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Cognitio populi – Vox populi: Implications of science-related populism for communication behavior

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Abstract: In many countries, science is challenged by science-related populism, which deems the common sense of "ordinary people" superior to the knowledge of "academic elites". Individual support for science-related populism can be associated with people's communication behavior: On the one hand, people who hold science-related populist attitudes may inform themselves differently about science; they may even be disconnected from societal discourse around science. On the other hand, they may communicate more actively on social media and in interpersonal conversations. We test this using nationally representative survey data from Switzerland. Results show that science-related populists use TV and social networking sites more often to get information about science. They are also more likely to communicate about science in social media comments. However, science-related populist attitudes are not associated with a general preference for social media over journalistic media. Science-related populism has thus not (yet) fueled a "science-related public disconnection". We also run multiverse analyses, which show further nuances of our results, and discuss implications for science communication.

Keywords: science communication, populism, public perceptions of science, media use, social media, survey

1 Introduction

Societal institutions in many countries are currently challenged by public resentment. These include science, which faces different variants of public backlash,

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including distrust, hostility, denial, and belief in misinformation (Scheufele et al., 2021). Studies show that people who harbor such resentment share similar sociodemographic backgrounds, political orientations, religious views – and communication behaviors: On the one hand, they exhibit similarities in *media use*, often refraining from using certain journalistic media (Metag, 2020) and instead turning toward social media, where conspiracy theories and common sense claims are more prevalent (Yan et al., 2022). On the other hand, they show more *communicative engagement*, articulating their views on social media, instant messaging, or personal conversations more actively (Eberl and Lebernegg, 2022; Porten-Cheé and Eilders, 2015).

We focus on one variant of public backlash against science: "science-related populism" (Mede and Schäfer, 2020, p. 473). It can manifest itself in attitudes suggesting that the scientific knowledge of "academic elites" is inferior to the common sense of "ordinary people" (Mede et al., 2021, p. 275). Individuals holding these attitudes claim that the people – rather than allegedly immoral scientists – should "*speak truth*" and *make decisions* on how "true knowledge" is produced (Mede et al., 2022, p. 2).

Similar to political populist attitudes (e. g., Jeroense et al., 2022; Schulz, 2019), science-related populist attitudes can be assumed to influence people's communication behavior by

(a) decreasing the use of media that connect the public and science (e. g., certain journalistic media),
(b) increasing the use of media that disconnect some of their users from science (e. g., certain social media), and
(c) causing individuals to communicate their (science-related populist) views to others more actively.

Science-related populism may thus catalyze a communicative disconnection between science and parts of the public – similar to what has been described as a "disconnectedness" (Blekesaune et al., 2012, p. 111) of publics from societal institutions that claim (journalistic) *truth-speaking* power and (political) *decision-making* authority: the "institutions of press and politics" (Bennett and Pfetsch, 2018, p. 243). However, a "science-related public disconnection" fueled by science-related populism would pertain to *scientific* institutions and *science-related* media, with segments of the public being disconnected from societal discourse around science.

Yet so far, scholars have only described single aspects of a science-related public disconnection, diagnosing "disconnects between public opinion […] and the scientific consensus" (Scheufele and Krause, 2019, p. 7662) or "echo chambers of denial", that is, disintegrated online communities rejecting this consensus (Walter

et al., 2018, p. 204). But these diagnoses have not considered people's science communication behaviors in general, have not referred to science-related populism, and have not always rested on the robust empirical evidence needed to adequately assess if and how populism undermines the science-society nexus (Bory et al., 2022). Our study adds to the literature on science communication, populism, and public criticisms of science by addressing these gaps. Drawing on a nationally representative population survey in Switzerland, we show how people's science-related populist attitudes relate to their media use and communicative engagement.

2 Conceptual framework and literature review

Science-related populist attitudes and what we know about them

Science-related populism has been conceptualized as a set of ideas suggesting a fundamental conflict between "ordinary people" and "academic elites", that is, scientists or scientific institutions (Mede and Schäfer, 2020, p. 481). It maintains that scientific elites produce knowledge that is allegedly useless, ideologically biased, without practical relevance, and inferior to the common sense of "ordinary people" (Saurette and Gunster, 2011; Ylä-Anttila, 2018, p. 358). Consequently, science-related populism claims that the people, and not academic elites, should govern scientific decision-making and determine what counts as "true knowledge" (Mede and Schäfer, 2020, p. 482). Science-related populism has conceptual similarities to *political* populism, but challenges *scientific* epistemologies and institutions instead of political power structures (Eberl et al., 2023). It can thus be understood as a distinct type of criticism of science – overlapping with, but also differing from, science denial, for example (Rekker, 2021).

Mede and Schäfer (2020) describe science-related populism as a "thin-centered ideology" (Mudde, 2004, p. 544). It can manifest itself in science-related populist *attitudes*, which can be conceived as relatively stable orientations cultivated through personal experience and socialization (Wintterlin et al., 2022), similar to positive attitudes toward other "thin" ideologies like technocracy or political populism (Caramani, 2017). Science-related populist attitudes have four dimensions: positive conceptions of the ordinary people, negative conceptions of the academic elite, demands for decision-making sovereignty, and demands for truth-speaking sovereignty (Mede et al., 2021). Conceptually, these dimensions are non-compensatory: Only support for all of them together indicates science-related populist attitudes, while exclusively demanding truth-speaking sovereignty may

rather indicate anti-intellectualism, for example (Merkley, 2020; see Wuttke et al., 2020).

Science-related populist attitudes can be measured with the SciPop Scale introduced by Mede et al. (2021). Empirical evidence on these attitudes is scarce, as the scale has not yet been applied systematically – but prior research investigated single components of science-related populist attitudes: It suggests that positive *conceptions of the ordinary people* are widespread among the US population, as 48 % of it agree that "ordinary people are perfectly capable of deciding for themselves what is true and what is not" (Oliver and Wood, 2018, p. 117). Negative *conceptions of the academic elite* were found among Italians, 14 % of whom agree that "people with advanced degrees do not understand the problems of ordinary people" (Roccato et al., 2019, p. 2156). Public *demands for (science-related) decision-making sovereignty* were observed in Switzerland, for example, where 19 % of the population want to participate in "decisions about the topics scientists research" (Schäfer et al., 2018, p. 842). And *demands for truth-speaking sovereignty* seem common among Germans, as 33 % of them believe that people should rely more on common sense and less on scientific studies (Wissenschaft im Dialog, 2019).

Further research explored the correlates of these separate components in detail: It found links to sociodemographic characteristics and political orientations, indicates variation across scientific fields, and suggests that there are cases where populists instrumentalize scientific expertise from certain disciplines to criticize scholars (Brühwiler and Goktepe, 2021; Mede et al., 2022; Schrøder, 2022). However, research has not yet examined links between science-related populist attitudes and science-related communication behavior.

Communication behavior of critical science audiences

Scholarship on (science) communication, (political) populism, and (critical) orientations toward science contains three strands conceptualizing a relationship between science-related populist attitudes and communication behavior. The first strand argues that fundamental individual orientations toward science influence communication behavior (Brossard and Nisbet, 2007) along an "information intake" dimension and an "outreach communication" dimension (Khan, 2017). These orientations may thus shape people's *media use* (intake), for instance, their choice of specific media (Valkenburg and Peter, 2013), and *communicative engagement* (outreach), for instance, people's willingness to discuss personal opinions in conversations, on social media, and instant messaging (Sotirovic and McLeod, 2001; Zhou and Pinkleton, 2012). Science communication scholars adopted this argument, suggesting that fundamental orientations toward science affect how people inform

themselves and communicate about science (Metag, 2020). Accordingly, we assume that science-related populist attitudes influence which media people use to get information about science and to engage with science.

A second strand of scholarship has focused on audiences with critical orientations toward established institutions and dominant epistemologies. On the one hand, it contends that these audiences often avoid *journalistic media* (e. g., newspapers, TV), as they perceive hostile resentment (Schulz et al., 2020) and "a subjective feeling of alienation and mistrust" toward them (Tsfati, 2003, p. 67). On the other hand, these audiences were found to use *social media* more often (e. g., blogs, social networking sites), perhaps hoping to circumvent the influence of an allegedly corrupt societal establishment, exchange with like-minded people, and spread counterhegemonic claims about science (Waisbord, 2018). Critics of hegemonic views and epistemologies were also described as more vocal in interpersonal conversations and online media (see Post, 2019), sometimes promoting their views regardless of whether they would discuss sensitive topics and hold minority opinions (Gearhart and Zhang, 2018). Science communication scholars therefore suggested that critical science audiences rely more on *social media* than on *journalistic media* for information about science, avoid science communication activities (like visiting lectures or exhibitions), and are more outspoken about their views in social media or interpersonal conversations (Nisbet and Scheufele, 2009; Ruth et al., 2019; Schäfer and Metag, 2021)[1]. Hence, we assume that *populist* science communication audiences prefer social media over journalistic media, refrain from formats offered by scientific institutions, and communicate about science more actively.

A third strand of scholarship has assessed which media accommodate anti-establishment movements. It has identified social media as a particularly "suitable channel for populist appeals" (Gerbaudo, 2018, p. 748), because they allow circumvention of presumed elite censorship and distribution of common-sense ideas (Hopster, 2021). Such "entrenchment" (Schroeder, 2019) of anti-elite sentiment within social media was also observed in research on public opinion and communication about science: Scholars have argued, for example, that some social media have an "elective affinity" with populism and experiential knowledge claims (Waisbord, 2018, p. 18), can provide favorable conditions for the spread of these claims (Ylä-Anttila, 2018), and may serve as echo chambers of science denial (Walter et al., 2018). These arguments suggest that science-related populism may be similarly "entrenched" within social media as other anti-establishment views, which sup-

1 However, scholars have acknowledged that these audiences may not distrust journalistic media altogether (because some outlets do promote critical orientations toward science), and may not prefer social media per se (because some platforms do challenge critical orientations; see Huber et al., 2019).

ports our assumption that science-related populists prefer these media to inform themselves and communicate about science.

Complementary to these three strands of research, public sphere theorists have proposed a more holistic approach. Some have suggested that populist sentiment within society may fundamentally undermine the communicative connection between citizens and public discourse by decreasing the use of certain *journalistic media*, increasing the use of certain *social media*, and fueling *communicative engagement* (Kleinen-von Königslöw, 2020; Pfetsch, 2020; Thorbjørnsrud and Figenschou, 2022). Segments of the population may actively avoid news media (Skovsgaard and Andersen, 2022), "tune out the world of current affairs" (Blekesaune et al., 2012, p. 120), and lose touch with societal debates and institutions (Bennett and Pfetsch, 2018), which would lead to "disconnected public spheres" (Pfetsch, 2018, p. 59) and "disintegrated societies" (Blekesaune et al., 2012, p. 110)[2].

These arguments focus on *political* institutions, *political* news use, and populist attacks on politicians' power claims and journalists' truth claims. But they translate to *scientific* institutions, *science* communication, and *science-related* populism, as science puts forward power claims similar to those of politicians (albeit they pertain to scientific rather than political decisions), and truth claims similar to those of journalists (albeit they are based on scientific epistemologies rather than journalistic research). Accordingly, a "*science-related* public disconnection" fueled by science-related populism may exist.

Evidence on the communication behavior of science-related populists

Evidence on the media use and communicative engagement of individuals with science-related populist attitudes is not available yet, but research on similar phenomena is helpful to set up our research questions and hypotheses. In line with the arguments discussed above, such research indicates that these individuals differ from others in their use of (1) journalistic media and (2) social media, (3) their participation in non-mediated communication formats, (4) and their communicative engagement with others.

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2 Scholars have also emphasized that social media may not undermine a public connection per se, because aspects of social media, like their ability to enable dialogue, might also strengthen a connection of the public and societal institutions (Swart et al., 2017). Additionally, it has been pointed out that (dis)connectedness should be conceived as a continuum, where even little use of journalistic and social media can be enough to maintain a weak connectedness (Couldry et al., 2010; Hovden and Moe, 2017).

(1) *Journalistic media* are often used less frequently by people with populist attitudes to get political news (Schulz, 2019). Similarly, people holding critical attitudes toward science tend to use newspapers, television, radio, or their online versions less often to inform themselves about science and science-related topics like nanotechnology or the COVID-19 pandemic (Ho et al., 2011; Merkley and Loewen, 2021; Metag, 2020), presumably because these media often feature pro-science portrayals and challenge populist resentment against science (see Brüggemann and Engesser, 2014). This seems to be a robust finding, even if science sceptics may use single journalistic media in fact more frequently, for example, those that often articulate criticism of specific scientists or disciplines. We thus formulate a hypothesis and an additional research question:

H1: Science-related populist attitudes are negatively associated with using journalistic media to get information about science.
RQ1: The use of which journalistic media is associated with science-related populist attitudes?

(2) *Social media* tend to be used more often by supporters of populist orientations toward politics or science, particularly social networking sites, video platforms like YouTube, and online blogs or forums (Eberl and Lebernegg, 2022; Enders et al., 2021; Yan et al., 2022). This corresponds with the assumption that some social media cater to populists' communicative preferences (Gerbaudo, 2018; Hopster, 2021). In contrast, however, some studies indicate that social media use may also be linked to positive perceptions of science (Huber et al., 2019). Overall, scholarship lets us assume that science-related populists use social media more frequently – albeit it is unclear which these are:

H2: Science-related populist attitudes are positively associated with using social media to get information about science.
RQ2: The use of which social media is associated with science-related populist attitudes?

(3) *Non-mediated science communication formats* (e. g., museums, exhibitions) may be used less frequently by science-related populists: Research found that people who have low trust in science, perceive academic education as elitist, and question the benefits of science are less inclined to visit museums, scientific talks, or events of research institutions (Humm et al., 2020; Kato-Nitta et al., 2018; Schäfer et al., 2018).

H3: Science-related populist attitudes are negatively associated with using non-mediated science communication formats.
RQ3: The use of which non-mediated science communication formats is associated with science-related populist attitudes?

(4) *Communicative engagement* on social networking sites, in instant messaging, and in personal conversations is often stronger among supporters of populist worldviews and alternative knowledge claims – not only for political (Jeroense et al., 2022; Lee et al., 2022) but also scientific issues (Eberl and Lebernegg, 2022; Wissenschaft im Dialog, 2018). Correspondingly, qualitative research has described proponents of commonsensical, anti-establishment, and experiential knowledge claims as particularly vocal in real-world discussions, social media, blogs, and online forums (Duchsherer et al., 2020; Hameleers, 2020; Johnson, 2015). However, the literature is not conclusive here: Critics of climate change research, for example, were found to be outspoken in online media (Porten-Cheé and Eilders, 2015) but less so in discussions with peers (Leombruni, 2015).

H4: Science-related populist attitudes are positively associated with science-related communicative engagement.
RQ4: Which forms of communicative engagement are associated with science-related populist attitudes?

3 Methods

Data

We relied on a nationally representative telephone survey of the Swiss population (N = 1,050; age: M = 48.3 years, SD = 17.3; 53.5 % female; 47.8 % post-secondary education[3]), conducted between 17 June and 20 July 2019 by a professional survey company in all three principal Swiss linguistic regions (German-, French-, and Italian-speaking). 81 % of respondents were contacted via landline numbers from public telephone listings and selected based on gender and age quotas; 19 % were interviewed in mobile phone calls and recruited via random digit dialing. 2.6 % of all calls resulted in completed interviews, while 75.7 % were not answered or reached a dead number. Survey weights, which accounted for unequal selection probabilities across language regions, genders, age groups, education level, and

3 Post-secondary education included: Completion of teacher education programs, advanced vocational trainings, colleges for advanced professional education, and university degrees (Bachelor, Master, PhD). Note that the sample descriptives are unweighted values, whereas our analyses relied on weighted data (age: M = 46.5 years, SD = 18.5; 51.0 % female; 33.7 % post-secondary education).

survey modes (landline vs. mobile), were used for estimating proportions and statistical inferences.

Switzerland provides an instructive setting for our study: The country's direct democratic system and presence of prominent populist voices may stimulate public support for populist ideas and avoidance of journalistic quality media (Ernst et al., 2017). Yet the Swiss show comparatively high levels of trust in science (Wellcome Trust, 2019), are resilient against non-scientific disinformation (Humprecht et al., 2021), and use journalistic media frequently (Newman et al., 2020). Switzerland thus exhibits both similarities with, and differences to, other countries, making it a compelling case to study science-related populism and its implications for communication behavior.

Measures[4]

Science-related populist attitudes. Our independent variable (IV) was the *SciPop Score*, a continuous score quantifying respondents' support for science-related populism (M = 2.22; SD = 0.80; possible range: 1.00–5.00). It was composed of responses to the SciPop Scale (Mede et al., 2021), an 8-item survey scale that measures science-related populist attitudes on four dimensions, asking respondents to indicate their level of agreement with statements like "Scientists are only after their own advantage" (1 = *do not agree at all*, 5 = *agree completely*). The SciPop Score was computed following the Goertz approach (Wuttke et al., 2020, p. 362). We calculated the mean values of each of the four 2-item subscales for every respondent and determined the smallest of these four values to represent their SciPop Score. This procedure accounts for the conceptual premise that science-related populist attitudes necessitate the concurrent presence of all its four theoretical components and cannot be diagnosed if respondents reject one or more components completely (Mede et al., 2021).

Science-related communication behavior. Our dependent variables (DV) consisted of 13 items asking respondents how often they get in contact with science and research via *journalistic media* (TV, radio, printed newspapers, science magazines, news websites/apps, on-demand TV/radio), *social media* (social networking sites like Facebook, video platforms like YouTube, blogs/forums, Wikipedia), and *non-mediated science communication formats* (museums/exhibitions, zoos/aquariums, events/lectures). They also consisted of five items asking respondents about

4 Supplemental Table S1 provides an overview of all variables and English translations of questions, items, and response options.

their *communicative engagement* with science in social media (post/share, like, comment science-related content) and conversations (instant messaging, talk to peers). All DVs were measured with 5-point Likert scales (1 = *never*; 5 = *very often*).

RQ analyses included the 13 individual items, whereas hypothesis tests relied on mean scores of items measuring the use of *journalistic media* (H1; M = 2.50; SD = 0.71; Cronbach's α = .56), *social media* (H2; M = 2.23; SD = 0.94; Cronbach's α = .73), *non-mediated communication formats* (H3; M = 2.40; SD = 0.86; Cronbach's α = .61), and *communicative engagement* (H4; M = 2.03; SD = 0.67; Cronbach's α = .68). The reliability of most scores was mediocre, which is plausible and somewhat desirable as they reflect a broad scope of different (yet conceptually related) media sources, communication formats, and modes of communicative engagement (see Taber, 2018).

Covariates. Control measures were age, gender, language region, urbanity of place of residence, education level, proximity to science, scientific literacy, religiosity, political orientation, interest in science, trust in science and scientists, and attention to, and satisfaction with, media coverage on science. We included these covariates since research indicates that they influence populist attitudes and critical views on science (e. g., Rovira Kaltwasser and van Hauwaert, 2020; Rutjens et al., 2022) as well as media use and communicative engagement (e. g., Metag, 2020; Takahashi and Tandoc, 2016). Controlling for language region accounted for differences in science-related populist attitudes between German-, French-, and Italian-speaking regions, which were found in a previous study in Switzerland (Mede et al., 2022).

Analytical strategy[5]

Main analysis. We tested all hypotheses in a single survey-weighted, multivariate linear regression model that used the SciPop Score and the covariates as predictors and included the four mean scores for journalistic media use (H1), social media use (H2), use of non-mediated science communication formats (H3), and communicative engagement (H4) as outcome variables. RQ1 to RQ4 were explored in four separate survey-weighted, multivariate linear regression models that contained the same predictors but used single items as outcome variables (RQ1 model: journalistic media; RQ2 model: social media; RQ3 model: non-mediated science communication formats; RQ4 model: communicative engagement). Fitting multivariate

5 All analyses can be reproduced with the materials we share at https://osf.io/yhmbd/ (code) and https://doi.org/10.48573/wpf5-hf36 (data, questionnaire, methodological report, etc.).

models instead of multiple univariate models allows for joint hypothesis testing, which enables us to compare estimates across outcomes (Binder, 1985).

Sensitivity tests. To explore further nuances of our results and assess how much they depend on our analytical decisions, we ran multiverse analyses (Steegen et al., 2016). Multiverse analysis involves testing a set of alternative models that the researcher could specify but did not, for instance, because of unconscious preferences (Gelman and Loken, 2013) or based on theoretical assumptions (cf. computation of the SciPop Score) and previous research (cf. choice of covariates). Our multiverse analyses scrutinized how results would have differed if we had applied other computation procedures of the SciPop Score (five scenarios), used only some covariates (18 scenarios), and analyzed subsets of the data (four scenarios; see Supplemental Material for details). Overall, we tested 7,920 different specifications using the R package specr v0.2.1 (Masur and Scharkow, 2020).

4 Results

Journalistic media use of supporters of science-related populism

Our results do not indicate that people holding stronger science-related populist attitudes use journalistic media less often than others to inform themselves about science: We do not find a positive association between respondents' SciPop Scores and their average use of TV, radio, printed newspapers, science magazines, news websites/apps, and on-demand TV/radio (b = 0.06, t = 1.23, p = .217; see Figure 1 and Supplemental Table S2 for detailed results). This contradicts H1.

However, there is one notable exception: Respondents holding stronger science-related populist attitudes are significantly *more* likely to get information about science from TV (b = 0.25, t = 2.94, p = .003; see Figure 2 and Supplemental Table S3). However, had we applied other procedures to compute the SciPop Score (see Methods section), we would have found that science-related populism is linked to lower digital news use: Multiverse analysis shows that 63.3 % of alternative models indicate significant negative effects of science-related populist attitudes on use of news websites/apps (see Supplemental Figure S2).

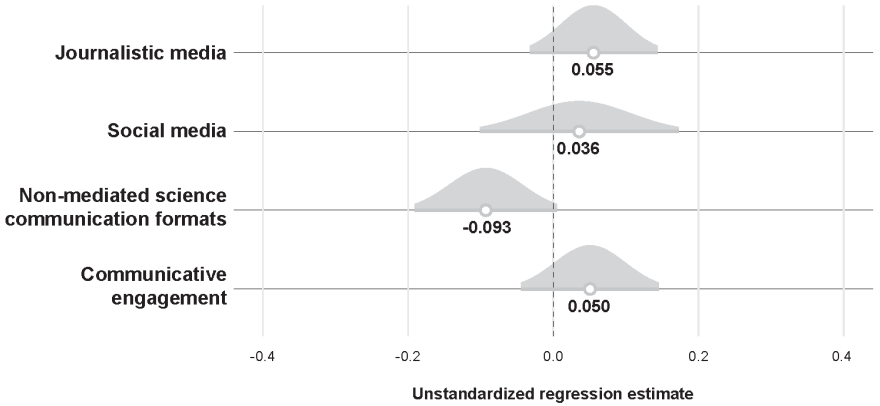

Figure 1: Regression estimates and 95 % confidence intervals of the effect of science-related populist attitudes on mean scores measuring media use and communicative engagement.
Note: Values indicated are unstandardized estimates. ***$p < .001$, **$p < .01$, *$p < .05$. 95 % confidence intervals visualized; if they do not include the vertical line (0.0), the effect of science-related populist attitudes on the DV is significant at the $p < .05$ level. Regressions were run with survey weights using the R package survey v4.0. Control variables: age, gender, language region, urbanity of place of residence, education, proximity to science, scientific literacy, religiosity, political orientation, interest in science, trust in science, trust in scientists, attention to science media coverage, satisfaction with science media coverage.

Social media use of supporters of science-related populism

Science-related populist attitudes are not positively associated with respondents' overall use of social media, that is, of social networking sites, video platforms, blogs/forums, and Wikipedia ($b = 0.04$, $t = 0.51$, $p = .611$). Accordingly, people holding stronger science-related populist attitudes do not differ from others in how often they use social media in general to obtain information about science. H2 is therefore not supported.

However, science-related populists are significantly more likely to use specific social media to get information about science, that is, social networking sites like Facebook or Twitter ($b = 0.22$, $t = 2.12$, $p = .034$; see Figure 2 and Supplemental Table S4). While further RQ2 analyses do not unearth significant correlations of science-related populist attitudes and use of other social media, multiverse analysis does suggest such correlations for video platforms and Wikipedia: Both might be used less often by supporters of science-related populism (significant negative effects in 71.1 % and 74.4 % of alternative model specifications, respectively; see Supplemental Figure S3).

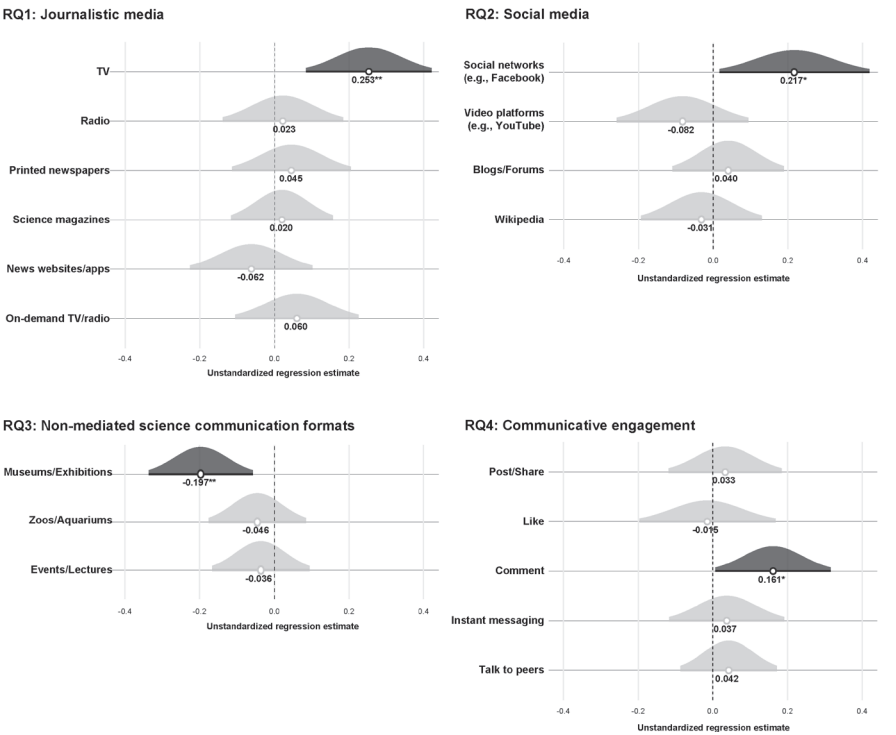

Figure 2: Regression estimates and 95 % confidence intervals of the effect of science-related populist attitudes on individual items measuring media use and communicative engagement.
Note: Values indicated are unstandardized estimates. ***$p < .001$, **$p < .01$, *$p < .05$. 95 % confidence intervals visualized; if they do not include the vertical line (0.0), the effect of science-related populist attitudes on the DV is significant at the $p < .05$ level. Regressions were run with survey weights using the R package survey v4.0. Control variables: age, gender, language region, urbanity of place of residence, education, proximity to science, scientific literacy, religiosity, political orientation, interest in science, trust in science, trust in scientists, attention to science media coverage, satisfaction with science media coverage.

Non-mediated science communication of supporters of science-related populism

Supporters of science-related populism tend to avoid non-mediated forms of science communication – but regression analysis indicates that this tendency is not significant: We do not find substantial effects of science-related populist attitudes and the average propensity to visit museums/exhibitions, zoos/aquariums, and scientific events/lectures ($b = –0.09$, $t = –1.86$, $p = .064$). While this weighs against H3,

multiverse analysis suggests that avoidance tendencies may exist (significant negative effects of science-related populist attitudes on non-mediated science communication in 76.7 % of alternative model specifications; see Supplemental Figure S1).

Meanwhile, RQ3 analyses indicate that science-related populists are significantly less frequent visitors of museums and exhibitions (b = –0.20, t = –2.78, p = .006; see Figure 2 and Supplemental Table S5). Multiverse analysis indicates that they may also refrain from attending scientific events and lectures (significant negative effects in 72.2 % of alternative model specifications; see Supplemental Figure S4).

Communicative engagement of supporters of science-related populism

Proponents of science-related populism are not generally more likely to communicate with others about science: They do not report higher overall willingness to post or share, like, and comment social media content about science and discuss it in instant messengers or conversation with peers (b = 0.05, t = 1.04, p = .298). This contradicts H4.

Yet, compared to people who have little or no sympathy for science-related populism, people holding science-related populist attitudes have a greater preference for specific forms of social media engagement: They are significantly more inclined to comment on science-related content on social networking sites (b = 0.16, t = 2.05, p = .040). This effect is small in the main analysis, but multiverse analysis shows that it is relatively robust and would be stronger if we had relied on alternative approaches to compose the SciPop Score (significant positive effects of science-related populist attitudes on commenting in 44.4 % of alternative model specifications; see Supplemental Figure S5). However, discussions in personal conversations and instant messaging are contexts in which science-related populists are not more or less outspoken about scientific issues than other people (see Figure 2 and Supplemental Table S6).

5 Discussion

The distinct communication behavior of science-related populists

Science-related populist attitudes, which deem the common sense of “ordinary people” superior to the expertise of “academic elites”, are challenging science in

several countries (Mede and Schäfer, 2020). Analyzing survey data from Switzerland, we show that individuals with such attitudes have distinct communication behaviors: The more people support science-related populism, the more they use TV and social networking sites to get information about science, avoid museum visits, and comment on science-related content on social media. But, notably, science-related populist attitudes are not associated with a "public disconnection" (Couldry et al., 2010, p. 3), that is, a general aversion to journalistic media and communication formats offered by scientific institutions, a general preference for social media, or a general tendency to communicate more actively with others about science.

These findings contribute to scholarship in four ways: First, they provide further evidence for the assumption that fundamental orientations toward science – such as science-related populist attitudes – affect people's media use and communicative engagement (see Brossard and Nisbet, 2007). However, this seems to apply to specific media only, and relatively modest regression coefficients indicate that this effect may be small.

Second, our results add to the literature on the media repertoires of populist (e. g., Schulz, 2019) and critical science communication audiences (e. g., Metag et al., 2017), showing that *science-related populist* audiences exhibit specific media preferences. On the one hand, we find that these audiences are *less averse* to certain social media, that is, social networking sites. Science-related populists might see these sites as a way to circumvent academic elites and get access to seemingly more "authentic everyday experiences" of "ordinary people" (Mede et al., 2021, p. 275). Yet, interestingly, they do not seem more attracted to video platforms like YouTube, which has been shown to host actors and content that challenge scientific consensus (Allgaier, 2019). On the contrary, multiverse analyses suggest that science-related populists may use video platforms even less frequently than others. This might be because YouTube, for example, does feature several high-quality science communication formats, has continued to remove problematic science-related content, and de-platformed populist conspiracy theorists particularly from right-wing milieus (Erviti et al., 2020; Vynck, 2021). This might have led science-related populists, who have been found to sympathize with these milieus (Mede et al., 2022), to migrate to other platforms (Zeng and Schäfer, 2021).

On the other hand, we find that supporters of science-related populism are *more averse* to certain communication formats offered by scientific institutions, that is, museums and exhibitions. This resonates with results from a survey showing that Swiss science-related populists have usually no close ties with academic institutions, as few work as scientists themselves or have family members who studied at universities (Mede et al., 2022). Supporters of science-related populism might perceive museum visits as an activity offered and used by members of a distant academic elite (Humm et al., 2020; Mede et al., 2022). However, we do not find a

negative correlation between science-related populism and journalistic media use. This contradicts other findings: For example, Swiss supporters of science-related populism were found to perceive science coverage of these media as less trustworthy, which suggests that they would refrain from using these media (Mede et al., 2021). In fact, Swiss science-related populists use TV *more often* than others. This may seem counterintuitive as they could be expected to avoid TV, because they might see TV stations as part of the same societal "mainstream" with which they associate organized science (see Denham, 2021). But our finding is consistent with research showing that people with *political* populist attitudes prefer commercial TV news (Schulz, 2019). After all, it suggests that certain TV programs may feature (or fail to challenge) problematic views on science, thus pandering to the ideological preferences of science-related populists.

Third, our results add to scholarship on the "affinity" of social media and populist milieus (Gerbaudo, 2018, p. 745), suggesting that this affinity may also pertain to *science-related populist* milieus, as stronger support for science-related populism seems to translate into higher willingness to use social networking sites for getting science-related information and into higher outspokenness in social media comments. This indicates that some social media represent "suitable channels" for (science-related) populist appeals (Hopster, 2021, p. 551): Certain platforms might rarely challenge – or even promote – views that favor common sense over scientific expertise, thus providing fruitful environments for alternative knowledge and anti-establishment claims (Mahl et al., 2021).

Fourth, our study advances research and public debate about assumptions of a "science/public disconnect" (Wladawsky-Berger, 2020), which has been neither theorized nor studied empirically against the backdrop of science-related populism. Our study addresses this caveat by conceptualizing and investigating a "science-related public disconnection" – that is, a constellation in which segments of the public feel alienated from scientific institutions due to a lack of connectedness to societal discourse around science-related topics. Our findings do not find such a disconnection: Supporters of science-related populism do not refrain from using journalistic media – which can serve as *connectors* of the public and science (see Swart et al., 2017) – more than others do. In contrast, they seem well-connected with scientific discourse via frequent exposure to televised information about science. Whether TV viewers obtain such information through journalistic quality coverage (e. g., science documentaries) or entertainment shows (e. g., sitcoms) may be secondary, as fictional programs can be just as capable of nurturing a public connection as non-fictional formats (Nærland, 2020). The potential tendency of science-related populists to use news websites/apps *less* frequently than others does not warrant severe concerns about a science-related public disconnection either, because even occasional use can convey a sense of connectedness (Couldry et al., 2010). There-

fore, Swiss science-related populists cannot be regarded "disengaged science audiences" (Burns and Medvecky, 2018).

However, people holding stronger science-related populist attitudes also seem more attracted to social networking sites. Some scholars have suggested that these sites harbor deviant views on science, inhibit deliberative communication, equip (science-related) populists with arguments supporting their views, and challenge the connection between science and parts of the public more generally (e. g., Hopster, 2021; Pfetsch, 2018; Yan et al., 2022). From this perspective, social media platforms may indeed contribute to a science-related public disconnection and may continue to do so in the future. Considering that such a disconnection could undermine the capability of science to fulfil its democratic and societal function (Mehta et al., 2020), one could argue that these platforms face increased responsibility to limit the prevalence of science-related populist messages and actors.

But social media platforms might not per se be detrimental to a science-related public connection: They can also provide users with high-quality information about science, offer forums for constructive debate about it, and allow meaningful interaction between scientists and citizens – thus connecting the public to scientific discourse and institutions (Huber et al., 2019; Williams et al., 2015; see Swart et al., 2017). From this perspective, the tendency of science-related populists to use social networking sites more frequently than other people cannot be interpreted as an indicator of a science-related public disconnection. This resonates with recent works suggesting that social media can be a fruitful venue for science communication about environmental and health issues, for example (Wirz et al., 2022), and should not be used "as a scapegoat for larger, more complex, social problems" without nuanced empirical analyses and scientific debate (Ferguson, 2021, p. 118).

Limitations and further research

This study has some conceptual and methodological constraints: Like many surveys, it focuses on only one country (which may reduce generalizability) and utilizes self-reports of communication behavior (which may be inaccurate). Moreover, it does not allow for causal claims due to its cross-sectional design. We thus acknowledge that science-related populist attitudes – which, as we argue, can plausibly be conceptualized *as a precondition* of communication behavior – could also be understood *as a function* of people's media use, because frequent use increases chances of exposure to messages that trigger anti-intellectual or populist ideation (Merkley, 2020).

Another caveat is that our study involved a sample that may be slightly pro-science biased, for example, due to self-selection bias or the high education level of

the Swiss population in general. This bias is presumably not very severe, as we controlled for respondents' interest and trust in science. After all, a high level of education does not necessarily translate into pro-science attitudes and rejection of populist resentment against academic elites, as populists' definitions of elites are often primarily tied to subjective perceptions rather than objective criteria like educational attainment (Brühwiler and Goktepe, 2021). However, the sample's pro-science bias may nevertheless have caused small flooring effects for science-related populist attitudes or regression to the mean – and could explain why we found relatively few and rather weak effects.

The absence of pronounced effects may also be due to reliance on the Goertz approach when composing an aggregate measure for science-related populist attitudes: Compared to measures based on other aggregation procedures (e. g., averaging all scale items), Goertzian measures of populist attitudes have been shown to have considerably weaker correlations with related concepts like institutional trust (Wuttke et al., 2020, p. 369). Our multiverse analyses indicate this same phenomenon: Significant effects of science-related populist attitudes on people's media use and communicative engagement appeared in 36.1 % of all model specifications that relied on an *average score* of the SciPop Scale items – but in only 23.5 % of specifications that relied on the *Goertz score*, that is, the one we used in our main analysis. A *categorical score* classifying respondents as science-related populists if they agree with at least six SciPop Scale items even showed significant effects in as much as 47.2 % of specifications.

Yet, despite these caveats, our study offers worthwhile insights into the implications of an increasingly relevant variant of public backlash against science – and suggests several starting points for further research: First, research should investigate other countries, for example, those that exhibit stronger polarization over science (e. g., the US) and more populist rhetoric within public discourse (see Mede, 2022). Second, future research should examine the content of those media that science-related populists use most, differentiating between single journalistic media outlets and social media platforms. This would consider that portrayals of science vary among outlets and platforms: For example, several Swiss newspapers offer high-quality science journalism (e. g., *Tages-Anzeiger*), yet some promote skeptical positions toward science (e. g., *Weltwoche*). Similar variations have been described for social networking sites, some of which may be more likely (e. g., *Parler*) and others less likely (e. g., *Twitter*) to harbor science-related populism. Third, it will be worthwhile to examine whether links between science-related populism and communication behavior depend on which scientific field is addressed: Perhaps, populists may only avoid attending lectures on scholarship that they deem ideologically biased (e. g., gender studies), but are perfectly willing to visit exhibitions about technology, physics, and other "exact sciences" (see Schrøder, 2022). Fourth,

future studies could follow up on the results of our sensitivity analyses, testing whether science-related populists may refrain from using news websites and apps, online video platforms and Wikipedia, and science events and lectures. Eventually, the findings of such studies as well as ours need to be related to the agenda of current science communication research and practice to address calls demanding that in a world "where notions of truth, trust, and expertise are now commonly contested [...] we need to [...] better understand the social and media environments we are now living in" (Cormick, 2019, p. 161).

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Data availability statement: The R code we used for the statistical analyses is available at https://osf.io/yhmbd/. Survey data and additional materials (e. g., the questionnaires and a methodological report, the former in German, French, and Italian, the latter only in German) are publicly available in the online repository SWISSUbase (doi: 10.48573/wpf5-hf36).