S13).

Table 6. Predicting conspiracy mentality by metacognitive sensitivity Study 1.

Predictor	*b (SE)*	*b* 95% CI	*beta*	*beta* 95% CI	*p*
(Intercept)	3.38 (0.32)	[2.76, 4.01]			
Metacognitive sensitivity	−0.22 (0.10)	[−0.41, −0.03]	−0.11	[−0.20, −0.01]	.024
Object-level knowledge	−0.32 (0.10)	[−0.52, −0.12]	−0.16	[−0.25, −0.06]	.002
Political attitude (left to right)	0.32 (0.05)	[0.21, 0.42]	0.25	[0.17, 0.33]	<.001
Gender (0 – female, 1 – male)	0.05 (0.13)	[−0.21, 0.31]	0.01	[−0.07, 0.10]	.722
Age	−0.00 (0.01)	[−0.01, 0.01]	−0.01	[−0.09, 0.07]	.798

Discussion

Across two independent, preregistered studies in Germany and the US, the latter based on quota-sampling representative for the US population, across different conspiracy theories, and using frequentist as well as Bayesian analyses, we show that generic conspiracy belief as well as the belief in two specific conspiracy theories (vaccination and QAnon) is related to lower metacognitive sensitivity, the ability to assign due confidence to the varying accuracy of own knowledge. This lower ability to differentiate one's own accurate from inaccurate knowledge (metacognitive sensitivity, meta-

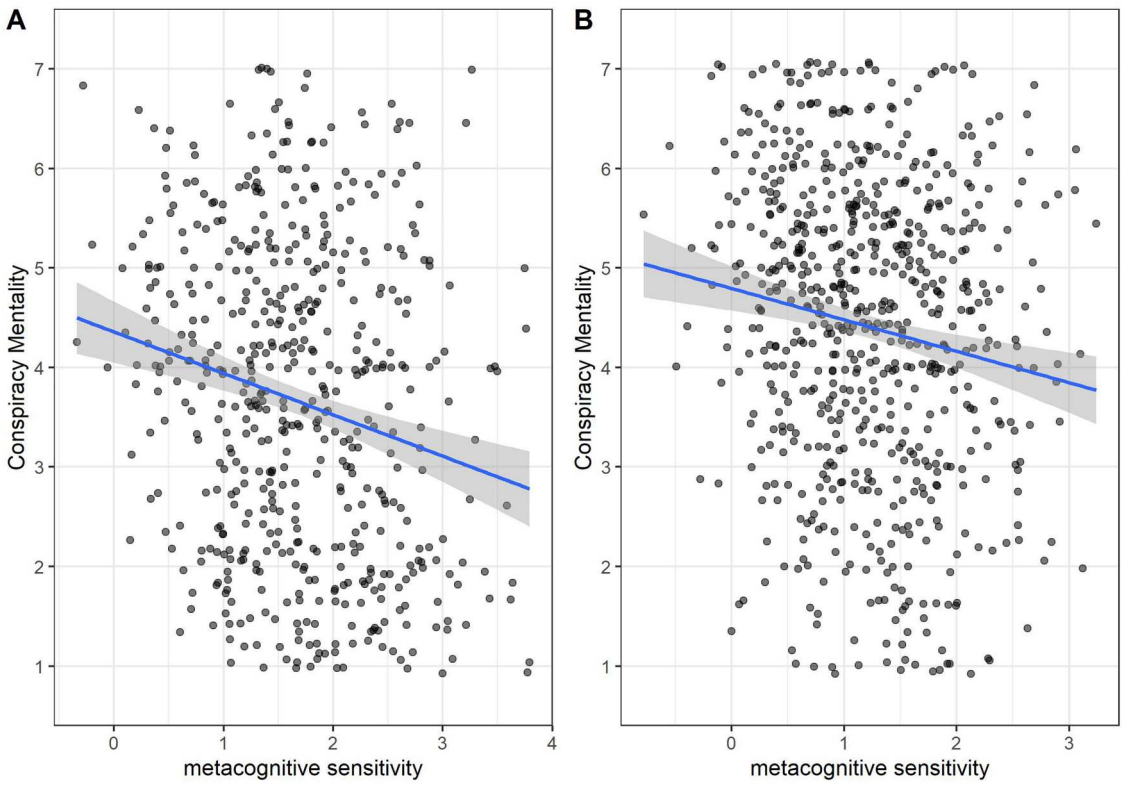

Figure 3. Relation between conspiracy mentality and metacognitive sensitivity in Study 1 (A) and Study 2 (B).

d') is predictive even when accounting for the accuracy of knowledge itself (object-level knowledge, d'), suggesting that an incorrect evaluation of *own* knowledge is related to the belief in popular conspiracy theories. This predictivity of metacognitive reflection of what one knows and does not know is also supported by the result that generic conspiracy belief was related to lower metacognitive sensitivity even when accounting for intuitive thinking and cognitive reflection.

While our results suggest that individuals believing in various conspiracy theories tend to exhibit lower metacognitive sensitivity even when accounting for differences in thinking styles, metacognitive sensitivity did not predict generic conspiracy belief when accounting for actively open-minded thinking. This may suggest that metacognitive sensitivity (i.e. an awareness for own fallibilities) and actively open-minded thinking (i.e. an openness for alternative viewpoints) relate to conspiracy beliefs via similar ways. In general, the relation between actively open-minded thinking and conspiracy beliefs deserves further attention, as an earlier study (Swami et al., 2014) (using all four subscales of actively open-minded thinking) reports a much lower correlation ($r = -.07$) between these concepts than the studies reported above.

We found mixed results regarding conspiracy mentality, which was related to a lower metacognitive sensitivity when looking at zero-order correlations (see Supplement, Tables S1 and S2) and also when controlling for object-level knowledge and demographics in Germany (albeit to a lesser extent than the belief in popular conspiracy theories), but not in the US. These findings add to the discussion on differences between a so-called "generic conspiracy belief" as measured via the belief in several popular conspiracy theories, and the concept of conspiracy mentality (e.g. Alper & Yilmaz, 2023; Douglas & Sutton, 2023; Imhoff et al., 2022; Nera, 2023; Pummerer, 2024). While both concepts assess a general tendency to believe in conspiracy

Table 7. Predicting conspiracy mentality by metacognitive sensitivity Study 2.

Predictor	*b (SE)*	*b* 95% CI	*beta*	*beta* 95% CI	*p*
(Intercept)	4.67 (0.24)	[4.19, 5.14]			
Metacognitive sensitivity	−0.09 (0.08)	[−0.25, 0.07]	−0.04	[−0.12, 0.03]	.281
object-level knowledge	−0.25 (0.08)	[−0.41, −0.08]	−0.12	[−0.20, −0.04]	.003
political attitude (left to right)	0.25 (0.03)	[0.20, 0.31]	0.31	[0.24, 0.38]	<.001
Gender (0 – female, 1 – male)	−0.17 (0.11)	[−0.38, 0.05]	−0.06	[−0.13, 0.02]	.131
Age	−0.01 (0.00)	[−0.02, −0.00]	−0.12	[−0.19, −0.04]	.002
Education	−0.04 (0.04)	[−0.11, 0.04]	−0.04	[−0.11, 0.04]	.343

theories, measures of generic conspiracy beliefs (e.g. Brotherton et al., 2013; Lewandowsky et al., 2015) focus on conspiracy theories that are scientifically implausible, while the conspiracy mentality questionnaire captures a broader suspicion about political events and powerholders, also in situations where such a suspicion is warranted. For example, conspiracy mentality is higher in countries with higher corruption (Alper & Imhoff, 2023). Such indications of warranted suspicion against powerholders might also explain the slightly different findings between the countries. In the US, polarisation between the "left" and the "right" is more pronounced than in the multi-party-system in Germany (Druckman & Levy, 2022; Hudde, 2022), and income differences are greater in the US compared to Germany (Priewe, 2024). Both might make a general suspicion against political and societal elites in the US more plausible, whereas such a suspicion in Germany (so far) is more connected to fringe platforms that share scientifically implausible conspiracy beliefs (Scott, 2022). Overall, findings support the notion also raised in earlier research (Biddlestone et al., 2022; Imhoff et al., 2022) that conspiracy mentality as a measure of general (plausible or implausible suspicion) is less related to biases in thinking styles compared to measures of generic conspiracy beliefs typically consisting of scientifically implausible conspiracy theories.

These results dovetail with Stanovich's work on "contaminated mindware" (Stanovich, 2011). Mindware consists of knowledge, skills, and strategies that promote rational, and epistemically sound decision-making and reasoning. Contaminated mindware, in contrast, negatively impacts reasoning and decision-making. Among these, Stanovich highlights a particularly harmful type: mindware that incorporates mechanisms which undermine critical evaluation (Stanovich, 2011). Our present results suggest that missing metacognitive insight into the validity of one's own object-level cognitions may play a crucial role in this process, undermining the development of more rational and evidence-based beliefs.

Constraints on generality

One reason for the difference found regarding a generic conspiracy belief and conspiracy mentality might be that conspiracy theories popular in Western countries are typically based on beliefs that are scientifically implausible, while conspiracy mentality also captures scientifically plausible ("rational") beliefs (Imhoff et al., 2022; Stojanov & Halberstadt, 2019). This points to an important constraint on generality of the findings: They might specifically apply to Western countries and conspiracy theories that are scientifically implausible. As an additional constraint, it should be mentioned that although the conspiracy theories included in the generic conspiracy belief measure as well as the two specific conspiracy theories (vaccination and QAnon) are among the more popular ones, the mean of the scales measuring belief in the theories was lower than the midpoint (ranging from 2.16 to 2.74 on a 7-point scale). Most participants in the samples scored lower (rather than higher) on the scales measuring conspiracy beliefs. Results, thus, might not apply to people who are extreme believers in conspiracy theories. A further limitation concerns the operationalization of QAnon beliefs. While our measure included six items, only one explicitly referenced "Q", whereas the other items tapped into more general "deep state". Thus, our findings regarding "QAnon belief" may more accurately reflect belief in deep state conspiracy theories more broadly. To address potential concerns, we repeated the analysis excluding the single item that explicitly mentioned "Q" (see Supplement, Table S5).

Conclusion

The present work offers new perspectives for understanding the cognitive correlates of conspiracy theories. Findings point to low metacognitive sensitivity as one key correlate of conspiracy belief. Based on the present results showing that individuals who believe in conspiracy theories exhibit unwarranted patterns of confidence, increasing metacognitive sensitivity might be a way to reduce the rigidity with which people hold conspiracy beliefs. The present results highlight the lowered ability to accurately reflect upon one's own internal knowledge as one cognitive correlate of conspiracy belief – as an additional factor to differences and biases in acquiring and processing object-level knowledge.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

Data and analysis code (R) are available at https://doi.org/10.23668/psycharchives.21255 (data) and https://doi.org/10.23668/psycharchives.21256 (code). Preregistrations can be seen at https://aspredicted.org/ZPR_KGF (Study 1) and https://aspredicted.org/4BV_G1Q (Study 2).

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