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Public (dis)trust in science in digital media environments

ARTICLE

Public perceptions of trustworthiness and authenticity towards scientists in controversial scientific fields

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Abstract

This study investigates public perceptions of trustworthiness and authenticity regarding scientists engaged in controversial and less controversial fields with a cross-sectional survey of a German sample (N = 1007). Results indicate that scientists in controversial fields like COVID-19 or climate change are perceived as less trustworthy and authentic compared to scientists in less controversial fields or scientists without specification of their field. Additionally, we found that science-related media consumption shaped people´s trustworthiness and authenticity perceptions towards scientists. Our analysis points out how public perceptions of scientists vary if these scientists research controversial areas, actively participating in public (and media) life.

Keywords

Public perception of science and technology; Science and media

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1 ▪ Introduction

Contemporary large-scale crises, such as climate change and the COVID-19 pandemic, have placed scientists at the center of societal and media debates. In both climate change and the COVID-19 pandemic, individual scientists could become very visible to the public and often found themselves in mainly uncharted territory, for instance, serving as pundits in media reporting or policy advisors [Butler et al., 2021; Joubert et al., 2023]. Doing so, such scientists served the public beyond their traditional domains, sometimes forced to balance objective evidence production and specific demands of policy or media stakeholders against each other [Pielke, 2007; Safford et al., 2021]. Accordingly, we assume that the more a scientific field becomes involved in media discourse and policy-making, the wider the gap and the greater the (perceived) conflicts may become between scientists in their primary role as 'broker' of scientific evidence [Pielke, 2007] and as advisors and public media figures. Correspondingly, scientists engaged in research on such controversial socio-scientific issues like climate change or COVID-19 [Brondi et al., 2021; Dixson et al., 2022; Nauroth et al., 2017], tend to face such role conflicts discussed above more than other scientists. In line with previous research [Drummond & Fischhoff, 2017; Gligorić et al., 2024; Suldovsky et al., 2019], we consider controversial scientific fields as such fields in which scientists "work on issues that are caught in the crosshairs of heavily politicized public debate" [Gligorić et al., 2024, p. 2]. Regarding these issues, publics may hold completely divergent opinions on how to use the knowledge produced within these scientific fields; therefore, we assume that individual scientists from such disciplines may be perceived differently by the public [Drummond & Fischhoff, 2017; Gligorić et al., 2024; Suldovsky et al., 2019].

In the study presented here, we inquire whether scientists in controversial scientific fields are perceived as equally trustworthy as scientists researching less controversial areas or scientists without specification of their field. In addition, we examine the same associations regarding assessments of scientists' authenticity which is connected to trust and has increasing relevance for the public understanding of science [Saffran et al., 2020]. Finally, considering media functioning as central place where people are confronted with scientific issues [Metag et al., 2018], we investigate whether different patterns of individual science-related media consumption are related to these associations. We conducted a cross-sectional survey focusing on public perceptions of trustworthiness and authenticity towards scientists in controversial and less controversial scientific fields. The total sample comprised N = 1007 participants, evenly distributed in terms of age, gender, and education.

2 ▪ Literature review

2.1 ▪ *Public perceptions of scientist´s trustworthiness*

Scholarly attention regarding trust in science has been growing steadily, at the very latest since the COVID-19 pandemic [Altenmüller et al., 2024, p. 9; Reif et al., 2023, p. 2]. Trust in science is fundamental for individuals to make evidence-based and informed decisions, for instance, in medical or environmental contexts [see Cologna & Siegrist, 2020; Dohle et al., 2020].

We consider trust to be a multilevel and multidimensional concept [Reif et al., 2023; Sztompka, 2007]. Accordingly, scholars need to differentiate between the different levels

(micro, meso, macro) at which the trustee (i.e., the individual, collective, or abstract 'actor' receiving trust) can be located [Besley & Tiffany, 2023; Reif et al., 2023]. The levels can vary, for instance, ranging from science in general, to individual scientists, scientific institutions, scientific disciplines, the scientific community, and trust in the scientific method [Sztompka, 2007, pp. 212–213]. Also, it is necessary to consider who the referenced trustor is — and for instance, distinguish between intra-scientific trust, i.e., scholars trusting each other, and trust expressed by persons who are not part of the scientific community, for example, "expressed by a wider public, common citizens" [Sztompka, 2007, p. 213]. Another important distinction can be made between behavioral trust and underlying trustworthiness perceptions [Besley & Tiffany, 2023; Schoorman et al., 2007]. Behavioral trust "can be understood as a trustor's willingness to make themself vulnerable to the behaviors or decisions of a trustee" , while underlying trustworthiness perceptions indicate "how a potential trustor perceives the person or group that is creating the potential vulnerability" [Besley & Tiffany, 2023, p. 1]. The latter, the underlying trustworthiness perceptions towards individual scientists, will be the focus of the current study. Hendriks et al. [2015] found three dimensions of trustworthiness perceptions: 'expertise', 'integrity', and 'benevolence' perceptions, building on previous research by Mayer et al. [1995]: (1) Expertise refers to a scientist´s ability in facing problems through knowledge gained from qualifications, experience, and education. (2) Integrity is ensured through objectivity, adherence to scientific standards and processes, as well as maintaining independence from external influences. (3) Benevolence refers to scientists serving the common good and contributing to a positive impact on society. In this regard, scientists display moral values, ethical norms and social responsibility [see also Reif et al., 2023, p. 4]. More recent works suggest the inclusion of additional categories such as 'openness', 'transparency', or 'dialogue' [see Besley et al., 2021; Reif & Guenther, 2021; Reif et al., 2023]. These differentiations are very commonly used in contemporary science communication research [Besley & Tiffany, 2023; Fuglsang, 2024].

Research has identified important predictors for trust related to science, including sociodemographic characteristics (e.g., age, gender, income, etc.), political ideology, personal and mediated experiences with science, basic orientations towards science (e.g., science-related populist attitudes), and media use related to science [for instance, see Achterberg et al., 2017; Anderson et al., 2012; Gligorić et al., 2022; Huber et al., 2019; Wintterlin et al., 2022]. However, especially regarding public perceptions of trustworthiness towards scientists, large parts of research has been conducted in stable periods [Mihelj et al., 2022]. Accordingly, we argue that, besides the previously discussed predictors, it is specifically the controversy of the scientific field that may alter how the public views their scholars — especially considering controversial socio-scientific issues like climate change or COVID-19 [Brondi et al., 2021; Dixson et al., 2022; Nauroth et al., 2017]. In line with previous research [Brondi et al., 2021; Gligorić et al., 2022, 2024], we therefore assume that trust levels may vary depending on the concrete topics or disciplines considered. First studies in this area indicate, for instance, that for scientists in controversial disciplines perceived morality plays a central role in building trust in these scientists [Gligorić et al., 2024]. Also, trust in climate scientists compared to trust in scientists in general can be quite different depending on the cultural and country-specific contexts [Cologna et al., 2023; Duffy et al., 2022; Gundersen et al., 2022]. In Germany, climate scientists received similar levels of trust as scientists in general, while in Italy or Poland, climate scientists received more trust than scientists in general. Conversely, in the U.K., scientists in general received more trust than climate scientists [Duffy et al., 2022; Gundersen et al., 2022]. These selective results show it

makes a difference what type of scientist people think of when they fill out a questionnaire. Nevertheless, this study addresses only one example of a controversial science field and only science in general as comparison parameter and there is limited systematic comparison yet about the role that controversial or uncontroversial research areas play for trustworthiness judgments [Gligorić et al., 2024]. In the current study, we accordingly ask:

> **RQ1**: How do publics perceive the trustworthiness of scientists researching different examples of controversial fields compared to scientists in general or scientists researching less controversial fields?

2.2 ▪ *Public perceptions of scientist´s authenticity*

Authenticity describes the extent to which persons remain true to themselves and act in accordance with their own values as well as norms of their societal role [see Luebke, 2021, pp. 636–637]. Focusing on political communication, Luebke [2021] differentiated the construct into performed, mediated, and perceived authenticity. While performed authenticity describes "a specific type or mode of performance that aims to construct an authentic image for the audience" and mediated authenticity "refers to processes of constructing authenticity through journalistic media and media technology", perceived authenticity features audience perspectives on attributes and impressions assigned to respective actors [see Luebke, 2021, pp. 637–641; O'Connor et al., 2017, p. 2]. Strategic political communication [Luebke & Engelmann, 2022] and communication the context of marketing, public relations, and online influencers [Molleda, 2010; Pöyry et al., 2019] still represent the focus of research of perceived authenticity. Molleda [2010] and Pöyry et al. [2019] highlight the elusiveness as well as the context sensibility of the authenticity construct. This makes it difficult to generalize results from fields such as political or marketing communication to science communication.

Notably, the role of authenticity in science communication remains widely underexplored. Recent research on perceived authenticity of scientists has connected it to related constructs like perceived trustworthiness of scientists [Saffran et al., 2020]. Saffran et al. [2020] found perceptions of 'connection' and 'integrity' to be fundamental for the construct of individual scientists' perceived authenticity. Connection refers to the association between the researchers and their self, research, and audience. The dimension of integrity primarily reflects researchers' abilities for 'unbiased processing' as well as being transparent and honest.[1] However, currently there is limited research testing and validating these dimensions. Also, there is no insight into perceptions of scientists' authenticity as a function of the scientific field. Accordingly, in the current study, we ask:

> **RQ2**: How do publics perceive the authenticity of scientists researching different examples of controversial fields compared to scientists in general or scientists researching less controversial fields?

1. This notion of integrity somehow overlaps with the respective dimension of perceived trustworthiness; nevertheless, Saffran et al. [2020] found strong correlations of their integrity items with the construct of authenticity [see Saffran et al., 2020].

2.3 ▪ *The role of science-related media consumption*

As mass media function as a central space to encounter scientific issues [Metag et al., 2018], we assume that individual patterns of science-related media consumption matter for people´s trustworthiness and authenticity perceptions [Brondi et al., 2021]. According to framing and cultivation theory, media reporting on scientific issues use certain frames and construct certain images of science and scientists, affecting audiences' understanding and perceptions [Dudo et al., 2011; Gerbner et al., 1981; Nisbet, 2009; Nisbet et al., 2002]. In times of crises, science-related media consumption may be quite varied, with some people intensively consuming many media outlets, intending to get a broad picture of the crises and the science behind, while others use only few — maybe only "old-world" or new-world" media [see Schneider & Eisenegger, 2019] — media or generally avoid crisis news [Schumann & Arlt, 2023; Viehmann et al., 2020] with the latter demonstrating a 'knowledge gap' and potentially diverse attitudes towards a crisis´ scientific input [for instance, see Gerosa et al., 2021; Tichenor et al., 1970]. Previous research has shown that the consumption of science news in old-world media (e.g., newspapers, science magazines) is often associated with higher levels of trust in science [e.g., Anderson et al., 2012; Nisbet et al., 2002] while a higher reliance on new-world media (e.g., social media) can make people more susceptible for science-related misinformation and thus negatively influence attitudes towards science [e.g., Xiao et al., 2021].

We argue that different forms of science-related media consumption about crises like climate change or the COVID-19 pandemic matter for public perceptions of scientists´ trustworthiness and authenticity. We therefore explore how different patterns of science-related media consumption [e.g., consumption of rather old-world or new-world media, see Schneider & Eisenegger, 2019] are associated with perceived trustworthiness and perceived authenticity of scientists. Additionally, we investigate if such associations concern scientists in general or are dependent on the field in which the scientists are active, researching either controversial or less controversial areas:

> **RQ3a**: How are different patterns of science-related media consumption associated with perceived trustworthiness of scientists?
> **RQ3b**: How are different patterns of science-related media consumption associated with perceived authenticity of scientists?
> **RQ3c**: Do these associations in RQ3a and RQ3b concern scientists in general or are they dependent on the field in which the scientists are active, researching either controversial or less controversial areas?

3 ▪ Methods

We conducted a cross-sectional national survey in Germany to address our research questions.[2] We used a quota sample structured by age (three equal groups: 18–35 years, 36–59 years and 60+ years), sex (two equal groups: male, female), and education (two equal groups: no German degree for higher education, German degree for higher education). The

2. As this analysis is part of a larger project, a different portion of the data that does not overlap with this analysis focuses on the endorsement of scientific norms across scientists in controversial scientific fields and will be presented elsewhere [Schug et al., 2024].

participants (n = 1148) were recruited with the help of the online access panel provider Respondi in March 2023. We eliminated cases of overly short and long response times (< 2:30 minutes and > 37:00 minutes) as well as cases of systematic responses (i.e., 'straight-lining'). In addition, we included two attention checks that tested the awareness of previous questions. If both questions were answered incorrectly, we eliminated the case from the data set. The final sample included 1007 respondents (age: M = 47.00, SD = 18.66; sex: 51.24% female; education: 50.8% with German degree for higher education). Table 1 gives an overview of detailed descriptive statistics and zero-order correlations of all relevant variables.[3]

We implemented the potential for controversy of scientific fields as an experimental factor. First, respondents answered questions on sociodemographic characteristics and science-related media consumption. Afterwards, they were randomly assigned to one of five questionnaire versions: from this point on, each of the five groups received a different questionnaire version, with each version using the same items, but with respective scientific fields as reference points, either included in the items or in the instructions of the questions. Questions on perceived trustworthiness and authenticity were therefore related only to a specific scientific field. We used virology with a focus on COVID-19 (n = 206) and climate science (n = 205) as examples for controversial fields; astrophysics (n = 192) and science of history (n = 195) as examples for less controversial fields. The fifth group acted as a baseline, receiving a questionnaire not specifying a field, but referencing "science in general" (n = 209). For instance, while we used the item "Scientists use their research to their own advantage" in the science in general condition, the same item read "*Virologists researching COVID-19* use their research to their own advantage" in the virology version — depending on the experimental condition replaced by "*Climate scientists*…", "*Astrophysicists*…", "*Historians*…" in the remaining versions.[4]

3.1 ▪ *Measures*

Perceived trustworthiness of scientists was measured with a shortened version of the Muenster Epistemic Trustworthiness Inventory [METI Hendriks et al., 2015] that was applied by the Science Barometer Switzerland [2019]. Accordingly, we asked respondents on 7-point semantic differentials from "not at all" (1) to "entirely" (7): "I generally see people who are *virologists researching COVID-19 / climate researchers / astrophysicists / historians / scientists* as …" and added three items each for expertise (e.g., from "incompetent" to "competent"), integrity (e.g., from "dishonest" to "honest"), and benevolence (e.g., from "irresponsible" to "responsible"). We computed subscales for expertise (M = 5.37, SD = 1.36, α = .89), integrity (M = 5.06, SD = 1.36, α = .90), and benevolence perceptions (M = 5.11, SD = 1.36, α = .89) and combined all nine items into one perceived trustworthiness scale (M = 5.18, SD = 1.29, α = .96).

Perceived authenticity of scientists was measured with eleven items (split into six items on 'connection' and five items on 'integrity') applied from Saffran et al. [2020]. As the original items from Saffran et al. [2020] referred to specific scientists respondents had been asked about in an experimental design (e.g., "How likely is this researcher to hide their true thoughts, feelings and doubts behind their role as a researcher?"), we adapted the items onto

3. All the tables are available as supplementary material 2.
4. For a complete overview of all measures, see supplementary material 1 "Scales and items".

scientists in general or discipline-specific contexts (e.g., "*Virologists researching COVID-19* / *Climate researchers* / *Astrophysicists* / *Historians* / *Scientists* hide their true thoughts, feelings, and doubts behind their role as a researcher"). All items were rated on 7-point agreement scales from "do not agree at all" (1) to "totally agree" (7). We built subscales for respective connection (M = 4.89, SD = 1.07, α = .85) and integrity (M = 4.18, SD = 1.20, α = .82) perceptions and combined all eleven items into one perceived authenticity scale (M = 4.57, SD = .88, α = .81).

Science-related media consumption was measured with ten items representing science news sources (newspaper, radio, podcasts, scientific publications, etc.). We asked the respondents: "Media report a lot about scientific topics. In the past two weeks, how often did you encounter information or contents from science in the following media?". The answers were captured on 8-point scales ("not at all" (1), "a few times" (2), "about once a week" (3), "a few times per week" (4), "nearly every day" (5), "every day" (6), "a few times per day" (7), "many times per day" (8)). The items were combined into an overall mean score for science-related news consumption (M = 2.44, SD = 1.26; α = .90). Furthermore, to identify different patterns of science-related media consumption, we built indices for the consumption of rather "old-world" and "new-world" science news sources [Brondi et al., 2021; Schneider & Eisenegger, 2019]. Accordingly, while the old-world index represents people´s consumption of more traditional media (newspapers, magazines, radio, TV, scientific publications; M = 2.58, SD = 1.28), the new-world index represents people´s consumption of more digital media (social media, Wikipedia, internet sites on scientific topics, podcasts, messaging services; M = 2.30, SD = 1.40).

4 ▪ Results

4.1 ▪ *Perceived trustworthiness and authenticity by scientific fields*

We first tested differences between the experimental conditions regarding scientists' perceived trustworthiness overall and its subdimensions (RQ1) and perceived authenticity and its subdimensions (RQ2) with one-way ANCOVAs controlling for age, gender, and education. We found that experimental conditions were significantly associated with the trustworthiness expertise dimension (F(4, 1002) = 4.01, p = .00, η^2 = .02) as well as the authenticity integrity dimension (F(4, 1002) = 2.83, p = .02, η^2 = .01. We found no significant associations regarding perceived trustworthiness overall, F(4, 1002) = .98, p = .42, η^2 = .00, its subdimensions integrity, F(4, 1002) = 1.30, p = .27, η^2 = .01, and benevolence, F(4, 1002) = .75, p = .56, η^2 = .00, as well as authenticity perceptions overall, F(4, 1002) = 1.38, p = .29, η^2 = .01, and its subdimension connection, F(4, 1002) = 1.40, p = .23, η^2 = .01 (see Table 2).

Next, as all Levene tests for variance homogeneity were significant, we calculated Tamhane corrected post hoc tests. Regarding trustworthiness perceptions, the tests demonstrate that scientists in general scored significantly higher than all other experimental conditions for the expertise dimension (virology: M_{Dif} = .29, 95%-CI[.03;.56]; climate science: M_{Dif} = .43, 95%-CI[.18;.69]; astrophysics: M_{Dif} = .31, 95%-CI[.06;.56]; science of history: M_{Dif} = .47, 95%-CI[.25;.69]). For the integrity dimension, scientists in general scored higher than climate scientists (M_{Dif} = .30, 95%-CI[.05;.56]). Regarding authenticity perceptions overall, we found that astrophysicists scored significantly higher than climate scientists (M_{Dif} = .21, 95%-CI[.05;.38]). For the connection subdimension scientists in general scored significantly higher than climate scientists (M_{Dif} = .26, 95%-CI[.07;.45]) and for the integrity subdimension astrophysicists overscored all other experimental conditions (virology: M_{Dif} = .33, 95%-CI[.07;.57]; climate science: M_{Dif} = .31, 95%-CI[.07;.53]; science of history: M_{Dif} = .27, 95%-CI[.05;.49]; science in general: M_{Dif} = .33, 95%-CI[.10;.54]).[5]

We replicated the calculations above with collapsed categories of the experimental conditions and compared controversial fields (combining virology with a focus on COVID-19 and climate science, n = 411), less controversial fields (combining astrophysics and science of history, n = 387) with the science in general condition (n = 209). We could observe similar trends in this analysis. The collapsed experimental conditions were significantly associated only with the trustworthiness dimension of expertise (F(2, 1004) = 6.79, p = .00, η^2 = .01), but not with perceived trustworthiness overall (F(2, 1004) = 1.77, p = .17, η^2 = .00), its subdimensions integrity (F(2, 1004) = 2.31, p = .10, η^2 = .01) and benevolence (F(2, 1004) = 1.28, p = .28, η^2 = .00) as well as authenticity perceptions overall (F(2, 1004) = 1.53, p = .22, η^2 = .00) and its subdimensions connection (F(2, 1004) = 1.80, p = .17, η^2 = .00) and integrity (F(2, 1004) = 2.71, p = .07, η^2 = .01) (see Table 3). Subsequent Tamhane corrected post hoc tests demonstrated that scientists in general scored significantly higher on expertise perceptions compared to controversial (M_{Dif} = .36, 95%-CI[.14;.56]) and less controversial fields (M_{Dif} = .39, 95%-CI[.17;.57]). Regarding the integrity dimension of trustworthiness, scientists in general scored significantly higher than scientists in controversial fields (M_{Dif} = .25, 95%-CI[.03;.46]). Concerning authenticity perceptions, scientists in general scored significantly higher than scientists in controversial fields for the connection dimension (M_{Dif} = .18, 95%-CI[.03;.35]). Regarding the integrity dimension of authenticity, we found that scientists in less controversial fields scored significantly higher than scientists in controversial fields (M_{Dif} = .18, 95%-CI[.01;.35]) as well as scientists in general (M_{Dif} = .20, 95%-CI[.01;.38]).[6]

Summing up our analyses regarding RQ1 and RQ2, we found that associations between the experimental conditions and trustworthiness perceptions varied by its subdimensions. Perceived expertise was significantly higher for scientists in general, compared to scientists of both controversial and less controversial fields. Integrity perceptions, on the other hand, seem to depend more on the controversy of the scientific field: scientists in controversial fields were perceived to have less integrity than scientists in general, while scientists in general did not differ from scientists in less controversial fields. Authenticity perceptions also depend on the controversy of the scientific field. Overall authenticity perceptions were lower for climate scientists compared to astrophysicists. The connection dimension of

5. All other related post hoc group comparisons concerning trustworthiness and authenticity perceptions have not been significant.
6. All other related post hoc group comparisons concerning trustworthiness and authenticity perceptions have not been significant.

authenticity scored significantly lower for scientists in controversial disciplines than scientists in general (probably mainly driven by the perception of climate scientists). The integrity dimension of authenticity was highest for scientists in less controversial fields compared to both scientists in general and scientists researching controversial fields.

4.2 ▪ *The role of science-related media consumption*

To examine the role of science-related media consumption, we first tested the associations between the overall amount of science news consumption and the amount of old-world and new-world media science news consumption as well as perceived trustworthiness overall and its subdimensions (RQ3a) and perceived authenticity and its subdimensions (RQ3b) using OLS regression models, controlling for age, gender, and education. Results indicate that high consumption of science news was positively associated with the benevolence dimension of trustworthiness (β = .07, p = .04) and the connection dimension of authenticity (β = .09, p = .01), but negatively associated with the integrity subdimension of authenticity (β = -.15, p < .001); the remaining dependent variables were not associated (see Table 4). Testing the same associations regarding science news consumption specifically related to old-world and new-world media, we found that, on the one hand, higher consumption of old-world media was positively associated with the integrity (β = .07, p = .04) and benevolence (β = .07, p = .03) dimensions of perceived trustworthiness. Regarding authenticity perceptions, old-world media science news consumption was positively associated with connection perceptions (β = .10, p = .00) but negatively associated with the integrity dimension (β = -.11, p < .001). High consumption of new-world media for science news, on the other hand, was not associated with any trustworthiness perceptions, but negatively associated with the integrity subdimension of authenticity (β = -.17, p < .001; see Table 4).

As to answer RQ3c, we replicated the calculations above within the experimental conditions regarding (1) the science in general condition (n = 209), (2) controversial fields (combining virology with a focus on COVID-19 and climate science, n = 411), and (3) less controversial fields (combining astrophysics and science of history, n = 387) (see Tables 5–7).

(1) Within the science in general condition, we found higher science news consumption overall to be positively associated with the integrity (β = .15, p = .04) and the benevolence dimension of trustworthiness (β = .25, p < .001) as well as the connection dimension of authenticity (β = .15, p = .05), but to be negatively associated with the integrity dimension of authenticity (β = -.25, p < .001). High consumption of science news in old-world media was positively associated with perceived trustworthiness overall (β = .15, p = .04), its integrity (β = .15, p = .04) and benevolence (β = .25, p < .001) subdimensions as well as the connection subdimension of authenticity (β = .17, p = .02). However, it was also negatively associated with the integrity dimension of authenticity (β = -.20, p = .01). In contrast, high consumption of science news in new-world media was positively associated only with the benevolence dimension of trustworthiness (β = .21, p = .01) and negatively associated with the authenticity subdimension integrity (β = -.27, p < .001) for scientists in general (see Table 5).

(2) Within the experimental conditions on controversial scientific fields, the only associations we found were that science news consumption overall (β = .11, p = .04) and old-world media science news consumption (β = .13, p = .01) were positively associated with the connection dimension of authenticity (see Table 6).

(3) Within the experimental conditions on less controversial scientific fields, we found that high science news consumption overall was negatively associated with authenticity perceptions overall (β = -.12, p = .02) as well as its subdimension integrity (β = -.24, p < .001). We observed similar trends regarding high old-world and new-world science news consumption as new-world media consumption was negatively associated with authenticity perceptions overall (β = -.13, p = .02) and both old- and new-world media consumption were negatively associated with its subdimension integrity (old-world: β = -.19, p < .001; new-world: β = -.25, p < .001). In contrast, we found no respective associations to be significant regarding trustworthiness perceptions (see Table 7).

Summing up our analysis of RQ3a–c, overall high consumption of science news showed to be slightly positive related to perceived trustworthiness (especially benevolence) and the connection dimension of authenticity, but negatively associated with the integrity subdimension of authenticity. Regarding this integrity subdimension of authenticity, we found similar trends for a high consumption of old-world and new-world media for science news. However, for high consumption of science news in old-world media, we also found that it was positively associated with the trustworthiness benevolence *and* integrity dimension and the authenticity connection dimension. This indicates that high consumption of science news in old-world media (e.g., newspapers, radio, TV) is generally associated with higher trustworthiness perceptions and less negative influence on authenticity perceptions whereas high consumption science news in new-world media (e.g., social media, Wikipedia, messaging services) was not associated with trustworthiness perceptions and showed stronger negative associations with perceived authenticity. However, we also found evidence that the associations between (old-world and new-world) science news consumption as well as perceived trustworthiness and authenticity also depend on the controversy of the respective scientific field. Differentiating between controversial and less controversial fields as well as science in general, we found positive associations between high science news consumption in old-world *and* new-world media and trustworthiness perceptions of scientists in general (especially regarding the benevolence dimension). However, authenticity perceptions of scientists in general were still partly negatively associated with high science news consumption (especially in new-world media). For controversial areas, we found no such positive associations apart from small associations between high consumption of science news overall as well as the consumption of old-world media for science news and the connection dimension of authenticity. For less controversial fields we found constant negative associations between science news consumption (old-world and new-world media) and perceived authenticity, especially regarding the integrity subdimension.

5 ▪ Discussion

Our study demonstrated that respondents tended to perceive scientists from controversial fields as less trustworthy and authentic compared to scientists in less controversial fields or scientists without specification. This expands prior research on discipline-specific perceptions of climate scientists which showed only few differences between trust in climate scientists and trust in scientists in general across European countries [Duffy et al., 2022; Gundersen et al., 2022]. However, the relationship between controversial, less controversial, and unspecified scientific fields with trustworthiness and authenticity perceptions is complex; the associations often depend on the subdimensions of the constructs as well as the comparisons of individual disciplines (e.g., astrophysicists compared to climate scientists).

Even if we assume that citizens usually do not have direct contact and experience with scientists from these fields, they do have a specific image in mind that might be intertwined with their answers. One of the sources of this "image in mind" could be indirect experiences with science through media. Our assumption that judgments of trustworthiness and authenticity are media-dependent were confirmed and in line with previous research [e.g., Brondi et al., 2021; Dudo et al., 2011]. We observed that participants with an overall high consumption of science news perceived scientists as partly less authentic. This somewhat surprising result was clarified by looking at the influences of new-world and old-world media separately: The negative associations between science news consumption and overall authenticity were mainly based on the consumption of science news in new-world media, while old-world science news consumption was partly also positively associated with authenticity. However, for the authenticity dimension of "integrity", both new and old media news consumption showed negative associations. Regarding trustworthiness, using science news from old-world media was positively associated with trustworthiness dimensions integrity and benevolence, while no relationship was visible for new-world media. These results seem plausible as old-world media usually offer discourses that are more favorable towards and supportive of science, while new-world media often offer space for critical and oppositional arguments [e.g., Anderson et al., 2012; Maurer et al., 2021; Xiao et al., 2021]. Controversy of the respective scientific field mattered for the judgments of trustworthiness and authenticity: High consumption of science news was positively associated with trustworthiness perceptions regarding scientists in general, but not regarding scientists of specific disciplines. Additionally, people who view scientists in less controversial or unspecified fields as low in authenticity tend to consume more science news.

The negative relationships of media usage and authenticity open up a number of interesting questions. Authenticity implies that there is a "true kernel" against which a person or, in our case, a group of persons is compared: it is the extent to which persons are true to themselves and consistent with their own values and their societal role [see Luebke, 2021, pp. 636–637]. This means that respondents need to imagine the "true kernel" of a scientist, and then compare their own image of the group to that kernel. If we assume that people usually do not have direct, let alone extensive, experience with different types of scientists, this raises the question: what shapes the kernel, and what shapes the image of the group — and, if media are the (probable) source of both, how come they diverge, resulting in low authenticity judgments? Apparently, the authenticity judgment is a multilayered cognitive task for respondents who rarely have the time or motivation to make clear distinctions between reliable and unreliable sources for the judgments. If the "true kernel" against which the judgments are made is not true at all, but biased, unrealistic, inconsistent with the scientists' role or simply shaped by myriads of fictional stereotypes of scientists, then authenticity judgments only represent the agreement or disagreement with a false ideal type. This poses an interesting theoretical challenge and room for new theory development for authenticity related to science.

Our study has some limitations that deserve attention. Regarding our measures of science-related media consumption, we treated our scales as pseudo-metric for the correlation and regression analysis, even though the scale we used was ordinal with all scale points labeled — an approach that may be very common, but nevertheless can theoretically be questioned [for instance, see Rhemtulla et al., 2012; Robitzsch, 2020]. Also, the measurement of perceived authenticity we adapted from Saffran et al. [2020] is limited as

people´s answers on some of the items might be influenced by their philosophical positions towards science respectively their discipline-specific perceptions of scientific norm fulfillment. For instance, the item "*Virologists researching COVID-19* / *Climate researchers* / *Astrophysicists* / *Historians* / *Scientists* think it is important that everyone understands their findings" strongly refers to people´s perceptions in how far scientists from these disciplines are able to fulfill the norm of communalism [Merton, 1973]. Moreover, our survey focused on the German population that is characterized by country-specific historical and cultural factors related to science communication, making our results only partially comparable to those of other countries [see Peters et al., 2020]. Additionally, the survey design included only four examples for controversial and less controversial scientific fields. While two examples from controversial and less controversial fields are certainly better than one, the examples used are very specific and may have particular meanings to the respondents apart from the controversy in the field. For example, virology is controversial, but also media-saturated, unusually obtrusive, and salient. Scientists from this field were as prominent as leading politicians during the pandemic and often the target of hateful discourse in social media. Other aspects than controversy may have been at play when we asked people to evaluate trustworthiness and authenticity. Including more examples of each category would ensure that the theoretical factor is more reliable. Related, we have no information how exactly people imagined the scientists and their disciplines we asked them to think about. For instance, it is possible that some might think of 'virologists researching COVID-19' as medical scientists while others might think of them as scientists related to pharma industry or that people confuse 'astrophysicists' with astrologists. Also, historians and astrophysicists may indeed both be considered as working in less controversial fields, but in the public eye may have very divergent methods of data collection and interpretation and therefore differ to the degree they are considered "scientists" [Gligorić et al., 2022; Suldovsky et al., 2019].

Considering potential future research directions on public perceptions of science, especially regarding controversial areas, it is first important to mention that based on our experimental design, we could identify associations between — not effects of — science news consumption as well as the controversy of scientific fields and perceptions towards scientists. Further research might consider experimental designs in which more direct associations between these constructs can be drawn — for instance, by actively manipulating the controversy attached to individual scientists in specific contexts, ascribing the scientists a concrete societal role (see Introduction) and investigating respective effects on perceptions. We also propose more theoretical work on differentiations between the constructs of perceived trustworthiness and authenticity and their respective subdimensions. For instance, both constructs rely on a subdimension of integrity, in each case theoretically justified [Hendriks et al., 2015; Saffran et al., 2020] and autonomous (see correlations, Table 1). In our study, high science-related media consumption (especially of old-world media) influenced these subdimensions in different directions, changing perceptions related to trustworthiness for the better while changing perceptions related to authenticity for the worse. Future studies might delve deeper into this conceptual issue and collect qualitative data on authenticity cues in media coverage. Likewise, qualitative approaches may illuminate the aspects responsible for forming authenticity judgements in audiences [e.g., consumption of fictional or narrative (stereotypical) science stories, see Kinnebrock & Bilandzic, 2023; Haynes, 2003]. These can then also be contrasted to previously discussed dimensions of perceived trustworthiness of scientists [Hendriks et al., 2015; Reif & Guenther, 2021; Reif et al., 2023]. Additionally, more research is needed on what role the perceived fulfillment of scientific

norms plays for people´s authenticity judgements (see above) and on the question how relevant it is for scientists from different disciplines to be seen as (in)authentic. For instance, authenticity judgements may affect behavioral outcomes of science communication just as trustworthiness perceptions do [Besley & Tiffany, 2023]. If actions recommended by scientists to solve problems depend on the authenticity perceptions of citizens, stakeholders, or politicians, then science communication cannot be confined to delivering scientific findings. We know that positive public perceptions of scientists may foster evidence-based decisions in medical or environmental contexts [Cologna & Siegrist, 2020; Dohle et al., 2020]. Such knowledge is inevitable in order to develop strategies for credible and authentic science communication in the context of socio-scientific issues like climate change or COVID-19 — for instance, on how to effectively integrate cues for trustworthiness or authenticity, and indicate transparency, and openness to dialogue in science messages addressing broader publics [Besley & Dudo, 2022; Cologna et al., 2023; Mede & Schäfer, 2020]. Also, more detailed regarding associations between high science news consumption and discipline-specific trustworthiness and authenticity perceptions of scientists, future research should explore motivations to consume discipline-specific science news intensively or rarely as well as investigate the way in which people process and interpret such news to reach a specific conclusion about authenticity. Therefore, we encourage further research that connects concepts like news information seeking, issue fatigue, and knowledge overestimation to media consumption regarding controversial scientific issues [Bilandzic & Gall Myrick, 2023; Mede et al., 2024; Schumann & Arlt, 2023].

6 ▪ Conclusion

Science is becoming increasingly crucial for modern societies as more and more societal crises demand scientific support and solutions, resulting in controversial socio-scientific debates [Leung & Cheng, 2021; Nauroth et al., 2017]. Because climate change and the COVID-19 pandemic probably will not be the last controversial socio-scientific issues of their kind, we should take these crises as opportunities to learn and create preparedness for future socio-scientific challenges. Against this backdrop, the tendencies we identified regarding discipline-specific trustworthiness and authenticity perceptions of scientists in controversial areas as well as the partly negative influence of intensive science news consumption represent an opportunity and obligation to further work on strategies to enhance the public perception of scientific disciplines actively contributing to crisis resolution.

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Supplementary material

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All materials related to our questionnaire and analyses are available as supplementary material to this article. The original dataset is available upon request after publication.

Supplementary material 1: Scales and items

Supplementary material 2: Tables

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