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## Populist attitudes towards politics and science: how do they differ?

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### ABSTRACT

While populist citizens' opposition to political elites has been intensively researched, populist criticism of other societal institutions, such as science, has only recently attracted public and scholarly attention. Political and science populism can both be understood as a set of ideas that revolve around an antagonism between a virtuous common people and an evil elite. However, political populism focuses on political power claims and challenges the political elites, whereas science populism addresses truth claims and criticizes the academic elites. Hence, *conceptually*, both populism variants pit the people against an elite – but they rely on different conceptualizations of the people and the elites, their authority claims, and the alleged (il)legitimacy of these claims. Yet, it remains unclear how distinct these two populism variants are *empirically*. We address this gap by comparing established scales for measuring individual attitudes towards both variants and provide three take aways: We recommend that scholars should (1) theorize and test the overlaps of the two populism variants, (2) acknowledge their differences and model these accordingly, and (3) consider which variant is better suited for predicting other attitudes or behaviours. Considering these takeaways would allow public opinion research to provide more fine-grained insights into the intricacies of populist attitudes within contemporary societies and challenges.

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Populism; attitudes towards science; science-related populism; technocratic beliefs; conspiracy theories

## Introduction

In many countries worldwide, the salience of populist ideas in political debates and campaigns has increased. This has sparked concerns about the public legitimacy of political power claims and decision-making – and prompted empirical research to study whether such ideas take into account particular orientations towards politics and

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society in the general population. These orientations have been conceptualized as (political) populist attitudes, and have been operationalized with a variety of different survey scales (e.g. Akkerman, Mudde, and Zaslove 2014; Hobolt et al. 2016; Schulz et al. 2018). Populist attitudes generally revolve around the notion that a supposedly evil political elite disregards the general will of ‘the people’ when exercising political or societal authority, despite the presumed goodness, virtuousness, and homogeneity of ‘the people’ warranting that such authority should rest with them, rather than with allegedly corrupt politicians, ruling parties, and other members of the political elites (Akkerman, Mudde, and Zaslove 2014).

However, recent public debates around scientific issues, such as climate change and the COVID-19 pandemic, have led populists to also criticize societal elites *other than just the political authorities*, notably, scientists (Bellolio 2022). Such criticisms have negative implications for the public acceptance of scientists, their knowledge and recommendations, and the legitimacy of scientific expertise within society more generally. Mede and Schäfer (2020) conceptualized such criticisms as science populism, and Mede, Schäfer, and Füchslin (2021) introduced a survey scale for measuring ‘science-related populist attitudes’. These attitudes encompass the belief that academic elites ignore the demands of ordinary people when deciding what should be researched and deemed ‘true knowledge’, despite the people’s common sense, gut feelings, and emotions being allegedly superior to the seemingly unreliable methods, biased knowledge, and useless studies of scientists. According to science populism, it should thus be the people who determine research goals and the production of ‘truth’ – not least because they are conceived to be a homogenous majority group within society, which is allegedly united by their collective reliance on mutual epistemologies (such as embracing commonsensical knowledge) and similar values (such as considering practical relevance as the only legitimate guiding principle of scientific research; Mede and Schäfer 2020).

Hence, *conceptually*, both populism variants have some overlaps but also some important differences. Yet *empirically*, we lack evidence on how distinct these two types of populist attitudes actually are, and how measures of science populism relate to measures of political populism. However, such evidence is crucial for social scientists seeking to research populist attitudes in survey or experimental research, as well as for policymakers and science communicators when referring to this research: It would help scholars to be able to put forward empirically based arguments on whether political and science populism refer to different underlying worldviews, to gain a more detailed understanding of societal milieus harbouring either populism variant, and to draw more nuanced conclusions on implications for the societal legitimacy of political and scientific expertise, which can then inform evidence-based political decision-making and the development of target group-specific science communication formats. In this study we provide such evidence through pursuing three research questions:

RQ1: To what extent are political and science populism two distinct concepts?

RQ2: How do sociodemographic and attitudinal predictors of the two sets of attitudes in citizens differ?

RQ3: How do political and science populism differ in predicting related concepts, such as trust in institutions or technocratic preferences?

This research note addresses these questions by comparing one of the most widely used scales of political populism (Castanho Silva et al. 2020; Hobolt et al. 2016) with the ‘SciPop Scale’ by Mede, Schäfer, and Füchslin (2021). Drawing on data from a large-scale nationally representative survey, our main goal in this study was to empirically probe for parallels and differences between the two scales, their correlates, and their predictive power. This would enable us to test whether the scales measure two distinct variants of populism. The comparison of the scales could then help us formulate recommendations for future scholarship. These recommendations will advise researchers to (1) conceptualize and explore the overlaps of both populism variants, (2) acknowledge their differences and model these accordingly, and (3) consider which variant is better suited for predicting potentially related attitudes or behaviours.

Empirical research provides only tentative insights into the relationship between political and science populism. First, political populism seems to resonate with certain phenomena that are similar to science populism. For example, *distrust* towards scientists was found to be more pronounced among people who hold populist attitudes towards politics (Huber, Greussing, and Eberl 2022) and people who support populist right-leaning parties (Funk et al. 2020). Further research indicated the existence of correlations between the endorsement of political populism and *conspiracy beliefs* (Castanho Silva, Vegetti, and Littvay 2017) as well as *anti-intellectualism* (Merkley 2020). Supporters of political populism have also been shown to be more prone to *scepticism* about scientific expertise on vaccination (Kennedy 2019), climate change (Huber 2020; Huber, Greussing, and Eberl 2022), or COVID-19 (Eberl, Huber, and Greussing 2021). Whether and how political populism is related to science populism is unclear, however, because phenomena like conspiracy beliefs, anti-intellectualism, and distrust towards science have conceptual differences from science populism. Understood as a ‘negative affect towards scientists and other experts’ (Motta 2018, 468), anti-intellectualism, for example, can be considered a form of anti-elitism (see also Hofstadter 1963), which brings it close to populism. Unlike science populism (Mede and Schäfer 2020), however, anti-intellectualism does not demand the participation of ordinary people within science (Merkley 2020). That is, science populism also considers the demands for decision-making sovereignty, as populists do not want the end of science as an institution *per sé* but want ‘the people’ to have more decision-making authority in this institution (see Mede et al. 2022, 3). Second, political and science-related populist attitudes seem to have similar predictors and correlates. Both tend to be more widespread among people with lower levels of education (Mede et al. 2022; Rovira Kaltwasser and van Hauwaert 2020). However, while political populism has been shown to be linked to age, gender, and right-leaning political views in many countries (Rico and Anduiza 2019), it is less clear whether this is also true for science populism (Mede and Schäfer 2022). Moreover, political populism often goes along with a low interest in politics (but see van Kessel, Sajuria, and Van Hauwaert 2021), whereas science populism has been found to be associated with a high interest in science (Mede et al. 2022; see Spruyt, Keppens, and van Droogenbroeck 2016). Finally, science populism seems to be less prevalent in the general population than political populism (Mede et al. 2022), suggesting that these two sets of attitudes do not necessarily appeal to the same people.

So overall, the existing studies appear to support the conceptual assumptions on the parallels and differences between political and science-related populist

attitudes. However, they do not allow for a systematic empirical comparison of the two concepts.

## Case and data

To explore our research questions, we used data collected in Austria, which represents a good example of an increasingly common situation in many Western parliamentary democracies, whereby established parties are being challenged by at least one major populist party. In Austria, such a populist party is the far-right Austrian Freedom Party (FPÖ). In the past, the FPÖ and its proponents have regularly made anti-science statements. Concerning climate science, former FPÖ environmental speaker Susanne Winter claimed that ‘climate change is a web of lies invented by the (liberal) media that needs to be torn down’ (Winter cited in Der Standard 2015). Although the FPÖ had been part of the federal government just a few years earlier, during the first years of the COVID-19 pandemic, the party was in opposition and strongly criticized both the government’s virus mitigation measures as well as the vaccination efforts (see Eberl, Huber, and Greussing 2021). The new party leader Herbert Kickl even called the COVID-19 vaccination campaign a ‘huge genetic engineering experiment, with an uncertain outcome’ (Kickl cited in Profil 2021). At the same time, in Austria, not only right-leaning populist parties but also substantial parts of the general population endorse and promote anti-science attitudes: The Eurobarometer surveys regularly show Austria as being among the most science-sceptic and least science-interested EU members. For example, in 2021, Austrians perceived scientists as less intelligent, less honest, and more immoral compared to the EU27 average (Special Eurobarometer 2021). Thereby, given both the level of political and science-related populism on the supply and demand side, Austria constitutes a crucial case (Gerring 2009), which is most useful for the comparison of both concepts in one setting.

In the present study, we used openly available data from a survey of the Austrian voting-age population during the COVID-19 pandemic (Austrian Corona Panel Project).<sup>1</sup> Respondents were recruited from an online panel that was certified under ISO 20252 and selected based on the following demographics: age, gender, gender x age, region (province), educational level, and municipality size. The quota sample was structured to closely represent the Austrian population (Kittel et al. 2020, 2021). We drew on data from two waves (12–19 February 2021 and 12–19 March 2021), which contained relevant scales to measure political and science populism as well as other attitudes relating to these measures that were used in the analyses below. We analysed the responses of those 861 respondents with full records on all the used variables.<sup>2</sup>

Political and science-related populist attitudes were measured with two reliable and validated survey scales: To capture the endorsement of political populism, we used a shortened version of the CSES module (6 items; Hobolt et al. 2016), which itself includes borrowed items from Akkerman, Mudde, and Zaslove (2014).<sup>3</sup> To measure the endorsement of science populism, we relied on the ‘SciPop Scale’ (8 items; Mede, Schäfer, and Fuchsli 2021). Both scales aim to capture three general features of populism: people-centrism, opposition to a societal elite, and the Manichean division between allegedly ‘good’ and allegedly ‘evil’ authority claims. However, they

**Table 1.** Exploratory factor analysis with both populism scales.

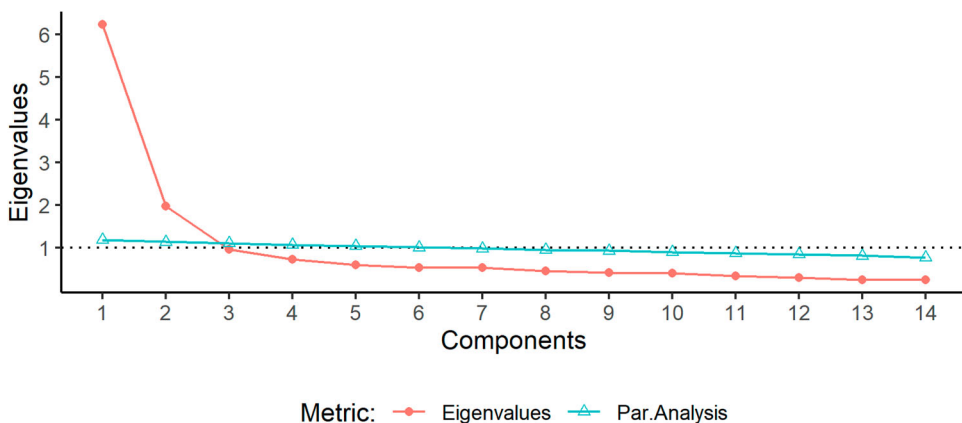
Questionnaire items	Factor 1	Factor 2
PP1 – What people call ‘compromise’ in politics is really just selling out on one’s principles	–0.02	0.72
PP2 – Most politicians care only about the interests of the rich and powerful	–0.04	0.79
PP3 – Most politicians are trustworthy	0.08	–0.69
PP4 – Parties are the main problem in Austria	0.04	0.65
PP5 – The people, and not politicians, should make our most important policy decisions	0.20	0.55
PP6 – I would rather be represented by a citizen than by a specialized politician	–0.02	0.67
SP1 – What unites the ordinary people is that they trust their common sense in everyday life	0.68	–0.06
SP2 – Ordinary people are of good and honest character	0.66	–0.08
SP3 – Scientists are only after their own advantage	0.72	0.08
SP4 – Scientists are in cahoots with politics and business	0.68	0.18
SP5 – The people should have influence on the work of scientists	0.77	–0.03
SP6 – People like me should be involved in decisions about the topics scientists research	0.65	0.01
SP7 – In case of doubt, one should rather trust the life experience of ordinary people than the estimations of scientists	0.84	0.00
SP8 – We should rely more on common sense and less on scientific studies	0.80	0.02

Note: Entries are standardized factor loadings from an exploratory factor analysis. Loadings above 0.2 are highlighted in grey.

rely on different conceptualizations of elites, authority claims, and the alleged (il)legitimacy of these claims. For a detailed overview of these scales, including all item wordings, see Table 1.

### Political and science populism: two distinct concepts?

In this subsection, we explore our argument that political and science populism are conceptually related, sharing common ideational roots but capturing substantially different aspects of populism (RQ1). In the first step, we included all 14 items capturing political and science populism in an Exploratory Factor Analysis (EFA). This analysis allowed us to explore whether the 14 items load on one or several factors. All items loading on one factor would indicate that they are too similar to distinguish them. If they load on two factors and cluster along the theoretical concepts, it would confirm the theoretical distinctiveness premise. However, if we find more than two factors, particularly if there

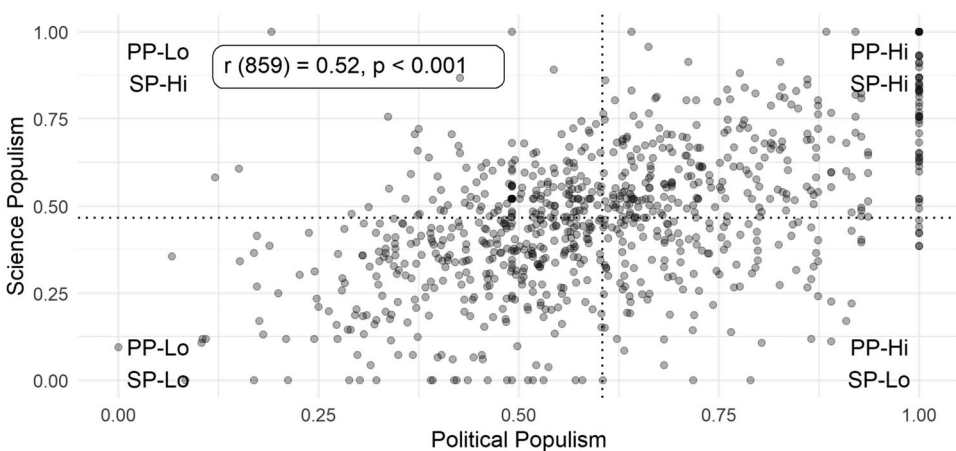
**Figure 1.** Scree plot for both dimensions of the studied populist attitudes.

are latent variables consisting of items from both scales, or if there are strong cross-loadings, it would cast doubt on the validity of the scales.

As shown in the scree plot, the established criteria suggest extracting two latent variables from the 14-item pool of both the political and science populism scales (see [Figure 1](#)).<sup>4</sup> As displayed in [Table 1](#), we found that all six items of political populism load on Factor 2, while there were no relevant cross-loadings on Factor 1. The same applies to all eight items capturing science populism: They load on Factor 1 but not on Factor 2. Hence, we could conclude that the 14 items map onto two separate factors, one representing the political populism scale and one representing the science populism scale. This is in line with the theoretical assumption that political and science populism are two *empirically* distinct concepts.

To test the robustness of these findings, we additionally extracted more than 2 factors in subsequent analyses and observed that the individual subdimensions of science populism tended to form separate factors when allowing more latent constructs (see Mede, Schäfer, and Fuchslin 2021). However, political populism remained as one distinct factor. Based on these insights, we specified two distinct factors in a confirmatory factor analysis, which correlated with  $r(859) = 0.52, p < 0.001$ . We used these two variables in the subsequent analyses.

Finally, plotting the standardized factor scores of each scale allowed us to examine the overlap between the two concepts in more detail (see [Figure 2](#)). Relative to the empirical mean of the respective scale, a little more than one-third of respondents score below average for both political and science populism (PP-Lo/SP-Lo = 35.1%). Another third were situated in the diagonal quadrant with high scores for political science populism (PP-Hi/SP-Hi = 32.3%). Slightly more respondents scored low on political populism while at the same time scoring high on science populism (PP-Lo/SP-Hi = 18%) as compared to those who scored high on political populism but low on science populism (PP-Hi/SP-Lo = 14.6%).



**Figure 2.** Comparison of prevalence of political and science populist attitudes.

Note: Dashed axis lines indicate the empirical mean of the respective scale based on its standardized factor score. This is consistent with the finding that the distribution of the political populism items is somewhat skewed towards high populism, whereas the opposite is true for science populism.

## Political and science populism: different antecedents?

After showing that both concepts are empirically distinct, we next compared sociodemographic and political predictors of them (RQ2): We defined a standard set of potential predictors, which we also used as control variables in the later analyses. These include age (in years), gender (with ‘male’ being the reference category), education in three groups (with ‘medium education’ as the reference category), individuals’ left–right self-placement on a scale from 0 (left) to 10 (right) and its squared term, individuals’ perceived financial situation<sup>5</sup> (on a five-point scale), and political interest (on a four-point scale). We standardized all continuous predictors between 0 and 1 to make them comparable.

We found that education is an important predictor for both concepts (see Table 2). Interestingly, we could observe an inverted U-shape; that is, both political and science populism are most pronounced among individuals with medium education – which corresponds with survey findings from Switzerland (Mede et al. 2022). This relationship was even stronger for science populism, where the effect size was twice the size it was for higher educated individuals; representing a plausible difference between both scales.

We also observed an interesting variation between the two concepts and political ideology. Specifically, while we saw no clear relationship between ideology and political populism (also see Figure A1 in the Appendix), the linear relationship with science populism was strong. For instance, right-wing individuals are substantially more likely to support science populism (as demonstrated in Figure A2 in the Appendix). The null-findings for political ideology and political populism are somewhat surprising: On the one hand, they seem less intuitive considering that the right-leaning FPÖ has fuelled political populist sentiment in Austria. But on the other hand, scholars argue that populism is not necessarily tied to certain political ideologies (Mudde 2004). Accordingly, voters of the Social Democratic Party were also found to endorse populist ideas after the FPÖ joined the government in 2017 (Huber, Greussing, and Eberl 2022).

In addition, both the perceived financial situation and political interest showed similar correlations with both scales: Individuals who believe to be financially better off and who are more interested in politics are less likely to hold political and science-related populist attitudes. Neither age nor gender predict either form of populist attitudes.

**Table 2.** Predictors of political and science populism.

	Political populism (PP)	Science populism (SP)	Diff. PP/SP
(Intercept)	0.73 (0.04)***	0.56 (0.04)***	0.17 (0.04)***
Age	0.05 (0.03)	0.00 (0.03)	0.04 (0.03)
Female	−0.00 (0.01)	0.00 (0.01)	−0.00 (0.01)
Education – Low	−0.05 (0.03)*	−0.05 (0.02)*	0.00 (0.03)
Education – Higher	−0.05 (0.02)**	−0.11 (0.02)***	0.06 (0.02)***
Left-Right self-placement	−0.07 (0.11)	0.08 (0.11)	−0.15 (0.11)
Left-Right self-placement sq	0.10 (0.11)	0.15 (0.10)	−0.05 (0.11)
Financial situation	−0.12 (0.03)***	−0.14 (0.03)***	0.02 (0.03)
Political interest	−0.07 (0.02)**	−0.08 (0.02)***	0.01 (0.02)
Adj. R <sup>2</sup>	0.05	0.17	0.06
N	861	861	861

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. Dependent variables were extracted from a confirmatory factor analysis. The third model predicts the difference between PP and SP so that a high score in the third model represents strong PP but weak SP and a low score represents strong SP but weak PP.



## Political and science populism: two distinct predictors?

Next, we tested to what extent political and science populism differ as predictors of related phenomena (RQ3). To this end, we used political and science populism as independent variables when predicting a set of four dependent variables: We performed regression analyses based on (i) trust in the government, (ii) trust in science, (iii) technocratic preferences, and (iv) COVID-19 conspiracy beliefs. Trust in the government and trust in science were measured on a scale from 0 (no trust at all) to 10 (complete trust). Technocratic preferences were operationalized as the agreement with the statement that ‘It is better for important policy decisions to be taken on the basis of scientific evidence by independent experts rather than by elected politicians’ and measured on a 5-point scale from 1 (completely disagree) to 5 (completely agree). To measure COVID-19 conspiracy beliefs, we used the mean agreement with the statements: (A) COVID-19 is a bioweapon, (B) COVID-19 is a natural disease (reversed), (C) COVID-19 is a secret US military experiment, (D) Bill Gates wants to vaccinate by force to earn money, and (E) 5G transmitter masts are responsible for COVID-19. Agreement was measured on a 5-point scale from 1 (very certain that this is false) to 5 (very certain that this is true). Again, all numerical variables were standardized between 0 and 1. We then ran three models for each dependent variable (Model 1: political populism; Model 2: science populism; Model 3: political and science populism entered simultaneously).

We observed that trust in the government is negatively correlated with both political and science populism (Model 1A and 2A of Table 3, respectively). The effect size was quite large, which was as expected. When including both populism variants in the same model (Model 3A), we found that the positive correlation of political populism remained largely the same, whereas the effect size of science populism was reduced by 60%. This leads us to assume that the relationship between populist ideation and trust in the government is mainly shaped by political orientations. The high negative estimate in Model 2A was primarily a function of the underlying correlation of political and science populism and may represent an omitted variable bias.

Table 4 demonstrates the relationship between trust in science and both populism scales. Here we observed the opposite pattern. Individuals with higher levels of *political* populism have a lower trust in science (Model 1B), but this coefficient was substantially decreased in Model 3B when controlling for *science* populism. The coefficient for science populism (comparing Model 2B and 3B) remained substantially more stable. It seems plausible that the relationship between populist worldviews and trust in science primarily addresses science populism, and only to a smaller extent political populism.

**Table 3.** OLS regressions predicting trust in government.

	Model 1A	Model 2A	Model 3A
Political Populism	−1.00 (0.04)***		−0.86 (0.05)***
Science Populism		−0.71 (0.05)***	−0.28 (0.05)***
Adj. R <sup>2</sup>	0.40	0.22	0.42

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is trust in government, measured on an 11-point scale from 0 (no trust at all) to 10 (complete trust) and standardized between 0 and 1.  $N = 861$ . The full regression table is available in the Appendix, see Table A1.

**Table 4.** OLS regressions predicting trust in science.

	Model 1B	Model 2B	Model 3B
Political Populism	−0.49 (0.04)***		−0.21 (0.04)***
Science Populism		−0.69 (0.04)***	−0.59 (0.04)***
Adj. R <sup>2</sup>	0.25	0.37	0.39

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is trust in science, measured on an 11-point scale from 0 (no trust at all) to 10 (complete trust) and standardized between 0 and 1.  $N = 861$ . The full regression table is available in the Appendix, see Table A2.

We now move from trust in institutions to two other, potentially more distant, (sets of) attitudes: technocratic preferences and COVID-19 conspiracy beliefs. Tables 5 and 6 lend our argument additional face validity: Political populism was found to be the stronger predictor of technocratic preferences (Table 5). While there is debate on whether populism and technocracy are compatible or not (Caramani 2017; Bertsoou and Caramani 2022), our finding does seem plausible from the point of view of political populism: When having to choose between elected politicians (i.e. the despised political elite) and scientific experts, political populists might still perceive scientific experts as a better alternative. The opposite holds true for science populists: While Model 2C suggests there is no relationship, Model 3C suggests that science populism is indeed negatively associated with technocratic preferences, as one would anticipate. However, this was only the case after controlling for political populism, which leads to opposing expectations.

The regressions predicting COVID-19 conspiracy beliefs with political and science populism were consistent with this narrative (see Table 6). Political populism was found to be associated with conspiracy beliefs (Model 1D), however, this relationship vanished after controlling for science populism (Model 3D). In contrast, the correlation of science populism and conspiracy belief was robust to including political populism in the same model.

## Discussion and takeaways

In sum, our analyses suggest that political and science populism are related yet distinct from each other, and behave in theoretically plausible ways: In a first set of analyses, we demonstrated that survey scales capturing political populist attitudes (Hobolt et al. 2016) and science-related populist attitudes (Mede, Schäfer, and Fuchsli 2021) measure two different phenomena as their items load on two distinct factors. We also observed that the two scales show similar relationships with key sociodemographic

**Table 5.** OLS regression predicting support for scientific experts vs elected politicians.

	Model 1C	Model 2C	Model 3C
Political Populism	0.33 (0.04)***		0.44 (0.05)***
Science Populism		−0.01 (0.04)	−0.23 (0.05)***
Adj. R <sup>2</sup>	0.11	0.05	0.14

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is agreement with the statement that 'It is better for important policy decisions to be taken on the basis of scientific evidence by independent experts rather than by elected politicians', measured on a 5-point scale from 1 (completely disagree) to 5 (completely agree). The variable is standardized between 0 and 1.  $N = 861$ . The full regression table is available in the Appendix, see Table A3.

**Table 6.** OLS regression predicting COVID-19 conspiracy beliefs.

	Model 1D	Model 2D	Model 3D
Political Populism	0.22 (0.03)***		0.00 (0.03)
Science Populism		0.46 (0.03)***	0.46 (0.03)***
Adj. R <sup>2</sup>	0.19	0.33	0.33

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is the mean value of agreement with the statements that (A) COVID-19 is a bioweapon, (B) COVID-19 is a natural disease (reversed), (C) COVID-19 is a secret US military experiment, (D) Bill Gates wants to vaccinate by force to earn money, (E) 5G transmitter masts are responsible for COVID-19. Agreement is measured on a 5-point scale from 1 (very certain that this is false) to 5 (very certain that this is true). The variable is standardized between 0 and 1.  $N = 861$ . The full regression table is available in the Appendix, see [Table A4](#).

variables. In a second set of analyses, we found that political populism has a stronger correlation with trust in the government, while science populism is better suited for predicting trust in science. Further findings indicate that technocratic preferences are *more* common among political populists, but *less* common among science populists. Finally, we show that both political and science populism are linked to stronger conspiracy beliefs individually, but science populism seems to explain much of the correlation between these beliefs and political populism.

These results lead us to formulate three takeaways: First, we show empirically that political and science populism overlap, as they correlate with each other and have similar relationships with some sociodemographic predictors. This suggests that both populism variants share common ideational roots, may prevail in similar segments of the population, and might even fuel each other (see Bellolio 2022). Future research should thus further conceptualize the commonalities and interactions of political and science populism – especially when studying populist voting behaviour in the context of vaccine hesitancy (Kennedy 2019), restrictive measures during the pandemic (Mazzoleni and Ivaldi 2022), climate policy and renewable energy projects (Meijers, van Drunen, and Jacobs 2022; Otteni and Weisskircher 2022), or any other topics that address both political and scientific controversies (Rekker 2021).

Second, we also demonstrate empirically that political and science populism still have crucial differences: Factor analyses showed that both variants are perceived as distinct sets of ideas and have different antecedents, which is in line with theoretical premises that political and science populism conceptualize ‘elites’ differently and attribute the alleged virtuousness of ordinary people to different reasons. Researchers should thus not consider science populism as ‘old wine in a new bottle’ (Geurkink et al. 2020), i.e. as a phenomenon that is already included in political populism (see Oliver and Rahn 2016), but should rather employ conceptual arguments based on which populism variant is (or whether both are) relevant to their research questions, and acknowledge that both variants may behave differently depending on the study setting, topical context, and choice of covariates (see Lundberg, Johnson, and Stewart 2021). This may require future scholarship on political and science populism to develop different theoretical and statistical models to explain support for either form of populism.

Third, political populism may affect the impact of science populism on the dependent variable and *vice versa*. A correlation of either political or science populism and the dependent variable may thus not always indicate a causal relationship between them but can be due to the underlying correlation of both populism variants. Researchers should thus

theorize which type of populism is theoretically better suited to explain their dependent variable – or include both populism variants in their models and research designs to identify which of these is more useful to explain the variance in their covariates.

Overall, our study shows that populist attitudes are not a one-size-fits-all concept. Therefore, populism researchers need to be aware of the multifacetedness of populism (see also works on media populism by Fawzi and Krämer 2021, on economic populism by Ivaldi and Mazzoleni 2021, or on medical populism by Lasco 2020). Research contexts that primarily refer to political values, claims, and debates may require scales specifically developed to measure political populism; while contexts that address orientations toward science, scientists, or science-related issues – such as climate change, vaccination, or gender studies – may necessitate instruments specifically capturing science populism, such as the ‘SciPop Scale’. However, and importantly, research revolving around the science–policy nexus – e.g. investigating people’s views on politicized research fields, technocratic attitudes, or partisan reasoning about science – may benefit from including both scales. Doing so will add more nuance to the study of political and science populism and phenomena beyond these concepts.

## Notes

1. Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.
2. Replication code is available via the Harvard dataverse: <https://doi.org/10.7910/DVN/JRI186>.
3. The scale for measuring political populism has been used in over 40 election studies worldwide between 2016 and 2021 and is thus by far the most widely used scale to measure political populism among voters. However, as previously suggested by Castanho Silva et al. (2020), we preemptively removed one item from the original scale to improve the fit of the scale dramatically.
4. Note that the eigenvalue of the third component was smaller than 1 and below the parallel analysis line (in turquoise) – thus, further supporting the presence of exactly two underlying factors.
5. The question wording was: ‘How do you assess the current financial situation of your household?’ with the answer categories ‘get by only with great difficulty’, ‘get by with difficulty’, ‘neither good nor bad’, ‘get by well’, and ‘get by very well’ (in German).

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## Appendix

**Table A1.** Trust in government.

	Model 1A	Model 2A	Model 3A
Political Populism	−1.00 (0.04)***		−0.86 (0.05)***
Science Populism		−0.71 (0.05)***	−0.28 (0.05)***
Age	0.06 (0.04)	0.01 (0.05)	0.05 (0.04)
Female	0.04 (0.02)*	0.04 (0.02)	0.04 (0.02)*
Education – Low	0.00 (0.03)	0.02 (0.04)	−0.00 (0.03)
Education – Higher	−0.00 (0.02)	−0.03 (0.02)	−0.03 (0.02)
Left-Right self-placement	0.23 (0.14)	0.36 (0.16)*	0.26 (0.14)
Left-Right self-placement sq	−0.21 (0.14)	−0.20 (0.16)	−0.18 (0.14)
Financial situation	0.18 (0.04)***	0.20 (0.04)***	0.15 (0.04)***
Political interest	−0.01 (0.03)	0.00 (0.04)	−0.02 (0.03)
(Intercept)	0.82 (0.06)***	0.49 (0.07)***	0.88 (0.06)***
Adj. R <sup>2</sup>	0.40	0.22	0.42
Num. obs.	861	861	861

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is trust in government, measured on an 11-point scale from 0 (no trust at all) to 10 (complete trust) and standardized between 0 and 1.

**Table A2.** Trust in science.

	Model 1B	Model 2B	Model 3B
Political Populism	−0.49 (0.04)***		−0.21 (0.04)***
Science Populism		−0.69 (0.04)***	−0.59 (0.04)***
Age	0.15 (0.04)***	0.13 (0.03)***	0.14 (0.03)***
Female	−0.02 (0.02)	−0.01 (0.01)	−0.01 (0.01)
Education – Low	0.02 (0.03)	0.01 (0.03)	0.00 (0.03)
Education – Higher	0.06 (0.02)**	0.01 (0.02)	0.01 (0.02)
Left-Right self-placement	−0.04 (0.13)	0.05 (0.12)	0.02 (0.12)
Left-Right self-placement sq	−0.15 (0.13)	−0.09 (0.12)	−0.09 (0.11)
Financial situation	0.18 (0.03)***	0.14 (0.03)***	0.13 (0.03)***
Political interest	0.06 (0.03)*	0.04 (0.03)	0.04 (0.03)
(Intercept)	0.79 (0.05)***	0.82 (0.05)***	0.92 (0.05)***
Adj. R <sup>2</sup>	0.25	0.37	0.39
Num. obs.	861	861	861

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is trust in science, measured on an 11-point scale from 0 (no trust at all) to 10 (complete trust) and standardized between 0 and 1.

**Table A3.** Support for scientific experts vs elected politicians.

	Model 1C	Model 2C	Model 3C
Political Populism	0.33 (0.04)***		0.44 (0.05)***
Science Populism		-0.01 (0.04)	-0.23 (0.05)***
Age	0.14 (0.04)***	0.15 (0.04)***	0.13 (0.04)***
Female	0.04 (0.02)*	0.04 (0.02)*	0.04 (0.02)*
Education – Low	-0.04 (0.03)	-0.06 (0.03)	-0.05 (0.03)
Education – Higher	0.01 (0.02)	-0.00 (0.02)	-0.01 (0.02)
Left-Right self-placement	-0.39 (0.13)**	-0.41 (0.14)**	-0.36 (0.13)**
Left-Right self-placement sq	0.20 (0.13)	0.24 (0.13)	0.23 (0.13)
Financial situation	0.05 (0.03)	0.01 (0.03)	0.03 (0.03)
Political interest	0.00 (0.03)	-0.02 (0.03)	-0.01 (0.03)
(Intercept)	0.55 (0.06)***	0.80 (0.06)***	0.60 (0.06)***
Adj. R <sup>2</sup>	0.11	0.05	0.14
Num. obs.	861	861	861

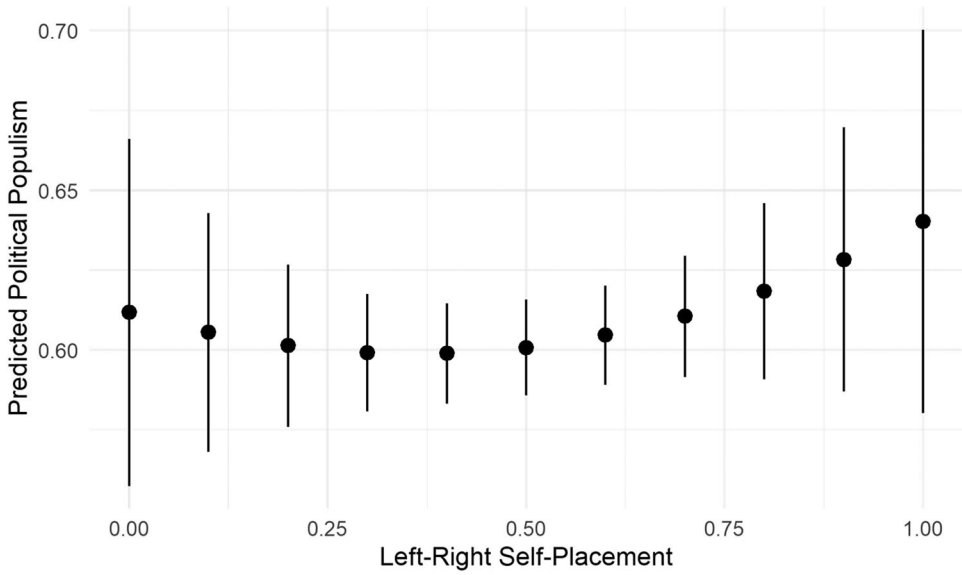
\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is agreement with the statement that 'It is better for important policy decisions to be taken on the basis of scientific evidence by independent experts rather than by elected politicians', measured on a 5-point scale from 1 (completely disagree) to 5 (completely agree). The variable is standardized between 0 and 1.

**Table A4.** COVID-19 conspiracy belief.

	Model 1D	Model 2D	Model 3D
Political Populism	0.22 (0.03)***		0.00 (0.03)
Science Populism		0.46 (0.03)***	0.46 (0.03)***
Age	-0.06 (0.03)	-0.05 (0.03)	-0.05 (0.03)
Female	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)
Education – Low	0.01 (0.02)	0.02 (0.02)	0.02 (0.02)
Education – Higher	-0.07 (0.01)***	-0.03 (0.01)	-0.03 (0.01)
Left-Right self-placement	0.06 (0.10)	0.01 (0.09)	0.01 (0.09)
Left-Right self-placement sq	0.17 (0.10)	0.12 (0.09)	0.12 (0.09)
Financial situation	-0.12 (0.03)***	-0.08 (0.02)***	-0.08 (0.02)***
Political interest	-0.06 (0.02)**	-0.04 (0.02)*	-0.04 (0.02)*
(Intercept)	0.18 (0.04)***	0.09 (0.04)*	0.09 (0.04)*
Adj. R <sup>2</sup>	0.19	0.33	0.33
Num. obs.	861	861	861

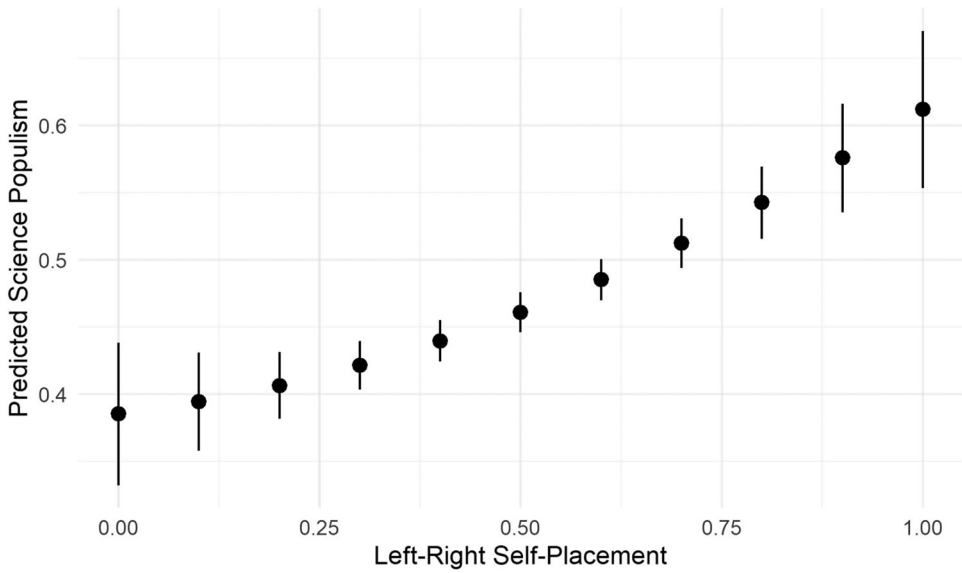
\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ . Entries are unstandardized coefficients from an OLS regression. Standard errors in brackets. The dependent variable is the mean value of agreement with the following statements: (A) COVID-19 is a bioweapon, (B) COVID-19 is a natural disease (reversed), (C) COVID-19 is a secret US military experiment, (D) Bill Gates wants to vaccinate by force to earn money, (E) 5G transmitter masts are responsible for COVID-19. Agreement is measured on a 5-point scale from 1 (Very certain that this is false) to 5 (Very certain that this is true). The variable is standardized between 0 and 1.





**Figure A1.** Left-right self-placement and political populism.

Note: Predictions for Figure A1 are based on Model 'Political Populism' in Table 2.



**Figure A2.** Left-right self-placement and science populism.

Note: Predictions for Figure A2 are based on Model 'Science Populism' in Table 2.