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Personal Epistemologies and Science Information: Exploring the Role of Scientific Evidence and Trust in Four Science-Related Topics

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Introduction

This chapter is based on a consultation on science communication organised in Portugal, in November 2019, in the context of the EU-funded project CONCISE (Communication Role on Perception and Beliefs of EU Citizens about Science). The main goal of the project was to provide qualitative knowledge through citizen consultation on the sources/channels by which EU citizens acquire their science-related

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A. Fage-Butler et al. (eds.), *Science Communication and Trust*,
https://doi.org/10.1007/978-981-96-1289-5_21

knowledge and to understand how this knowledge influences their beliefs, opinions, and perceptions.

The public consultation was held in Lisbon and had 102 citizens participating each in four rounds of group discussions, each revolving around a distinct science-related topic: climate change, vaccines, complementary and alternative medicine,[1] and GMOs (genetically modified organisms)[2]. Using vignettes to illustrate individual positions, in this chapter, we examine these discussions through the lens of personal epistemology theories (Hofer, 2008) and epistemic trust (Hendriks et al., 2016), focusing on the positions of selected participants throughout the four rounds of discussions of the Portuguese consultation.

Our research question: how are personal epistemologies of science expressed when participants discuss different science-related topics? More specifically, by analysing the basis upon which participants justify their epistemic trust (or distrust) in science and expert knowledge, when assessing information on these subjects, we aim to reflect on the relationships individuals have with science in general and with specific scientific topics and how trust in scientific expertise is contextually interpreted.

Personal Epistemologies and Trust in Science-Related Topics

Personal epistemologies have been defined as individual conceptions of knowledge and knowing that are central to how we think, interpret, and evaluate science (Hofer, 2008). According to Hofer's (2000) review, the study of personal epistemologies encompasses two interrelated areas: the *nature of knowledge* and the *process of knowing*.

[1] Complementary and alternative medicine (CAM) is treatment that falls outside of mainstream healthcare. The Portuguese legislation definition is "Non-conventional therapies are considered those that originate from a philosophical basis different from conventional medicine and apply specific diagnostic processes and their own therapeutic methods" as per Law 45/2003 of August 22.

[2] The formal definition of a GMO in Portuguese legislation is "any organism whose genetic material has been altered in a way that does not occur naturally through mating and/or natural recombination" as per Directive 2001/18/EC, Article 2, No. 2.

On the one hand, the *nature of knowledge*, which pertains to individuals' beliefs about the essence of knowledge, encompasses two dimensions: the certainty of knowledge, which addresses whether knowledge is regarded as certain and absolute or as continuously evolving, and the simplicity of knowledge, which concerns whether knowledge is perceived as discrete, concrete, and knowable or as relative, contingent, and contextual.

On the other hand, the *process of knowing*, which considers how individuals come to know, comprises two sub-dimensions: the source of knowledge, which regards whether individuals mostly rely on external authority, or whether one integrates one's own perspective and reasoning. And the justification for knowing, which encompasses how individuals evaluate knowledge claims. This involves either justifying their beliefs through personal observation and first-hand experience or mobilising the rules of inquiry to integrate arguments based on evidence, reason, or expert opinion.

Research has also shown that personal epistemologies can be both domain-specific and domain-general (Muis et al., 2006). Accordingly, this suggests that knowledge in science can be perceived as more certain and scientific expertise can carry more authority in specific domains than in others (Hofer, 2000). Furthermore, it also means that individuals can hold general beliefs about knowledge but may also make distinctions in relation to particular domains of knowledge (Muis et al., 2006).

Personal epistemologies can be expressed and negotiated differently when we discuss issues that mobilise different norms, values, and ways of knowing (Hofer, 2005). These variations may be influenced by our distinct relationships with the topic and levels of expertise in these areas. For instance, differing degrees of academic orientation and structural organisation within various domains can significantly influence how we contextualise and interpret knowledge dimensions (Glaser et al., 1987). Moreover, our expertise within a specific domain can impact our epistemological awareness of that domain, but it may not necessarily influence how we accept authority or seek answers in unrelated domains (Hofer, 2005).

Most studies about personal epistemologies and domain specificity have adopted a quantitative approach, based on measuring a specific set

of epistemological dimensions that can be tested in relation to specific scientific disciplines (Muis et al., 2006). In most cases, these studies have relied on studying perceptions between different scientific fields, such as mathematics and social sciences (King et al., 1990), psychology and science more generally (Hofer, 2000), or mathematics, social sciences, and business (Schommer-Aikins et al., 2003). However, this approach tends to focus on quantifiable and decontextualised science knowledge beliefs, limiting the ability to understand how people make sense of science-related topics in their daily lives.

In recent years, there has been a push to expand the scope of personal epistemology studies beyond constrictive notions of scientific domains towards a more integrated model, where "individuals' personal epistemologies can be understood as evolving through a non-linear and recursive path" (Diamond & Stylianides, 2017, p. 334). This shift involved the incorporation of other significant domains of individuals' experiences and worldviews into the development of their personal epistemologies, and considering the wide spectrum of knowledge and epistemic resources that people draw upon when reasoning about specific topics or scientific claims (Davis & Russ, 2012).

Particularly relevant is the exploration of personal epistemologies within the context of individuals' information behaviour (Kelly, 2020). For instance, in the field of science communication, Suldovsky and Taylor-Rodríguez (2021) explored the relationship between personal epistemology and public engagement on a controversial topic affected by declining trust in science among political groups. They analysed citizens' engagement preferences on the topic of climate change for liberals, moderates, and conservatives living in Oregon (USA) and found that liberals prioritise expert knowledge and perceive climate science as certain, while conservatives rely on direct experience and view it as uncertain. Notably, perceived certainty and simplicity of climate knowledge correlated with a preference for the deficit model of science communication.

Schwarzenegger (2020) further developed this notion and introduced the concept of "personal epistemologies of the media" to explore the relationship between personal epistemologies and the decision-making process of whom to trust or challenge as information sources. According

to Schwarzenegger (2020), personal epistemologies extend beyond mere epistemic beliefs, as they encompass a broader range of factors, such as prior experiences with topics, worldviews, and political orientations, as well as judgments of personal taste, aesthetics, values, and assumed truths regarding the social and physical world. Within his analysis, he discerned three interrelated dimensions that exert a significant influence on users' navigation of media and news repertoires: selective criticality, pragmatic trust, and competence–confidence.

These studies are relevant because they provide evidence of how personal epistemologies do not have to be necessarily restricted to scientific disciplines or quantifiable notions of belief, truth, and justification. Instead, they are seen as dynamic and contextual, influencing the way individuals make sense of specific issues in their daily lives. Additionally, they highlight the importance of personal epistemologies in studies on trust in science and science communication, by drawing attention to the articulations between people's experiences, their understandings of the nature of science, and their epistemological assumptions about sources of information.

Lastly, this perspective is supported by research on trust that showcases how trust in science varies widely when specific topics are considered. Hendriks et al. (2016) suggest that such variation can be attributed to a difference between a personal position about a topic and personal trust in the science that produces knowledge about that topic, a distinction that is frequently difficult to make. They note, "when a science-related topic is of interest for segments of the public, then these sub-populations develop personal stances related to this topic. These stances thereby modify their 'default' trust in science" (Hendriks et al., 2016, p.151). In other words, epistemic trust in science—understood as trust in knowledge that has been produced or provided by scientists—is contextually defined and evolves in response to the public's perspectives towards specific scientific topics. Personal experiences with topics, controversial debates, political orientations, and epistemic beliefs about science and media, among others, all influence how individuals interpret and evaluate information on science-related topics and decide whom they can trust to provide reliable knowledge within specific domains.

Data and Method

In this article, we conduct an exploratory qualitative analysis based on fieldwork carried out in Portugal as part of the EU-funded (H2020 SwafS) research project CONCISE. The data was collected during a one-day public consultation, where 102 citizens were invited to engage in four rounds of group discussions on science communication, totalling 48 discussions (12 round tables for each topic). Each round of discussion focused on a specific science-related topic: climate change (CC), vaccines (VAX), complementary and alternative medicine (CAM), and genetically modified organisms (GMOs). Each participant participated in four rounds of discussions and debated the four topics.

Each round table included eight to nine participants who remained in the same group for the initial two discussions before switching groups for the subsequent two. At each table, there was a facilitator and an observer who recorded the group's dynamics and the participants' attitudes during the discussions. The discussions were structured into three parts: understanding how citizens perceive science communication, identifying the information sources and channels they rely on and trust, and gathering suggestions for improving science communication.

Participants were recruited through various means, including the press, social media, institutional mailing lists, posters, leaflets, and targeted email campaigns. To achieve our goal of having 100 citizens participate in the consultation, we admitted a substantial number of registrants to the study. The primary exception was science communication professionals, who were requested not to attend due to their close relationship with the topic under discussion. Although participants were not a representative sample of the Portuguese population, it was diverse in terms of age (ranging from 18 to 76), gender, origin, education, and professional backgrounds.

All 48 group discussions were recorded and subsequently transcribed. During the manual transcription process, the data was anonymised, and a unique identifier was assigned to each participant. Following this, we employed Nvivo to automatically create a case node for each participant based on their respective identifiers (Dhakal, 2022). This method

facilitated the systematic capture of each participant's contributions throughout the four discussions.

For this chapter, we have decided to base our analysis on individual vignettes (Jacobsen, 2014; Lupton, 2019). Vignettes are short narratives, especially useful when working with rich qualitative material, including interviews and focus groups, since they provide a way to "pull the threads" of an individual's account together and contextually situate the participant's narratives of their experiences (Maslen & Lupton, 2020). In the case of our study, since each participant took part in four separate group discussions, the use of vignettes offers a unique opportunity to analyse the contributions participants made separately on each topic. This approach facilitated the creation of detailed narratives capturing the varied ways individuals expressed their personal epistemologies of knowledge and trust throughout the consultation while underscoring the diversity of their viewpoints across the different scientific domains.

To produce the vignettes, we reviewed the outputs of each case node in Nvivo (i.e., the contributions of each participant), paying particular attention to the participants whose positions during the four discussions were clearly articulated. In this initial analysis, we specifically examined the way participants expressed their positions and the role they attributed to both science and expert knowledge when assessing and trusting information on these subjects. This exploration led us to identify five cases that displayed significant depth and paradigmatic relevance, serving as illustrations of diverse expressions of personal epistemologies of knowledge, the role of scientific evidence, and trust in the scientific process concerning the four topics under discussion. All five cases are university graduates (as well as the majority of the participants in the consultation).

The vignettes were produced and reviewed by the authors of the chapter and were derived from a thorough analysis of the participants' contributions to each discussion. Each vignette is identified by an alias. The use of anonymised data meant that seeking participant approval for these vignettes was not an option. Consequently, these vignettes should not be interpreted as exact representations of the participants' views on the discussed topics. Nevertheless, they provide significant insights into the participants' personal epistemologies about science and trust, as

inferred from the perspectives they shared with others in a very specific setting—a group discussion on science communication.

We analyse these individual perspectives to gain a better understanding of how issues related to trust and scientific evidence are approached regarding specific domains. Specifically, we delve into the epistemological foundations they used to make sense of the topics, the knowledge they drew upon to justify their opinions, the consistency of their viewpoints throughout the discussions, and the role they attributed to science and expert knowledge in each topic.

Analysis

A brief note on context. Portugal may not have the most advanced scientific system in Europe but for the past three decades, it has made a substantial effort in bringing science to the public. There is a national agency in charge of promoting scientific culture, all research institutions are required to perform science dissemination to get public funding, and science communication is a thriving profession with its own association and annual conference (Entradas et al., 2020). Mejlgaard et al. (2012), in their cluster analysis of the role and location of science in European countries, classified Portugal as "consolidated" in terms of science communication culture. Survey results have regularly demonstrated that trust in science and in scientists is quite high: the 2018 Wellcome Global Monitor shows that 34% of Portuguese respondents have high trust (the global average is 18%), 54% have medium trust, and 11% low trust in the Trust in Science Index.

The following vignettes are illustrative of how personal epistemologies play a significant role in how citizens interpret and evaluate information and allocate trust on science-related topics.

Vignette 1: André (male, land planning, late thirties)

CC: André learned about the consultation on Facebook through a pro-science association, an organisation devoted to promoting science-based scepticism and resisting the spread of pseudoscience. He mentions that climate change it is not a topic he actively seeks out but

rather something he encounters passively in online newspapers and on social media. He often relies on sources shared by the sceptic community group, which he describes as an 'absolutely robust scrutinising machine.' During what he calls the 'last years of the post-truth era,' he developed a method to access information that involves: seeking credible sources, verifying the origins of information (including scientific studies), and always looking for counterarguments to better position and defend his views. He believes that information on this topic is relatively unambiguous and easier to connect with various positions influenced by political ideologies.

VAX: This is a topic he has not actively sought out much information on and he mostly relies on medical professionals for guidance. He has engaged in discussions with a friend who harbours doubts about vaccines and finds it enlightening to understand the reasons behind their hesitancy. He also recognizes the potential risks of avoiding critical discussions, as it may create voids that allow for other forms of questioning. He emphasises the importance of trusting the scientific process and underscores that one individual case is not statistically significant.

CAM: His current stance towards science was mainly sparked by his curiosity about CAM. His girlfriend is a CAM advocate and works in the field, which prompted him to delve deeper to understand why people choose alternative therapies over conventional medicine. This exploration has made him increasingly sceptical about CAM. He views CAM as a fascinating subject for examining what drives belief in alternative therapies, describing it as having an inclusive nature that aims for our well-being. He acknowledges that the complexity and elusiveness of science make it challenging for people to trust. Nevertheless, he emphasises the importance of regulation and trust in scientific experts in these matters.

GMOs: He considers them a positive scientific development, but notes that there is often an ideological, non-scientific component to people's perceptions of GMOs. He describes it as a topic that blends various factors, making it difficult to separate them. André highlights the distinction between the scientific aspects and the role of large corporations in the GMOs discussion. He believes that CAM advocacy,

vaccine hesitancy, and criticism of GMOs all tend to stem from a lack of trust in science and large private corporations. He believes that science has not effectively informed the public about this issue, and the lack of clarity around the term 'biological' further complicates the matter. However, he personally expresses trust and appreciation for living under EU regulation, which alleviates his concerns about GMOs.

Vignette 2: Sofia (female, lab technician, late twenties)

CC: She is particularly attuned to the issue of climate change and has curated her social media feed to access information tailored to her interests. She follows the IPCC and UN closely, giving precedence to scientific sources. She is cautious in relation to NGOs and scrutinises their funding sources. She observes a significant gap between scientific understanding and public awareness on this matter. She mentions an incident involving an academic journal publishing a false article, highlighting a systemic issue within the scientific community. She also notes the connection between climate change and significant economic interests. She contends that discussions on secondary issues like recycling divert attention from more critical matters. She stresses the need for accessible resources to help people comprehend complex issues and locate reliable scientific information, expressing concern about the prevailing tendency to view everything through the lens of personal opinion.
VAX: She has observed numerous discussions surrounding vaccines in her social networks, which pique her interest in the subject. She actively gathers information to stay informed and be prepared for discussions with friends who seek insights from individuals with scientific backgrounds like her, but she refrains from sharing information online, fearing that it may inadvertently empower anti-vaccine movements. Her information-seeking habits involve consulting reputable sources such as health clinic websites, the World Health Organization (WHO), and scientific articles, but she also refers to her doctor as her primary source of information. She has a much more critical stance toward private laboratories that sell vaccines.

CAM: Sofia has developed a keen interest in osteopathy, prompted by a friend's recommendation. She is currently exploring this field, particularly Chinese medicine, on a part-time basis. However, she seeks sources that are credible and certified, distinct from what she calls "old-fashioned practices resembling witchcraft". She emphasises India and China as vital repositories of knowledge in this realm, stressing that modern science has evolved from traditional wisdom over millennia. She advocates for greater availability of information on these traditions and critiques the scepticism that exists towards CAM within the scientific community. She highlights the value of CAM in underexplored aspects of conventional medicine, such as the placebo effect or holistic bodily health.
GMOs: She has extensive knowledge of GMOs due to her field of work. She values their importance but acknowledges the need for preventing them from reproducing due to the potential risks of disrupting ecosystems. She views GMOs as a considerably more intricate topic than vaccines, with numerous factors to consider and consequences that are often challenging to test. She points out the complexity of distinguishing between fundamentalist views, hidden interests, and ethical arguments within the GMOs discourse making it difficult to discern reliable sources. She acknowledges the difficulty in reaching definitive conclusions, recognizing that individual values and priorities play a pivotal role in shaping perspectives on this complex issue.

Vignette 3: Nuno (male, physician, early forties)

CC: Nuno believes there is an abundance of information on climate change. He primarily relies on social media and online newspapers as his sources of information. When searching for information, he considers it essential to validate the claims by evaluating the scientific evidence that has accumulated in a certain direction. Not all studies are equal, and individuals must possess scientific literacy and critical thinking skills to evaluate it. However, he notes that science is not entirely neutral, and there is a need for impartial evaluations, meta-analyses, and systematic reviews. Sometimes the conclusion is that

there is no absolute truth. Nevertheless, for the general public, some aspects can be intricate and science must find ways to make information accessible to them. Public entities should bear responsibilities in this regard.

VAX: Nuno works in the field and acknowledges that his opinion is biased. He possesses substantial knowledge about the scientific and public policies related to vaccines. He believes there is a deficit of information in the general population on this topic and that many misconceptions exist not only regarding the side effects of vaccines but also concerning public policies and available information. He strongly criticises the anti-vax movement because he believes it endangers others and considers vaccination a social responsibility that everyone should uphold. While he does not advocate for mandatory vaccination, he emphasises the importance of informed choice.

CAM: Nuno believes that CAM is a pseudo-science and that the political validation it receives in Portugal is counterproductive. He thinks that some CAM practices may have placebo effects but lack scientific validity, leading to widespread misunderstandings on the topic. In conventional medicine, there are rigorous studies, evidence, and research, whereas CAM often lacks sufficient evidence. Therefore, he contends that homoeopathic products should not be labelled as medicine since they are not subject to the same regulations as conventional medicines. In conventional medicine, treatments that prove ineffective are discontinued, reflecting an ongoing process of refinement. Nuno believes that the scientific method should be applied uniformly, and CAM practices must be held to the same standards. He understands that people turn to CAM when they do not find answers in conventional medicine, but he is critical of those who sell ineffective products, emphasising that individual cases should not be generalised.

GMOs: Nuno has limited knowledge on this topic and does not hold a strong opinion about it. He recognizes that various factors come into play concerning the environment and public health, but he has not formed a definitive position towards it.

Vignette 4: António (male, retired designer, early seventies)

CC: He considers climate change a very important issue and worries about the future of the planet. He believes that there is an excessive amount of information on the subject, but much of it is not directly related to people's everyday lives, which can desensitise public opinion on the issue. He values the role NGOs and artists have in raising awareness on the issue. Although he appreciates the scientific information available on the subject, he believes that a purely scientific discussion around climate change—based on notions of absolute truth and the sanctity of science—is pointless. He also points out that there are scientists who argue against the existence of climate change. He thinks there should be more information on how citizens can take action, not just science information. He highlights the importance of decisive political and economic action to address it.

VAX: He is highly sceptical of vaccine benefits and worries about their health impacts. He thinks that vaccination in Portugal is an accomplished fact, a consensual topic that people consider beyond debate, and that, because of that, there is no good information on the issue. He believes that people cannot make objective decisions because there is no information on the adverse effects. He considers that there is no scientific consensus on this matter, and the information is not clear on the subject. He is aware of many cases of side effects, including his own. He believes that science is a specific belief system with a high degree of uncertainty, and citizens need to cross-reference scientific information with information from everyday life to reduce the degree of uncertainty when making choices. He refers to the fact that there is no such thing as complete neutrality in research and that universities are often funded by pharmaceutical companies.

CAM: He is a CAM advocate and studied the topic in India. He considers there is a lot of quackery around CAM in Portugal and that it is important to turn to the best sources, such as Ayurvedic universities, the School of Traditional Chinese Medicine, or homoeopathy centres. He thinks there is scientific ethnocentrism in how traditional medicines are seen. He considers them legitimate forms of medicine with theories, scientists, and medical practice. He blames the pharmaceutical and medical lobby for creating barriers and misconceptions and for the lack of information on the topic.

GMOs: He is against GMOs and thinks they are an invention of the agribusiness. He considers that there is no good information on the issue and that they pose a risk to biodiversity and health. He worries about research in biogenetics. He thinks it is a topic where consumers have more to say because they can stop consuming GMO products. He considers the EU could have a more important role in regulating it by creating positive discrimination towards non-GMO agriculture in Europe.

Vignette 5: Júlia (female, biology teacher, mid-fifties)

CC: She subscribes to several scientific journals, follows several scientists and the IPCC, and she often shares information with her students. She believes people may not understand the urgency of the topic because many impacts are projected as long-term. She thinks that individual choices and policymaking should be based on the positive and negative impacts already mapped by science and believes that too much information on the topic can be counterproductive if people do not have the knowledge and scientific reasoning to assess the information. People do not have access to evidence and experience.
VAX: She reads a lot of scientific information about the topic, namely from journals and websites like *Science*, *Nature*, and *Science Daily*. She is not against vaccines but questions the existence of a universal vaccine, and the way some vaccines operate and are administered. She believes that in order to reflect on these issues and be able to identify what is fake or what comes from pharmaceutical lobbies, it is important to inform herself. She had some hesitations and only vaccinated her son when he was one year old, with the agreement of her paediatrician. She thinks that science is dynamic and contextual; it is important to provide people with the basis to read and interpret scientific information because it changes every day.
CAM: She is a CAM advocate. She believes there are tensions between traditional and alternative medicines, as well as too much misinformation and resistance from those in traditional medicine. She thinks both medicines are complementary and supports alternative medicines as part of the healing process. She is surprised when she perceives that

scepticism towards CAM is much higher than towards VAX. She questions why it is easier for us to take something we do not know what is inside (vaccines) and so difficult to take something that is natural (CAM). She thinks that this is due to cultural factors and believes there are cultural prejudices towards CAM. She defends that there are scientific articles supporting areas like Reiki or meditation.

GMOs: It is a subject she informed herself about to be able to teach her students. She thinks it is a complex topic with contradictory information and believes it is important to seek scientific knowledge not to criticise, but to question. She thinks that there are not enough studies about GMOs' impacts, so she tries to stay informed to see what studies there are for and against. She uses NGO websites as sources of information. She thinks that the reason there is not much attention given to the topic is that there are no long-term studies that can help us measure impacts. She thinks we cannot be blind to science; this type of intervention can have unforeseen consequences, like the ones we are seeing with the climate. She is scared by the fact that people are so uninformed on the subject, leaving decisions to politicians only.

Discussion

These vignettes illustrate how the five selected participants expressed their epistemic assumptions about authority, media, and the role of science during the group discussions and how these are profoundly intertwined with the way they access information and sources but also the difference in attitudes towards different science-related topics. The vignettes also reveal how they relate to science in different ways when specific topics are considered expressing different degrees of epistemic trust in scientists and scientific expertise (Muis et al., 2006). Educational background, occupational activities, and personal experiences all colour the way the selected participants envision scientific topics and trust the scientific establishment and its professionals (Hendriks et al., 2016).

Some of the participants shared similar viewpoints, albeit with individual nuances. Nuno and André, for example, share similar positions

regarding the role of science and scientific knowledge in all topics. They both emphasise the importance of scientific evidence and express trust in the scientific process. They express high confidence in scientists in specific topics (vaccines for Nuno and CAM for André) and rely on a more pragmatic trust in external sources of authority on topics about which they are less knowledgeable. However, their paths to these understandings are distinct. Nuno is heavily influenced by his academic background and professional experience, leading him to adopt a more assured standpoint in relation to the authoritative value of science. André's interest in these topics seems to be primarily driven by personal curiosity and exploration. The two men also highlight different aspects related to science production and communication. Nuno expresses an epistemic trust in the scientific process (and is mostly concerned with the difficulty of making scientific information accessible to the public). André, on the other hand, is more interested in the inherent complexity of these issues and understands that some topics are more "open to interpretation", which explains the difficulty scientific knowledge has in establishing itself as the main criteria for evaluation in specific fields.

In contrast, Sofia and Júlia showed less consistent positions towards the role of science in all the discussed topics. Both value the importance of scientific knowledge and actively seek information from what they consider to be credible sources regarding the four topics. They are both interested in the topic of vaccines and emphasise the need to stay informed on the topic, even though they rely on their physicians for reference. They show a selective critical approach to sources of information often highlighting the need to discern hidden biases, such as those of NGOs and pharmaceutical companies. This selectivity becomes more evident in the case of CAM. They are both advocates of CAM and believe that cultural prejudices exist towards these practices. They see this as a result of the clash between conventional and alternative medicines, leading them to manifest an epistemic distrust in the scientific community's stance on the topic. They draw on their own positive personal experiences with CAM but also highlight the existence of credible alternative knowledge on the topic, whether from certified sources or scientific literature, to justify their interest and position. They both

refer to the importance of science information to be able to question assumptions and help people make informed decisions.

António, on the other hand, stands out and demonstrates much lower levels of trust in science in all the topics in discussion, often criticising the scientific process, functioning, and implementation. For him, science is "just another system of beliefs" and as such, it is susceptible to be criticised as any other. He criticises science's detachment from everyday life and considers that purely scientific discussions are often pointless. He was one of the consultation participants who expressed more concern about vaccines.

Scientific knowledge was considered less certain and straightforward in CAM and GMOs, where the inherent complexity of the topic was acknowledged by several participants. However, domain specificity (Muis et al., 2006) was much more evident in the case of CAM. Although some participants were critical about these kinds of practices, highlighting the lack of scientific evidence and regulatory mandates as conventional medicine, others found space to question the certainty of current scientific knowledge on the topic and to defend the validity of alternative sources of knowledge. Scientific expertise carried greater authority in domains like vaccines and climate change, even if the inherent uncertainties of the scientific process were acknowledged, particularly by participants with lower levels of trust in science and heightened selectivity regarding information sources (Schwarzenegger, 2020).

Even among participants with seemingly similar epistemic orientations towards science, subtle differences and nuances emerged in how they valued and assessed scientific knowledge, particularly in terms of its certainty or simplicity (Hofer, 2005). These differences are often obscured in larger quantitative studies, albeit they reflect diverse conceptions of the normative role that science plays or should play in various aspects of society. They also underscore the intricate ways in which scientific knowledge is contextually interpreted and negotiated.

Furthermore, the cases presented also illustrated how personal epistemologies articulate specific orientations towards science communication (Suldovsky & Taylor-Rodríguez, 2021). Participants who emphasised the complexity and uncertainty of the scientific knowledge associated with

the topics under discussion often stressed the importance of citizens' critical questioning and active engagement. This inclination was particularly conspicuous in the context of more controversial topics such as CAM or GMOs but was also visible in the discourse of participants who expressed criticism or hesitation regarding vaccines.

Conclusion

The use of rich individual vignettes to describe participants' position in the four group discussions offers us an opportunity to better understand how their professional and academic background, personal experiences, and relations, all shaped, in different ways, the specific way they think, interpret, and evaluate different science-related topics. The analysis illustrates how citizens' personal epistemologies towards different science-related issues tend to reflect general beliefs about knowledge but are also shaped by domain specificity. While some participants expressed more consistent epistemic positions towards the role of science in all the discussions, others showed more contextual understandings. Differences between domains reflected not so much a lack of information on the topic, but a specific understanding of the role of scientific evidence within that domain.

Nevertheless, we must acknowledge the exploratory nature of this study, as well as its limitations. The cases presented were selected by the authors because of their paradigmatic relevance and capacity to illustrate diverse expressions of personal epistemologies. This might signify a bias towards science-oriented participants who were more comfortable expressing their views within a large group discussion. Future studies on personal epistemologies of science should strive for a more diverse and representative sample and explore alternative methodologies of data collection that would allow delving deeper into the contextual interpretation of trust in science in everyday life and a more comprehensive understanding of how individuals' diverse backgrounds and perspectives shape their relationships with science.

In conclusion, this research underscores the dynamic and topic-dependent nature of personal epistemologies and trust in scientific expertise and their profound influence on the way individuals engage with and evaluate science-related topics. It emphasises the need for tailored approaches to science communication that account for the nuanced epistemological positions held by different individuals across various domains of scientific knowledge.

Acknowledgements We are grateful to our colleagues in the CONCISE project with whom we co-constructed the methodology for the consultation and analysis. We are also grateful to the reviewers who have made insightful comments and suggestion.

Funding The CONCISE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824537.

Research Ethics Statement The project CONCISE had an Ethics advisor and written guidance on the technical and organisational measures implemented to safeguard the rights and freedoms of the data subjects/research (Deliverable 6.2) and an analysis of the potential risk the proposed research raises in regard to the vulnerable populations, and the measures to protect them and minimise the risk of their stigmatisation (Deliverable 6.5), as well as instructions on obtaining informed consent (Deliverable 6.4).

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