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People's understanding of the concept of misinformation

Magda Osman[a], Zoe Adams[b], Bjoern Meder[c], Christos Bechlivanidis[d], Omar Verduga[e] and Colin Strong[f]

[a]Centre for Science and Policy, University of Cambridge, Cambridge, United Kingdom; [b]Department of Linguistics, School of Languages, Linguistics and Film, Queen Mary University of London, London, United Kingdom; [c]Department of Psychology, University College London, London, United Kingdom; [d]Department of Psychology, Health and Medical University, Potsdam, Germany; [e]Biological and Experimental Psychology Group, Queen Mary University of London, London, United Kingdom; [f]Behavioural Science, Ipsos Mori, London, United Kingdom

ABSTRACT

In the main, work has focused on defining and conceptualising the term misinformation, why and how people share misinformation, as well as the consequences for individual behaviour and policy making. Misinformation is an especially live issue in the context of the SARS-CoV-2 pandemic, and the communication that people use to inform their interpretations of risks, and claims about what is needed to reduce exposure and spread of the virus. However, we know very little about what the public take the concept of misinformation to mean. Therefore, here and for other matters of public interest, it is worth understanding what informs the way people report what misinformation means to them. To address this, we present findings from a large scale representative survey ($N = 4{,}407$) from four countries (Russia, Turkey, UK, USA) to investigate the various ways in which people understand the concept of misinformation. Intentionality appears to matter, where most agreement was for the general description of misinformation as 'Information that is intentionally designed to mislead' (69.00%). Relative to other sources (e.g. media, other people), experts (48.38%) and scientific evidence (60.20%) were the most common sources by which to determine that something is misinformation. Finally, looking at specific features of information, misinformation was most associated with information that exaggerated conclusions from facts (49.24%), didn't provide a complete picture (48.83%), and was presented as fact rather than opinion or rumour (43.07%). In general, country and demographic factors (age, gender, education, marital status, employment status) did not appear to distinguish these patterns of responses. This work helps to reveal what people report they take the concept of misinformation to mean, which may inform ways of targeting it.

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Public understanding of misinformation; misleading information; scientific evidence; expert opinion

Introduction

The fight against the SARS-CoV-2 (alternatively referred to as COVID-19) pandemic not only involves combating a global public health crisis but also several other factors. Notably, the pandemic has given rise to a plethora of misinformation that is proposed to hamper efforts to

CONTACT Zoe Adams z.adams@qmul.ac.uk Department of Linguistics, School of Languages, Linguistics and Film, Queen Mary University of London, London, United Kingdom.

overcome it. This 'infodemic' comprises generating several beliefs, such as that vaccines contain microchips, or that the spread of the virus is related to the 5G mobile telephone technology. At the same time, the infodemic crisis involves fundamental uncertainties and valid questions which are reflected in both the scientific and public discourse which we now discuss.

For instance, there is a waxing and waning of several competing hypotheses where no scientific consensus has emerged yet. A case in point is the origin of the SARS-CoV-2 virus, a question that has led to fierce debates in the scientific, political, and public sphere. Early in the pandemic, several researchers propose that the SARS-CoV-2 virus likely stems from cross-species transmission from animal to human ('zoonosis hypothesis'). In support, there are several published articles in leading scientific journals (Andersen et al. 2020; Burki 2020; Calisher et al. 2020; Casadevall, Weiss, and Imperiale 2021; Holmes et al. 2021; Latinne et al. 2020; Lau et al. 2020; Rasmussen 2021; Von Borowski and Trentin 2021; Zhang and Holmes 2020; Zhou et al. 2020). These same articles also make a strong case against the hypothesis that the virus was artificial in origin such as being bioengineered ('laboratory engineering hypothesis'). However, there are also scientific publications that have not ruled out the artificial origin of SARS-CoV-2 (Decroly, Claverie, and Canard 2021; Deigin and Segreto 2021: Piplani et al. 2021; Sallard et al. 2021; Segreto and Deigin 2021; Segreto et al. 2021; Seyran et al. 2021; van Helden et al. 2021). Several other hypotheses consider pollution, environmental, and ecological factors (Banerjee et al. 2021; Domingo 2021; Han et al. 2020; He, Shao, and Han 2021; Hu et al. 2021; Jo et al. 2021; Lytras et al. 2022; Malaiyan et al. 2021; Zhou et al. 2021; Zhou and Shi 2021). What's more, the World Health Organisation (WHO) also explicitly asserted in public communication that all hypotheses remain open for evaluation (WHO 2021a, 2021b), including the artificial origin of the virus.

The example also raises important questions regarding how the concept of misinformation is understood by the public. For instance, in public discourse does the intention to mislead count as the basis on which to delineate what is from what isn't misinformation? And if so, what cues do people use to determine whether a piece of information is intentionally misleading? Does it also matter if the claim that is communicated exaggerates the facts, draws unsubstantiated conclusions, or is later shown to be a lie, critically matter? If we return to the origin of SARS-CoV-2, by carefully reviewing the evidence for the competing hypotheses even an impartial observer with scientific expertise might struggle to delineate what is misinformation from what isn't. If they are an expert in one field (e.g. psychology) then they may not be equipped to evaluate the relevant scientific evidence from other fields (e.g. virology, biochemistry, medicine) that support competing claims. The impartial expert may instead have to make a determination based on the source and quality of where the findings are published, and what authorities support particular claims. If most of the competing findings are published in the most prestigious journals, then here also delineating credible information from misinformation will be hard to do. Even if they are an impartial expert in various relevant fields (e.g. virology, biochemistry, medicine), then they still have to consider the quality of data, empirical methods and analyses on which to evaluate the competing claims, and may find that on the whole the data, methods and analyses for each side are valid.

What happens in cases when the impartial observer is not a scientific expert? What types of conditions do they set to be able to judge what is from what isn't misinformation? Scientists studying misinformation have come up with different criteria for labelling particular claims as misinformation (Tandoc et al. 2018; Hameleers, Van der Meer, and Vliegenthart 2021; Vraga and Bode 2020). However, little is known about how the public conceptualises the notion of misinformation and what aspects they consider when distinguishing fact from falsehood, and so we know little about whether this aligns with how researchers conceptualise it. The present study aims to shed some light on this by looking at what the general concept of misinformation is taken to be by the public, the sources they use to judge misinformation, and the specific features that they think might constitute misinformation. Crucially, by focusing on general factors

rather than specific examples of misinformation, the rationale is that the findings from our survey could be used to generalise to the way any type of information, be it the communication of risks, or particular scientific claims, may be conceptualised as misinformation. Therefore, at the end of this article we apply insights from our findings to examine the particular status of misinformation with respect to the scientific uncertainty regarding the origin of SARS-CoV-2, which continues to be a matter of public interest.

Review of the literature

Misinformation is claimed to be widespread in recent years (Bode and Vraga 2015; Chen and Sin 2013; Guo et al. 2019; Lewandowsky et al. 2012; Wang et al. 2019; Wu et al. 2019) and has been subject to fierce academic debate as well as media scrutiny. In the context of the SARS-CoV-2 pandemic, the spread of rumours and misinformation has been coined an 'infodemic' that needs to be battled just as the virus itself (Naeem and Bhatti 2020; Orso et al. 2020; Patwa et al. 2021; Zarcostas 2020). Indeed, there is considerable theoretical and empirical work that has focused on understanding the psychological and social processes that lead to the adoption of (Cann and Katz 2005; Margolin 2021; Pan, Liu, and Fang 2021; Schwarz and Jalbert 2021; Stecula, Kuru, and Jamieson 2020), the spread of (Duffy, Tandoc, and Ling 2020; Effron and Raj 2020; Kirkpatrick 2021; Pennycook et al. 2021; Petersen, Osmundsen, and Arceneaux 2020; Talwar et al. 2019), and the resistance to misinformation (Desai and Reimers 2019; Desai, Pilditch, and Madsen 2020; Flynn, Nyhan, and Reifler 2020; Huang and Wang 2020; Lewandowsky and van der Linden 2021; van der Linden et al. 2017). At the same time, there is limited work that examines what people generally take misinformation to mean. For people to detect misinformation, and for efforts designed to reduce the uptake of misinformation particularly around the communications of risks, it is important to examine how people understand the term. Therefore, while misinformation is firmly embedded in public discourse, the objective of our study is to shed light on the potential alignments and discrepancies between public understanding and definitions offered by academics, public institutions, and the media. These findings can then inform interventions to improve their effectiveness for reducing uptake of misinformation. For example, if the public believe misinformation is primarily exaggerations, but not omissions, then efforts must be channelled to communicate that misinformation also comprises omissions. What's more, despite the plethora of insightful studies examining why misinformation is shared, there is next to nothing exploring how people claim to identify misinformation.

While there is very little on public understanding of the term misinformation, previous literature highlights three areas of interests that can facilitate a meaningful contribution. First, it is important to explore the extent to which the public agree with statements regarding general descriptions of misinformation offered by the media, institutions and scholars. A common definition of the term is false information which is shared unintentionally (e.g. BBC 2021; Farhall et al. 2019; Qazvinian et al. 2011; Rubin 2019). This is supposed to distinguish from related terms that circulate, such as 'disinformation' which is false information that is shared intentionally (Ireton and Posetti 2018; Levi 2018; Shao et al. 2018; Shin et al. 2018; Søe 2018). While the term disinformation has raised concerns about how intent is determined (Haiden and Althuis 2018; Karlova and Lee 2011; Vraga and Bode 2020), it remains unknown whether intention features in public understanding of the term misinformation. These terms are also regarded as distinct from the term 'fake news' which emerged in 2016 during the U.S elections. However, Jahng, Lee, and Rochadiat (2020) found that deceptive motivations, i.e., disinformation, were a defining aspect of fake news among PR practitioners, and it is often used interchangeably with disinformation. In another study, Flintham et al. (2018) asked respondents to describe fake news in their own words. One group believed it was a story that departed from the truth, while another group, similar to Jahng, Lee, and Rochadiat (2020) focused primarily on intent with some arguing

it is a deliberate attempt to cause harm and others claiming it is the result of boredom. However, fake news is also used synonymously with misinformation among scholars (e.g. Shao et al. 2018; Tambuscio et al. 2015) and the media, particularly in the sense of aiming to discredit information. For example, in one Guardian article (Meade 2021), Sky News CEO Paul Whittaker said it 'now appears commonplace to discredit any debate on contentious issues as 'misinformation'. Given these inconsistencies, it is important to explore whether, if at all, public understanding maps onto these overarching conceptualisations.

Although the above targets broad descriptions of misinformation, an equally under-researched yet valuable area of investigation is the key criteria for defining misinformation. Given that misinformation generates discussions about misinformation itself, public understanding about more nuanced characteristics may be informed by the media. First and foremost, a range of publications and institutions commonly refer to the presentation of opinions disguised as facts in articles about misinformation, such as the Pew Research Centre (Desilver 2018), The Centre for American Progress (Simpson and Conner 2020), British Science Association (Herr 2021), Reuters Institute (Newman and Fletcher 2017) and The Conversation (Wilson and Wiysonage 2020). The blurred lines between fact and opinion as a criterion of misinformation, and related terms like fake news and disinformation, are also mentioned in the literature (e.g. Gelfert 2018). However, exaggeration also co-occurs with misinformation, for example, a headline in the Guardian (Devlin 2017) quoting the president of the Royal Statistical Society reads: 'Exaggerations threaten public trust in science', says leading statistician'. Scholars also link misinformation, and related terms, to exaggeration (e.g. Hendricks and Vestergaard 2018; Macron, Murdoch, and Caulfield 2017), such as Al Khaja, Alkhaja, and Sequeira (2018) whose content analysis of misinformation relating to drugs and dietary supplements revealed exaggerations around their efficacy and safety. Another feature is the context in which misinformation is often discussed, that is, where it is a known problem, for example, SARS-CoV- 2, climate change, the 2016 U.S election and childhood vaccinations. Vox (Cummins 2021) published an article entitled 'Vaccines, climate change, and elections: The dangers of the new skepticism' which outlined the issues eroding the public's trust. However, the link between misinformation and controversial topics also extends to academic research (e.g. Graham Forthcoming; Hartley and Khuong 2020; Lewandowsky and van der Linden 2021; Nyhan 2020). For instance, Zielinski et al. (2018) argue that the contentious nature of misinformation can lead to filter bubbles, and users should be pre-warned of any controversial topics. In addition, omission is frequently referred to in media discussions of the term, such as The Washington Post (Ajaka, Samuels, and Kessler 2019) whose guide to manipulated videos states that omission forms part of misinformation, namely, 'deceptive editing', and Vogue (Ruiz 2021), who quote two former conservatives commenting on Tucker Carlson's series *Patriot Purge* which contains 'damning omissions'. Other possible perceived defining criteria of misinformation that have been alluded to in the media, and could inform public understanding, include exposing new patterns or unknown facts and revealing a lie such that it invalidates legitimate information. By way of example, both CNN Business (Fung 2020) and Los Angeles Times (Stokols 2021) refer to Trump's 'Big Lie' regarding voter fraud in an article about misinformation. In terms of academic studies exploring public perceptions of misinformation and all the aforementioned criteria, there is a significant gap in the literature. However, the more granular analysis of Jahng, Lee, and Rochadiat's (2020) research found that PR practitioners defined fake news as anything expressing exaggerated claims, including opinions and emotions, and well-known controversial topics. Again, while there are countless experimental studies on how people process misinformation, examining public perceptions of the defining criteria for the term 'misinformation' would further improve attempts to combat the problem.

The third and final focus for the present research is the source of information people use to judge whether or not something constitutes misinformation. It has been argued that the demarcation between information and misinformation is a false dichotomy (e.g. Tandoc, Lim, and Ling 2018; Ferreira, Robertson, and Kirsten 2019; Haiden and Althuis 2018; Marwick 2018).

This is because it neglects the complexity of ascertaining the truth, which Krause et al. (2020) illustrate in their real-world example of SARS-CoV-2 where the efficacy of measures, such as masks, was initially uncertain. In other words, the consensus regarding the ground truth of any claim is dynamic and people may use different sources at different points. Drawing on Nyhan and Reifler's (2010) claim that accuracy is determined by clear evidence and expert opinion, Vraga and Bode (2020) outline issues, for example, what constitutes an expert, and if absent, who should we rely on? As such, experts may not be perceived as a reliable source for ground truth. One alternative to this latter question is traditional media which was widely regarded as a gatekeeper of knowledge (Farhall et al. 2019) and a trusted institution (Steensen 2019) but media and journalism scholars are increasingly concerned this is waning (Godler 2020; Posetti and Matthews 2018; Scheufele and Krause 2019). Further still, empirical research suggests that misinformation leads to a decline in trust, as observed in South Africa (Wasserman and Madrid-Morales 2019) and the U.S. (Ognyanova et al. 2020). It therefore remains to be seen if this perceived power extends to the public when distinguishing between falsehood and veracity. Science is another candidate for verifying the veracity of a claim. Owing to double-entry bookkeeping, ballistics and perspective painting, the world has relied on accurate measurements of natural phenomena for centuries (Wootton 2015), and scientists have enjoyed epistemological prestige. However, experts, traditional media and scientists must all now contend with two increasingly powerful sources when debunking misinformation and communicating ground truth: one's values and one's social circle. In an era of information proliferation (Hill 2019), numerous scholars have discussed how and why our reference point for judgments is increasingly identity-driven, rather than institution- or expert-driven (e.g. Kahan 2017; Oyserman and Dawson 2019; Margolin 2021; Trevors 2019). For example, Kahan (2017) draws on the concept of identity protective cognition, arguing that culture is both cognitively and normatively prior to fact. He uses this theory to explain his findings that people are more likely to hold misconceptions if they are consistent with their values. While science and experts largely remain the default reference point for ground truth, it is of great consequence to understand how the public think they evaluate these other sources when deciding whether something constitutes misinformation given today's competitive information landscape.

The perceptions of these three aspects may be affected by a variety of factors which suggests a cross-cultural comparison of public understanding would be valuable. While misinformation is not a new concept, as rumour and hearsay date back millennia (Grant 2004; Guastella 2017), it is a new term which may have varying connotations in different countries. In turn, this could impact the most salient criterion on which people judge whether something constitutes misinformation or not. Trust in traditional media also varies by culture (Humprecht, Esser, and van Aelst 2020) and could therefore potentially impact the perceived importance of different actors, such as scientists or one's social circle, in identifying misinformation.

Survey

In the survey we focus specifically on the factors that people use to determine whether a piece of information should be considered as misinformation. We consider this from a general point of view rather than focus on specific examples of what is and isn't misinformation because we were interested in people's reported general understandings of the concept. First, we present a question examining general descriptions of misinformation. Here we make prediction 1 informed by past literature (Jahng, Lee, and Rochadiat 2020; Flintham et al. 2018): A claim that is presented in ways that implies an effort to mislead should be the most common criterion for judging a piece of information as misinformation. Second, we present a question examining the sources on which a piece of information is judged to be misinformation. Here we make prediction 2 informed by past literature (Vraga and Bode 2020): A claim that has been challenged by experts/scientific evidence should be the most common basis for judging a piece of

information to be misinformation. Third, we also present a question examining the key criteria on which a piece of information could constitute misinformation. Here we make prediction 3 informed by past literature (Brotherton and Son 2021; Jahng, Lee, and Rochadiat 2020; Flintham et al. 2018): We can examine two potential predictions, (1) Unintentional false information is misinformation, which is based on academic definitions discussed earlier in our review of the literature; (2) Intentional false information is misinformation based directly on Jahng, Lee, and Rochadiat (2020) and Flintham et al. (2018) whose respondents mainly defined fake news as *intentional* false information. These include presenting facts as opinions, and to a lesser extent exaggeration, omissions and where misinformation is a known problem.

Participants and design

A total of 4407 participants took part in the survey which was ran by IPSOS, collecting data from a representative sample of participants in each country based on gender, age, employment status, marital status, and education. The data was collected on a randomised basis using sample quotas for representativeness with final corrections made with weight factors. The data reported (including demographic data in Table 1) is weighted, ensuring we are representative of the populations (rather than the sample). The inclusion criteria for taking part in the study were that participants were born in, and current residents of each respective country that was included in the study: Turkey, Russia, UK and USA (see Table 1). Participants had to be a minimum of 16 years to take part in the study (age restrictions were 16-75 in the UK; 18-75 in the US; 16-60 in Russia; 16-60 in Turkey). Ethics approval was undertaken within the Market Research Society Code of Conduct and as such no separate specific ethics approval was required. Nonetheless all participants were required to give informed consent at the beginning of the web survey before participating.

Ipsos collected the data through online research panels in each market; the participants had agreed to take part in research surveys and as such gave their consent to have their data collected and shared anonymously. Overall, the main survey contained three main variables (General descriptions of misinformation, Sources used to judge a piece of information as misinformation, Specific properties of misinformation) (see Table 2), and six demographic details, country, age, gender, education, marital status, employment status. All participants were presented with identical questions (translated) which were presented in a consistent order but with the items within each question presented in a randomized order. The survey took less

Table 1. The total sample includes $N = 4407$ participants from four countries.

Sample	Turkey	Russia	UK	USA	Total
N	1074	1093	1129	1111	4407
Gender					
Male	50.2%	48.2%	48.7%	48.8%	48.9%
Female	49.8%	51.8%	49.6%	51.2%	50.6%
In another way	0%	0%	1.2%	0%	0.3%
Prefer not to say	0%	0%	0.5%	0%	0.1%
Age	$M = 35.84$	$M = 37.31$	$M = 44.99$	$M = 45.01$	$M = 20.86$
	$SD = 11.74$	$SD = 11.77$	$SD = 16.50$	$SD = 15.69$	$SD = 14.75$
	16 – 60	16 – 60	16 – 75	16 – 75	16 – 75
Employment status					
Working	52.5%	70.6%	63.6%	62.4%	62.3%
Not working	47.5%	29.4%	36.4%	37.6%	37.7%
Marital status					
Married/Living as married	61.3%	62.6%	54.8%	57.9%	59.1%
Single	32.3%	25.6%	33.0%	30.6%	30.4%
Widowed/Divorced/Separated	6.4%	11.8%	12.2%	11.5%	10.5%
Education					
Non-University Education	36.8%	41.7%	58.6%	53.3%	47.7%
University Education	63.2%	58.3%	41.4%	46.7%	52.3%

Table 2. Questions presented to participants in survey.

Survey	Question	Statement	Response options
General descriptions	How closely, if at all, do each of the following match what misinformation means to you? There are no right or wrong answers, we just want to know what, if anything, misinformation means to you.	1. Information that is intentionally designed to mislead 2. A term that is used to discredit information; 3. Information that is unintentionally misleading 4. Information that has been created without caring about whether it is misleading.	1. Very close 2. Fairly close 3. Not very close 4. Not very close at all 5. Don't know
Sources on which a judgement is made	Thinking of the sources you may refer to when considering if something is misinformation, please select which of the following sources, if any, you personally consider apply. There is no right or wrong answer, we just want to know how you might consider these sources. Please pick as many or as few as apply. *"It is likely to be misinformation if…."*	1. Most scientific evidence indicates it is incorrect 2. Most media reporting indicates it is incorrect 3. Most expert groups indicate it is incorrect 4. Most people I know indicate it is incorrect 5. It does not feel right to me 6. It does not fit with my understanding of what is correct 7. None of these 8. Don't know	Yes/No to each statement
Key criteria	Thinking of the way in which information is presented, which of the following, if any, might cause you to suspect that something is misinformation. Again, there are no right or wrong answers, we just want to know how you might consider a piece of information. Please pick as many or as few as apply. "*I am likely to consider something might be misinformation if…*"	1. It is claiming to be fact when I consider it is instead an opinion or rumour 2. It is claiming to reveal a lie 3. It is claiming to expose unknown facts 4. It is claiming to reveal new patterns between things 5. It does not seem to me to properly represent the full picture 6. It is on a subject where misinformation is a known problem 7. It is information that seems to me to make exaggerated conclusions from the facts 8. None of these 9. Don't know	Yes/No to each statement

than 5 minutes to complete, and as panel members, participants were provided with points for their participation.

Procedure

Once participants had given their consent, and provided their demographic details, they were presented with the first question which referred to general descriptions of misinformation. They were then presented with the second question which referred to the sources on which a piece of information can be judged as misinformation. Then participants were presented with the third question which referred to key criteria on which a piece of information could be judged as misinformation. Once they had completed these questions the survey was complete.

Results and discussion

General descriptions of misinformation

The first question of interest concerns general descriptions of misinformation. Overall, looking at responses for the four main response options, the highest agreement was for the statement 'Information that is intentionally designed to mislead' (total sample = 69.00%, see Figure 1). Here we find general

support for prediction 1: A claim that is presented in ways that implies an effort to mislead should be the most common criterion for judging a piece of information as misinformation.

Given the large sample, we only report the analyses that reached effect sizes that were medium to large (adopting Cohen's (1988) convention), using Cramer's V appropriate to the degrees of freedom for each type of categorical test performed. The analyses we present are chi-squared where we assume independence of the observations for the reason that a selection of a response option excludes a selection of the remainder response options. The first main analysis we conducted examined the extent to which there were significant differences in response patterns by statement, focusing first on the total sample. When comparing all five response options to each statement, χ^2 (12, $N = 17628$) = 1032.82, $p < .001$, $V = .24$ (effect size large) the analysis revealed significant differences between statements. To locate the differences, we conducted a comparison with each statement against the most popular agreed upon statement 'Information that is intentionally designed to mislead'. The chi-squared analyses revealed that, when compared against the popular agreed upon statement, responses significantly differed for the statement 'A term that is used to discredit information', χ^2 (4, $N = 8814$) = 694.62, $p < .001$, $V = .28$ (effect size medium), 'Information that is unintentionally misleading', χ^2 (4, $N = 8814$) = 649.13, $p < .001$, $V = .27$ (effect size medium), 'Information that has been created without care about whether it is misleading', χ^2 (4, $N = 8814$) = 375.89, $p < .001$, $V = .21$ (effect size medium). The findings show that the response patterns for each of the three remaining statements differ significantly from the most agreed statement.

If we look to the pattern of responses (Figure 1), there appear to be differences by country, in particular Turkey appear to differ in their pattern of responses from the other three samples. A chi-square analysis was performed on each statement comparing those that had selected each of the five response options by country. For all four statements, the analyses revealed country differences of medium to large effect sizes (based on the degrees of freedom for each test): 'Information that is intentionally designed to mislead' ($V = .29$, effect size large); 'A term that is used to discredit information' ($V = .14$, effect size medium); 'Information that is unintentionally misleading' ($V = .13$, effect size medium); 'Information that has been created without care about whether it is misleading' ($V = .27$, effect size large).

Running the same analysis for Gender (V ranged from .04 to .06), Education (V ranged from .03 to .07), Age (V ranged from .03 to .05), Marital status (V ranged from .02 to .07), or

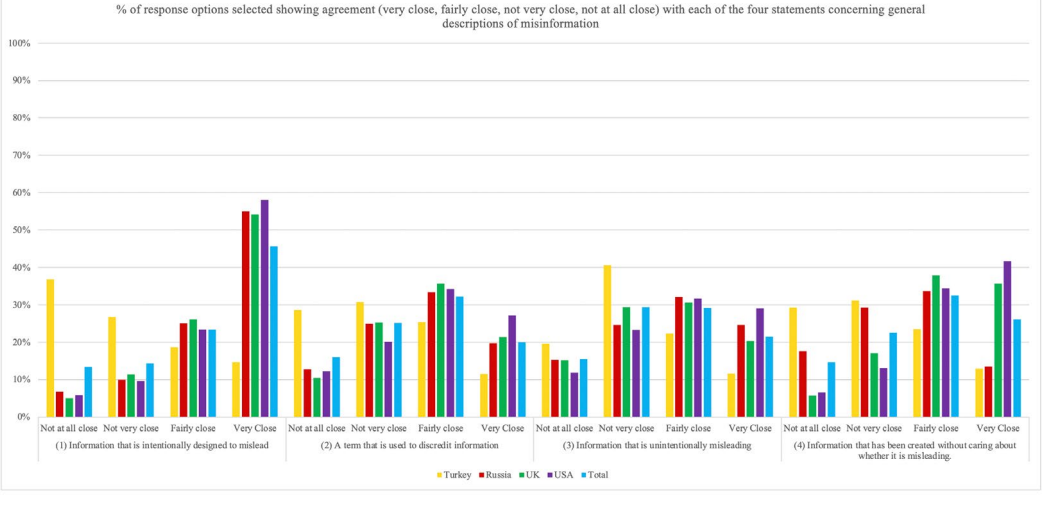

Figure 1. Percentage of response options selected showing agreement (fairly close, very close, not very close, not all close) with each of the four statements concerning general descriptions of misinformation.

Employment status (V ranged from .05 to .10), we find that none of the analyses that reached significance were close to the region of medium to large effect sizes, and in many cases did not approach small effect sizes.

In summary, there are three noteworthy findings. First, consistent with prediction 1, overall the findings suggest that the most common description that participants agree with is one which indicates a deliberate effort to mislead: 'Information that is intentionally designed to mislead'. We find that there are country differences, where it appears that for this question Turkey is the outlier. Third, we do not find differences by the demographic variables we recorded (Gender, Age, Education, Employment Status, Marital Status) at the level of medium and large effect sizes. Thus indicating that on the whole, participants tended to respond more similarly than they did differently based on the demographic variables we collected.

Sources on which information is judged as misinformation

The second question concerned the sources people say they refer to when judging whether a piece of information is misinformation. We find support for prediction 2, such that a claim that has been challenged by experts/scientific evidence should be the most common basis for judging a piece of information to be misinformation (Figure 2). The most frequently agreed with statement was 'Most scientific evidence indicates it is incorrect' (Total sample = 60.20%), and the second most common agreement being for the statement 'Most expert groups indicate it is incorrect' (Total sample = 48.38%).

The yes responses to 'none of these' and 'don't know' for country and the total sample ranged between 1.40% and 6.38%, so we focused our initial analysis on the extent to which there were significant differences in response patterns by each of the 6 remaining statements, focusing first on the total sample. Confirming the differences as implied in Figure 2, when comparing yes and no responses to each statement, χ^2 (5, $N = 26442$) = 1818.16, $p < .000001$, $V = .25$ (effect size large) revealed significant differences between statements. To locate the differences, we conducted a comparison with each of the 5 main statements against the most popular agreed upon statement 'Most scientific evidence indicates it is incorrect'. The chi-squared analyses revealed that yes responses were higher with medium to high effect sizes when compared against the statements (again based on the corresponding degrees of freedom of each test performed): 'Most media reporting indicates it is incorrect' (V = .31, effect size medium), 'Most

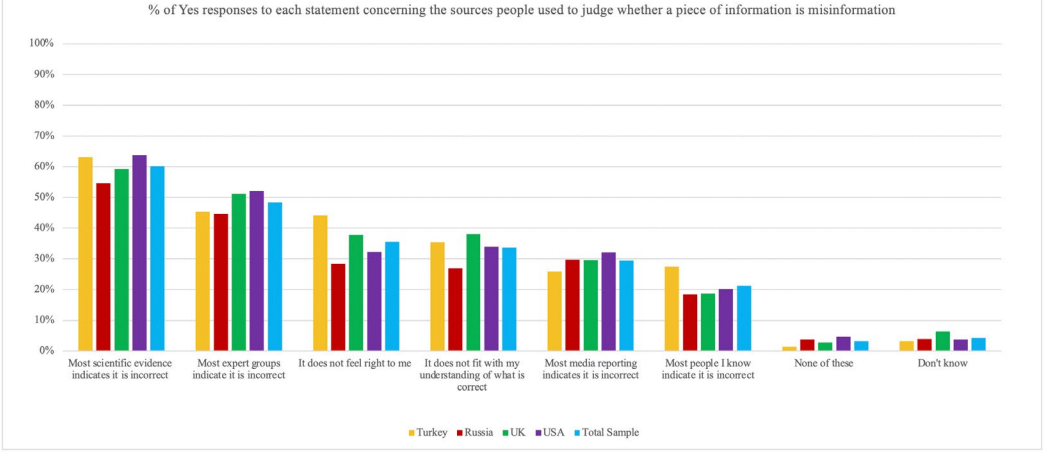

Figure 2. Percentage of yes responses to each of the statements presented in Question 2.

people I know indicate it is incorrect' (V = .39, effect size medium). For the statements 'Most expert groups indicate it is incorrect' (V = .12), 'It does not feel right to me' (V = .23), and 'It does not fit with my understanding of what is correct' (V = .27), there were no medium or large effects differences when compared against 'Most scientific evidence indicates it is incorrect'.

Next we conducted analyses to detect any country differences in the pattern of responses to each of the 6 main statements. Here we do not find any chi-squared analyses for country comparisons that reached medium or large effect sizes, (Cramer's V ranged from .05 to .12). We repeated the same analyses to detect any demographic differences, running the same chi-squared analysis for gender (V ranged from .01 to .05), Education (V ranged from .02 to .14), Age (V ranged from .003 to .01), Marital status (V ranged from .006 to .07), or Employment status (V range from .001 to .06).

In summary, there are two noteworthy findings. First, consistent with prediction 2, overall the findings suggest that the most common source by which participants judge a piece of information as misinformation involves deferring to expertise (either referred to as 'expert' in general, or specifically scientific evidence). Other groups that could be used as sources to label a piece of information as misinformation such as the media or other people didn't tend to be as popular. In addition, we do not find differences by country or the demographic variables we recorded (Gender, Age, Education, Employment Status, Marital Status) at the level of medium and large effect sizes.

Key criteria on which to judge information as misinformation

The third question of interest concerns the key criteria on which people judge a piece of information as misinformation. We find moderate support of prediction 3, namely that the level of assertion of a claim that implies deliberate efforts to mislead should be the most common basis for judging a piece of information to be misinformation. The most frequently agreed statements were (Figure 3) 'It is information that seem to me to make exaggerated conclusions from the facts' (Total sample = 49.24%), 'It does not seem to me to properly represent the full picture' (Total sample = 48.83%), and 'It is claiming to be fact when I consider it is instead opinion or rumour' (43.07%).

The yes responses to 'none of these' and 'don't know' for country and the total sample ranged between 2.14% and 7.53%, so we focused our initial analysis on the extent to which there were significant differences in response patterns by each of the 7 remaining statements, focusing first on the total sample. Confirming the differences as implied in Figure 3, when comparing yes and no responses to each statement, χ^2 (6, N = 30849) = 1926.08, $p < .000001$, V = .25 (effect size large) revealed differences between statements. To locate the differences, we conducted a comparison with each statement against the most popular agreed upon statement 'It is information that seem to me to make exaggerated conclusions from the facts'. The chi-squared analyses revealed that yes responses were higher with medium to high effect sizes when compared against the statements: 'It is claiming to reveal a lie' (V = .26, effect size large), 'It is claiming to expose unknown facts' (V = .21, effect size large), 'It is claiming to reveal new patterns between things' (V = .36, effect size large), 'It is on a subject where misinformation is known to be a problem' (V = .11, effect size medium). For the statements 'It is claiming to be fact when I consider it is instead an opinion or rumour' (V = .06), and 'It does not seem to me to properly represent the full picture' (V = .004), there were no medium or large effect size differences when compared against 'It is information that seem to me to make exaggerated conclusions from the facts'.

The next analyses conducted were designed to detect any country differences in the pattern of responses to each of the seven statements (excluding 'none of these' and 'don't know' statements). Here we do not find any chi-squared analyses for country comparisons that reached the medium or large effect sizes, (V ranged from .09 to .19). We repeated the

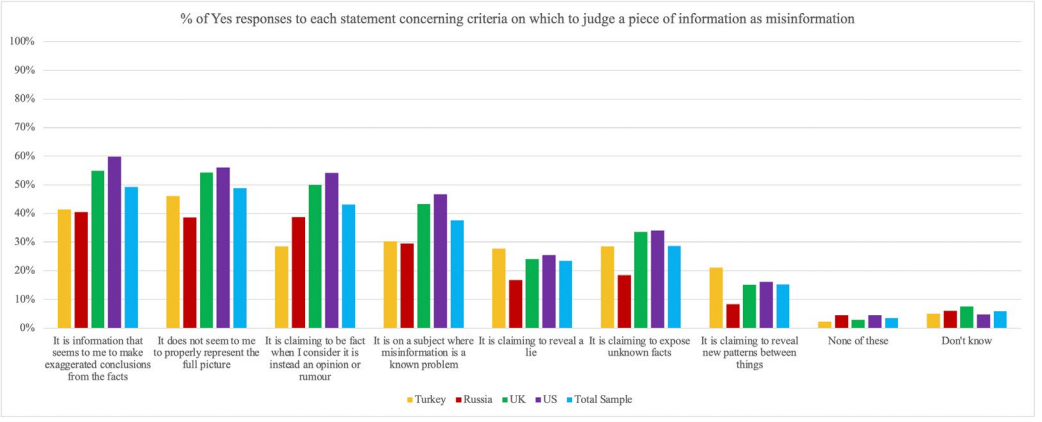

Figure 3. Percentage of yes responses to each of the statements presented in Question 3.

same analyses to detect any demographic differences. Running the same chi-squared analysis for gender (*V* ranged from .03 to .05), Education (*V* ranged from .005 to .04), Age (*V* ranged from .001 to .03), Marital status (*V* ranged from .02 to .07), or Employment status (*V* range from .001 to .03), we find that none of the analyses that reached significance were close to the region of medium to large effect sizes, and in many cases did not approach small effect sizes.

In summary, there are two noteworthy findings. First, generally consistent with prediction 3, overall the findings suggest that the critical details participants use to judge a piece of information as misinformation involve: 'It is information that seem to me to make exaggerated conclusions from the facts', 'It does not seem to me to properly represent the full picture', 'It is claiming to be fact when I consider it is instead opinion or rumour'. We do not find differences by country or the demographic variables we recorded (Gender, Age, Education, Employment Status, Marital Status) at the level of medium and large effect sizes. Thus, indicating that on the whole, participants tended to respond more similarly regardless of country or demographic factors.

General discussion

In the present survey we devised questions to examine what people report they take misinformation to mean, the sources they use, and the specific features that they use to identify misinformation. The questions were devised to look at these aspects in general rather than using specific examples, for the reason that the findings we report on should provide insights that generalise to any type of information that the public encounters, be it in the form of risks and other statistics or specific scientific claims. To this point, the survey reveals no differences (based on medium to high effect sizes) by the demographic variables we collected (gender, age, education, marital status, employment status), and for all but one question, there were no differences by country.

General understanding of the term misinformation

With the exception of Turkey, responses from the three remaining countries indicate agreement that misinformation is intentionally designed to mislead. This is in line with Jahng, Lee, and Rochadiat (2020) and a subgroup of Flintham et al.'s (2018) results because their respondents also believed misinformation is closely associated with deception. In other words, intentions

matter, and inadvertently communicating falsehoods does not constitute misinformation nearly as much as deliberately communicating falsehoods. This description aligns with scholarly definitions of disinformation rather than misinformation (Ireton and Posetti 2018; Levi 2018; Shao et al. 2018; Shin et al. 2018; Søe 2018), and raises the possibility that, while people acknowledge misinformation can be unintentional, they are more likely to identify misinformation when they believe there is an issue of intent. Therefore, for information where intentions are not questionable, perhaps due to the high credibility of the source, then the threat of misinformation will not be as salient. However, if the source is deemed suspicious, then this will cast doubt on their intentions, and they will be inclined to perceive the information as misinformation. One reason why respondents may show less agreement around descriptions of misinformation that require looser standards (e.g. not taking care, unwittingly misleading) is because if they communicate as well as encounter misinformation themselves (e.g. in social media), then showing leniency may well be personally motivated. More broadly, responses to this question highlight the problem of defining new terms, and how scientists, institutions, and the media communicate and use these terms in public discourse. Here we have only explored misinformation, and briefly touched on how definitions of the term in research, media and institutions overlap with fake news, but there are many other related terms that further complicate real-world usage and understanding, such as lies, fabrication, satire, parody, propaganda, rumour, and gossip. If we want to halt the spread of misinformation, then communicating a clear definition to the public is a necessary precursor to the implementation of any intervention.

Sources used to determine what is misinformation

Consistent with prediction 2, respondents determine if a piece of information is misinformation based on experts, however defined, and scientific evidence. One must note the potential role of social desirability bias here, where respondents may have felt pressured to select these two sources. Even if these were regarded as the 'correct' answer though, this still suggests that scientists maintain epistemic influence to some degree. Given misinformation is anything that is intentionally misleading, one could argue that people may defer to scientific evidence due to its impartiality. It is interesting that respondents judge misinformation to be so if 'it does not feel right to me' and 'it does not fit with my understanding of what is correct' more than 'if most people I know indicate it is incorrect.' Evidence suggests that group membership can, in fact, drive both the acceptance (Axt, Landau, and Kay 2020; Oyserman and Dawson 2019) and sharing of misinformation (Duffy, Tandoc, and Ling 2020; Pennycook et al. 2021) regardless of whether one believes the information is accurate (Pennycook et al. 2021). So, just as people signal that they use scientific evidence and experts as a basis to judge misinformation for self-preservation purposes, they may wish to signal that they do not rely on their social circle. Yet, while there are arguably negative reputational outcomes of admitting that one relies on one's own subjective worldview, it is possible that evaluating information in a manner where one is the reference point (rather than other people one knows) is increasingly respected as it shows independent thinking in an era of information proliferation. This may be the case especially in contrast to the media which was not regarded as a source on which one should rely to identify misinformation. This finding coincides with work in communication, media and journalism studies indicating the decline in the trust in the media. Specifically, it has been argued that misinformation 'presents an unprecedented threat level' (Posetti and Matthews 2018: 1) and current changes 'have given new urgency to the problem' (Scheufele and Krause 2019: 7762) while Godler (2020: 169) believes that the fate of journalism 'has never looked bleaker'; a sentiment shared by others (Hameleers, Van der Meer, and Vliegenthart 2021; Huang and Wang 2020; Bode and Vraga 2015). However, this result is particularly interesting based on our assumption that the public typically access scientific and expert information through the media rather than from the original source, such as academic journals. As such, this raises the question

of how different media sources might mediate the credibility of scientific/expert information, and therefore the identification of misinformation.

Specific features of misinformation

Finally, none of the responses from the total sample showed agreement above 50% concerning specific criteria for misinformation. It is possible that participants indicated what criteria are *not* especially indicative of misinformation than criteria that are. As such, these statement options may not closely represent their understanding of the concept of misinformation. This was especially the case for three options where there was a low proportion of 'yes' responses across all countries: if it is claiming to reveal a lie (23.49%), if it is claiming to expose unknown facts (28.68%) or claiming to reveal new patterns (15.16%). A speculative reason as to why these did not necessarily indicate misinformation is because they do not relate to being deliberately misleading, which respondents indicated is important in question 1. This also explains why there were comparatively fewer 'no' responses to statements that indicate that the information presented might be designed to mislead (i.e. claiming it is a fact rather than an opinion, not representing the full picture, or exaggerating conclusions from facts). It is worth highlighting here that the three most commonly agreed with statements presume that there is a factual basis to the information (e.g. not fabricated), but the misinformation component concerns the way the facts are presented, which also indicates some properties of being misleading. In fact, this might be an important conceptual distinction where further work could explore which is judged to be most akin to misinformation: (i) misinformation where there is no factual basis and conclusions are drawn, (ii) misinformation where there is a factual basis but the conclusions are exaggerated, (iii) misinformation where there is massive uncertainty in the factual basis and conclusions are still drawn.

While not significant, the UK and U.S displayed agreement at 50% or above for these three most commonly agreed with statements compared with Turkey and Russia. When exploring the popularity of these responses, it could be that they are based on a review of articles by British and American publications and institutions to which the public may be exposed. On the other hand, it may be that there are fewer references to omissions, exaggerations and opinions presented as fact in Turkish and Russian articles on misinformation. We should point out that among these three statements, exaggeration was the most popular response for the UK, U.S and Russia, and second most popular for Turkey. Along with references to exaggeration in American and British articles on misinformation, Russian's primary social network, VKontakte (VK), has been linked with exaggerated claims, as well as incomplete information and representing creative works as real, such as proving the existence of new species (Fedyukovsky 2020). In sum, we can see that while misinformation is most commonly defined in the literature as unintentional sharing of false information, this is not the view held by the public and there is even less agreement about specific criteria used to inform understanding of misinformation. However, we must remember that it may be too early for the meaning and criteria of these new terms to be fully formed in the minds of the public yet. Avital and colleagues (Avital, Dennis, and Baiyere 2020) provide position statements on attempts to define fake news, and remind us of the inherent difficulties of reaching a consensus whenever a new term emerges.

Back to SARS-CoV-2

We have proposed that a good reason for starting to understand what people report they take misinformation to mean provides a useful basis for efforts to reduce it, if demonstrated that it is the direct cause of negative behavioural outcomes. We return to the start of this article

regarding the origins of SARS-CoV-2. Early in the pandemic there were speculations that acceptance of misinformation such as the origin of the virus may have corresponded with estimates of the risks of the virus, and levels of compliance with nonpharmaceutical interventions (e.g. mask wearing, social distancing, hand washing). For instance, in the special issue on SARS-CoV-2 that was published in this journal (Covid-19 special issue 2020, Volume 7-8, p 833-1120), a 6-item risk scale was presented (Dryhurst et al. 2020). This was later used in a study examining the connection between risk and misinformation of claims around SARS-CoV-2 (Roozenbeek et al. 2020). One notable claim that was examined as an example of misinformation was 'The coronavirus was bioengineered in a military lab in Wuhan'. Responses to the statement on the origin of SARS-CoV-2 and other statements classified as misinformation were used to predict or correspond with several factors including behavioural responses to mitigation measures and risk perceptions. This along with other studies (e.g. Allington and Dhavan 2020; Freeman et al. 2020; Serrano, Papakyriakopoulos, and Hegelich 2020) also examined the claim that SARS-CoV-2 was bioengineered, with varying details as to whether it was in a laboratory in Wuhan, or more specifically a military laboratory in Wuhan. Along with this, several public polling organisations (e.g. Pew 2020; PRRI 2020) also indicated that anything between 23% and 40% of respondents in the US agreed with statements claiming that SARS-CoV-2 was bioengineered rather than naturally occurring.

As discussed at the start of this article, there were assertions, based on analysis and evidence (Andersen et al. 2020; Burki 2020; Calisher et al. 2020; Casadevall, Weiss, and Imperiale 2021; Holmes et al. 2021; Latinne et al. 2020; Lau et al. 2020; Rasmussen 2021; Von Borowski and Trentin 2021; Zhang and Holmes 2020; Zhou et al. 2020), that claims of the kind regarding the bioengineered origin of SARS-CoV-2 could be ruled out. Moreover, there was considerable media attention guarding against this claim, and taking great efforts to admonish those that entertained it (e.g. see Thacker 2021). As also discussed, there has been amassing evidence and discussion in prominent scientific journals that rule the bioengineering claim back in (Decroly, Claverie, and Canard 2021; Deigin and Segreto 2021: Piplani et al. 2021; Sallard et al. 2021; Segreto and Deigin 2021; Segreto et al. 2021; Seyran et al. 2021; van Helden et al. 2021), or else consider other hypotheses regarding the origins of the virus (Banerjee et al. 2021; Domingo 2021; Han et al. 2020; He, Shao, and Han 2021; Hu et al. 2021; Jo et al. 2021; Lytras et al. 2022; Malaiyan et al. 2021; Zhou et al. 2021; Zhou and Shi 2021).

To date, within the scientific community, there are still efforts to determine the origin of SARS-CoV-2. Importantly, the discussion has now also turned to enabling an open debate that does not limit the scope of the hypotheses being examined (Dyer 2021; Godlee 2021; Sallard et al. 2021; Shin and Manuel 2021; Thacker 2021; van Helden et al. 2021). Crucially, given the early ruling out of the bioengineered origin of SARS-CoV-2, and that claims of this kind were labelled misinformation, this may constitute a form of censorship (e.g. prohibiting discussion or sharing of information on social media about this claim), and that the public were not made aware of the continuing efforts in the scientific community to examine all possible hypotheses regarding the origin of the virus.

If we look to how people in the present survey report on their own understanding of misinformation, then this highlights several important factors. Our findings suggest that people tend to treat the general description of misinformation in line with how the scientific community define disinformation, where deliberate attempts to mislead matters. In addition, people tend to defer to experts and scientific evidence as sources on which to judge a claim as misinformation. Also, in line with deliberate attempts to mislead, common features indicative of misinformation are claims presented as facts rather than rumour or opinion, not representing the full picture, or exaggerating conclusions. We now apply these insights to the specific example regarding the ambiguous status of the origin of SARS-CoV-2.

If the general description of misinformation is information that is deliberately designed to mislead, then the public would have to infer some intentions behind what is being

communicated to them by experts to judge it as misinformation. To do this would require positing extra information (e.g. evidence of censorship, conflicting interests of scientists, political agendas, the countries scientists are from) to infer where deliberate efforts to mislead would come from, and why.

If experts and scientific evidence are sources on which people judge a claim as misinformation, then at the very least the origins of the virus example shows that, for both scientist and scientific evidence there is no consensus as to the origin of SARS-CoV-2. Here again, it wouldn't be clear which claims constitute information from misinformation if the public were aware of the lack of consensus. More to the point, if the scientific evidence itself is the basis on which to delineate information from misinformation, then things still remain uncertain, so labelling one claim as misinformation over another is premature. For the reasons stated earlier, this also has the chance of backfiring, should the public come to know that one claim was dismissed quickly as misinformation, and then later found to be worth considering.

If cues such as presenting information as fact rather than opinion, not presenting a complete picture, and exaggerating conclusions from facts matter, then the natural origins of the virus hypothesis may suffer because of how it was presented initially. In light of what we now know about its uncertainty of the origin of the virus, the natural origin hypothesis could be construed along all three core features that people use to judge a claim as misinformation.

Because of these factors, some have also highlighted that more latitude ought to have been taken to begin with in classifying the claim regarding the bioengineered origin of SARS-CoV-2 itself as misinformation (Thacker 2021). Moreover, the need for latitude was also extended to media reporting because beliefs in this claim were taken to constitute a conspiracy theory. This latitude ought to also apply to the work of those that used this claim to explore the extent to which the public endorsed it, and what other demographic or psychological factors predicted its endorsement. Understanding the patterns of behaviour that are associated with particular claims needs to at the very least consider the epistemic status of those claims if they impact the public. This is especially important if acceptance of particular claims is also speculated to be associated with negative behavioural outcomes. For some claims the epistemic status may be unambiguous, but for others, such as the origin of SARS-CoV-2, they are not. Therefore, even more care is needed when labelling one claim over the other as misinformation. Looking at the way the public take the concept of misinformation to mean is at least a useful factor in understanding in general how the public then may go about demarcating what is from what isn't misinformation, and the extent to which it also aligns (or not) with how the scientific community do the same.

Conclusion

Because there is limited work looking at what people take the concept of misinformation to mean, we devised a survey to address this. The findings from our survey show that people's reported general understanding of misinformation aligned with how researchers define disinformation, that is information intended to mislead. Experts and scientific evidence are common sources people report they use to decide what is misinformation. The presentation of information matters to the extent that if presented as facts rather than opinion or rumour, conclusions from the facts are exaggerated and a complete picture isn't offered, then this can constitute misinformation. We have proposed that it is important to first understand what people take misinformation to mean, and not doing this excludes the public from core conceptual discussions on a matter, especially if the content of the information is clearly of public interest. Moreover, not appreciating what the public take the concept to mean entails researchers understanding a proportion of the entire issue based only on how they themselves classify claims as misinformation without knowing what the public use as criteria to determine what constitutes misinformation.

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ORCID

Magda Osman http://orcid.org/0000-0003-1480-6657
Bjoern Meder http://orcid.org/0000-0002-9326-400X
Christos Bechlivanidis http://orcid.org/0000-0001-9111-9653

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