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Why metacognition matters in politically contested domains

Helen Fischer[1,2,*] and Stephen Fleming[3,4,5]

Emerging evidence highlights the importance of metacognition – the capacity for insight into the reliability and fallibility of our own knowledge and thought – in politically contested domains. The present synthesis elucidates why metacognition matters in politically charged contexts and its potential impact on how individuals form beliefs, process evidence, and make decisions.

A characteristic of debates around politically contentious topics is the firm belief that the other side is wrong. When beliefs become entrenched, finding common ground and reaching bipartisan agreements becomes difficult, hindering the ability to address pressing issues effectively. Yet, just as identifying errors in others' beliefs is a symptom of contentious debates, its psychological inverse – being able to identify errors in one's own beliefs – offers a potential remedy. An emerging body of research highlights that metacognition (Box 1), defined as insight into the accuracy of knowledge and beliefs, may relate to lower belief polarization. Here we examine how and why metacognition matters in politically contested domains. We highlight the involvement of metacognition in psychological processes such as information search, evidence integration, and belief formation, and how these processes manifest in politically contested domains. Our analysis thereby elucidates how a human capacity to reflect on our own cognitions can help to explain the psychological factors contributing to global challenges, spanning from climate change to pandemics.

Why metacognitive insight matters for contentious topics: domain-general foundations

It is an ancient notion that wisdom lies in recognizing the limits of one's own knowledge, as exemplified by thinkers such as Socrates ('I know that I am intelligent because I know that I know nothing') and Lao Tzu ('To know that one does not know is best; Not to know but to believe that one knows is a disease'). Today, growing empirical evidence indicates that metacognitive insight plays a pivotal role in how individuals accumulate, process, and draw conclusions from evidence; thereby influencing the extent to which these conclusions are justified or wise.

Experiments leveraging the toolbox of cognitive neuroscience have found that holding high confidence in a belief influences how the brain processes subsequent information: high initial confidence amplifies the integration of confirmatory evidence while abolishing the integration of disconfirmatory evidence – a confidence-weighted confirmation bias [1]. This basic mechanism highlights why flawed beliefs may persist despite ample contradictory evidence: high-confidence beliefs resist counteracting evidence. In turn, these findings highlight a role for metacognitive insight in ameliorating confirmation bias: being aware that a belief could be mistaken, and holding it with lower confidence, leads to greater openness to corrective information. This relationship between metacognitive capacity and changes of mind has also been demonstrated in laboratory experiments [2].

Cultivating metacognitive awareness of uncertainty hence aids in drawing justified conclusions from evidence. In turn, metacognition also shapes subsequent behavior. For example, confidence guides information sampling: individuals tend to seek out information that aligns with their initial decisions as their confidence in those decisions rises [3]. Importantly, these effects were observed in an arbitrary perceptual domain (decisions about dot density), where beliefs and choices lack intrinsic personal meaning. This suggests that responsiveness to confidence – and susceptibility to unwarranted confidence – is a fundamental aspect of human behavior.

However, not everyone is equally likely to make use of metacognitive signals. Research indicates that when searching for novel information, more dogmatic individuals are less likely to heed metacognitive signals of uncertainty than less dogmatic individuals [4]. These interindividual differences in the reliance on metacognitive signals may help to explain the varying degrees to which individuals are receptive or resistant to updating of incomplete knowledge when faced with additional evidence.

Extending metacognition into politically contested domains

Recent evidence suggests that these basic interactions between confidence and belief change, initially observed in 'cold', domain-general tasks such as visual perception, also extend to the 'hot' realms of political debate. These studies have highlighted the prevalence of metacognitive confusion: a marked lack of insight among citizens regarding the accuracy of their knowledge about politicized science such as climate change and coronavirus disease 2019 (COVID-19) compared with non-politicized domains such as biology and physics [5–7]. One study surveyed members of the general population on their knowledge related to climate change (e.g., 'True or false? The increase of greenhouse gases is mainly caused by human activities') and general, non-politicized science (e.g., 'True or false? Electrons are smaller than atoms'). Confidence ratings were used to assess metacognitive insight. While citizens were appropriately aware of their knowledge and knowledge gaps in non-politicized

Box 1. Metacognition

Metacognition refers to the class of mechanisms that allow us to form beliefs about other mental operations, and encompasses self-reflection, knowledge assessment, and self-evaluation of learning. A central aspect of metacognition is confidence, reflecting the degree of certainty we assign to other cognitive processes, such as when we have high confidence that our thinking is valid or low confidence that our knowledge is accurate. By fostering awareness of our own cognitive strengths and limitations, metacognition enables individuals to regulate their cognitive activities effectively. For example, individuals may choose to rely on their memory rather than writing a shopping list or, conversely, may decide to learn more about a topic before committing to a course of action.

In laboratory settings, researchers often assess metacognition through tasks that require participants to make judgments about their own performance or knowledge accuracy. For instance, these tasks may require participants to indicate their confidence that a particular perceptual judgment ('Are the dots moving to the left or right?') is accurate. The quality of these metacognitive judgments can then be assessed by determining the statistical relationship between confidence and objective performance. A central measure in this endeavor is metacognitive sensitivity, the extent to which confidence tracks objective performance (in which good metacognitive sensitivity is associated with individuals being more confident when correct and less confident when incorrect).

science, this insight selectively failed for climate change, with confidence becoming decoupled from knowledge [5]. A domain specificity in metacognitive confusion could stem from the prevalence of misinformation, which may act to erode confidence in accurate knowledge and/or bolster confidence in inaccurate knowledge [6]. Recent evidence suggests that the former mechanism is most likely at work: citizens lack confidence in accurate climate change knowledge, rather than exhibiting inflated confidence in inaccurate knowledge [8].

A related line of research seeks to understand the role of political ideology in the accuracy of citizens' metacognitive insight. Studies have generally found little systematic differences in metacognitive insight between Democrats and Republicans when detecting misinformation overall [9,10], instead finding that lower metacognitive insight is more associated with rigidity of political beliefs than any particular ideology [2]. However, a recent study reported that Republicans exhibited lower metacognitive insight relative to Democrats when faced with information contradicting their political views [10], suggesting asymmetries may emerge when the information in question is disagreeable.

Besides these internal factors, external factors also relate to the accuracy of metacognitive insight. There is some evidence that the way science is communicated can help or hinder metacognitive insight. One study scrutinized political decision-makers' interpretation of graphs from the Intergovernmental Panel on Climate Change (IPCC) and their awareness of errors associated with these interpretations. The results revealed that when graphs deviated from robust design assumptions (i.e., when higher bars indicated lower quantities), this deviation not only diminished the precision of conclusions drawn from these graphs – it also impaired metacognitive insight, such that decision-makers' confidence became a less reliable indicator of the accuracy of their conclusions [11]. These results have important implications for how science is communicated to the public to ensure that metacognitive insight is maintained, especially in politically contested domains.

Real-world consequences of metacognitive insight

We are also beginning to understand the real-world consequences of metacognitive insight, or lack thereof. Metacognitive awareness of one's own knowledge and knowledge gaps may play a role in belief formation and the polarization of beliefs about contentious topics. In one study, metacognitive insight was measured in a perceptual task [12]. Notably, individuals identified as climate skeptics had poorer metacognitive insight into their performance on this unrelated task and were less likely to update their climate beliefs in response to novel belief-disconfirming climate change evidence.

As described earlier, confidence also plays a central role in guiding future behavior – and a lack of metacognitive insight can lead to maladaptive choices, as people are likely to act on (high confidence) incorrect beliefs. Accordingly, citizens with lower metacognitive insight into their COVID-19 knowledge exhibited reduced compliance with recommended public health measures (e.g., wearing masks) and a reduced willingness to be vaccinated during the pandemic. Notably, this relationship between metacognitive insight and behavior persisted after accounting for the accuracy of beliefs *per se*, as well as political attitudes and demographic attributes [13]. The implication here is that decisions aligning with the best available evidence hinge on an awareness of the varying degrees of accuracy of one's beliefs rather than only the accuracy of the beliefs themselves. In other words, while it is important to be accurate, it is also important to know when we might be wrong.

These findings highlight the pivotal role of metacognitive awareness in explaining belief formation and responses to new and potentially belief-discordant information. Notably, the effects observed in each study concerning metacognitive insight in politically contested domains tend to be small in magnitude. This suggests that, while metacognition reliably relates to processes of evidence interpretation and belief formation, these relationships may be nuanced, and depend on additional underlying mechanisms. Obvious candidates such as general intelligence appear unlikely, however, as awareness of one's fallibilities is distinct from other facets of fluid intelligence [14]. As such, much remains to be uncovered about the determinants of metacognitive insight in contested domains (Box 2).

Box 2. Open questions and future directions

Prevalence of misinformation

Metacognitive confusion is observed in some domains (climate change or COVID-19) but not others (physics or biology). Future research could seek to distinguish the factors that make a particular domain prone to metacognitive confusion. A plausible avenue for investigation involves the prevalence of misinformation and the success of science communication: if citizens habitually sample low-reliability information, this should reduce their metacognitive sensitivity.

Evidence-based belief updating

What are the conditions that govern evidence-based belief updating? How does metacognitive insight – the capacity to recognize one's own errors – support or interact with intellectual humility – the epistemic virtue of acknowledging one's fallibility? One hypothesis is that metacognitive insight provides the tools necessary for adaptive belief updating, whereas intellectual humility provides the personality and mindset necessary for its implementation.

Political symmetry, asymmetry, or extremism

Which factors determine whether metacognitive insight into misinformation differs between the political left and right? Is metacognitive insight related to the rigidity of political views, one's ideology, or a mix of both? Research has begun to elucidate those factors, but a systematic investigation appears worthwhile.

Can metacognitive insight be improved?

There is an active debate over the effectiveness of interventions aimed at enhancing metacognitive insight [15]. It remains an open question whether and how interventions could improve awareness of the fallibility of knowledge and beliefs.

Concluding remarks

Metacognitive insight presents paradoxical challenges: while it is diminished in contested domains such as climate change and COVID-19, better metacognitive insight relates to lower polarization of beliefs about these issues. By fostering an awareness of the limits of one's own knowledge and thought, metacognitive insight appears to equip individuals with a crucial tool for navigating divisive issues with a more discerning mindset that facilitates truth-seeking and evidence-based judgments rather than confirmation of inaccurate beliefs. In politically contested domains, metacognitive insight may therefore help to lay the foundation for better-informed and more humble debates.

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[1]Leibniz Institut für Wissensmedien, Tübingen, Germany
[2]Karlsruhe Institute of Technology, Karlsruhe, Germany
[3]Department of Experimental Psychology, University College London, London, UK
[4]Wellcome Centre for Human Neuroimaging, University College London, London, UK
[5]Max Planck UCL Centre for Computational Psychiatry and Ageing Research, University College London, London, UK

*Correspondence:
h.fischer@iwm-tuebingen.de (H. Fischer).

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