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Effective Ways of Casting Doubt? Examining the Different Effects of Blatant and Suggestive Disinformation

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Most disinformation research focuses on blatantly communicated disinformation. However, disinformation is often communicated more implicitly. In this study, we examined both the effects of suggestive disinformation (implicitly communicated as a question or suggestion) and blatant disinformation about science through a survey experiment conducted in the Netherlands. Contrary to concerns about anti-science disinformation, we found no effects of suggestive and blatant disinformation on misperceptions and attitudes toward science. Overall, participants saw politicians who spread blatant disinformation as less credible than politicians who spread suggestive disinformation or accurate information. Rightist, populist, and lower-educated individuals, however, found politicians who spread blatant and suggestive disinformation more, and equally, credible. Populist and right-wing politicians may thus benefit from spreading suggestive disinformation by being perceived as more credible by their core voters while avoiding reputation harm among the general population.

Keywords: mis- and disinformation, anti-science communication, political communication, experiment

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Recent years have shown increased concern about disinformation and its effects. Disinformation is believed to have negative effects on democracy by harming trust in democratic institutions of press and politics (Bennett & Livingston, 2018), increasing cynicism (Lazer et al., 2018), and undermining deliberative democracy (McKay & Tenove, 2021). Because of the prevalence of disinformation in public discourse, researchers have argued that a "post-truth" era has emerged, where public actors deny factual evidence and personal opinion is perceived as more important than scientific facts (Lewandowsky, Ecker, & Cook, 2017; Van Aelst et al., 2017). Examples include Donald Trump's false claims that the 2020 elections were stolen (Yen & Klepper, 2022) and Dutch member of parliament Caroline van der Plas's questioning of the integrity of scientists studying the nitrogen crisis in the Netherlands (Van der Goot, 2022).

Questioning factual information has become a weaponized tactic for politicians to sow doubt among the public (Bolsen & Druckman, 2015). Populist politicians especially use anti-science discourse to portray scientists as sources of disinformation and members of an "evil elite" (Egelhofer, 2023; Hameleers & Van der Meer, 2021). This type of discourse forms "one of the most important challenges to science communication today" (Krämer & Klingler, 2020, p. 254). Scholars worry that accusing scientists of spreading disinformation leads to negative evaluations of science and lowers scientific trust. Moreover, ongoing attention to the perceived prevalence of disinformation can lead people to believe that disinformation is widely available, diminishing trust in accurate information (Van der Meer, Hameleers, & Ohme, 2023).

This study focuses on politicians who accuse scientists of spreading false information, which we understand as a specific form of disinformation. Following Wardle (2018), we define disinformation as false information that is intentionally shared. We use the term "disinformation" and not "misinformation" (unintentional spread of false information) since we focus on the spread of false information by politicians. Politicians are likely to communicate strategically and thus spread false claims intentionally (Weeks & Gil de Zúñiga, 2021). False information is defined as information not supported by expert consensus or the best available evidence at the time (Vraga & Bode, 2020).

While ample research has examined the effects of disinformation, little attention has been devoted to its more subtle forms. Research on disinformation often operationalizes disinformation as blatantly false information (Altay, Berriche, & Acerbi, 2023), clearly communicated through explicit propositions (Pritchard, 2018). However, disinformation is not always presented blatantly. It can be expressed in more nuanced forms, such as cherry-picking, suggesting alternative explanations, or questioning information (Allen, Watts, & Rand, 2024; Williams, 2023). The latter is especially used by proponents of conspiracy theories under the guise of "just asking questions" as a rhetorical strategy to signal conspiracy (Lyons, Merola, & Reifler, 2019). Because of heightened attention to the spread of fake news and conspiracy theories, spreading disinformation is increasingly stigmatized (Carlson, 2018; Harambam & Aupers, 2017). Asking questions and considering suggestions, on the other hand, are valued in current, science-driven, societies (Berg, 2023). In this study, we zoom in on this phenomenon by focusing on disinformation phrased as a question or suggestion, which we label suggestive disinformation.

We argue that suggestive disinformation could instill doubt among the public and could serve as a gateway that increases the likelihood of people believing in disinformation. However, no studies have been conducted that examine the effects of suggestive disinformation. A few studies have examined implicit forms

of mis- and disinformation, operationalized in different ways. Some have specifically explored implicit conspiracy cues (Lyons & Workman, 2022; Lyons et al., 2019), misleading social media posts (Allen et al., 2024), deceptive news headlines (Ecker, Lewandowsky, Chang, & Pillai, 2014), and implicitly stated false information in news articles (Rich & Zaragoza, 2016; Tay, Hurlstone, Kurz, & Ecker, 2022). Our focus, however, is on a different phenomenon: suggestive disinformation—disinformation phrased as a question or suggestion—shared by a politician about a scientific finding.

We conducted an online survey experiment (N = 1,606) in which participants read a news article about a politician responding to a scientific finding on the Dutch nitrogen crisis. The politician either attacked the finding by making blatantly false claims (blatant disinformation), attacked it through suggestions and questions (suggestive disinformation), or supported the report (accurate information/control condition). The nitrogen crisis is a polarized debate about the reduction of nitrogen emissions in the Netherlands that revolves around highly complex scientific issues about, for example, the measurement of nitrogen pollution (Tullis, 2023; Van der Goot, 2022). We tested whether exposure to disinformation about the nitrogen crisis affected individuals' misperceptions, the perceived credibility of the politician making the claim, science trust, and the perceived credibility of the university that produced the scientific finding. We also tested the differences between the effects of blatant and suggestive disinformation.

This study contributes to misinformation research by examining the roots of public misperceptions, deepening our understanding of how different forms of false information impact society. Additionally, by studying suggestive disinformation, we expand on the work by Allen et al. (2024), Altay et al. (2023), and Van der Linden and Kyrychenko (2024), who have called for research examining the effect of "gray-area content" (i.e., content that raises questions without containing explicit falsehoods), since this type of content is more prevalent and potentially more impactful than explicitly false content.

Theoretical Framework

The Effects of Blatant and Suggestive Disinformation

Misperceptions

Reviews of experimental studies on the effects of mis- and disinformation have shown that, overall, exposure to mis- and disinformation increases misperceptions (Li & Yang, 2024; Rode et al., 2021). However, effect sizes vary across studies, with some studies even showing a negative effect of exposure on misperceptions (Li & Yang, 2024). Effects vary based on participant characteristics, source and topic of the mis- and disinformation (Li & Yang, 2024), and social and political context (Marwick, 2018). Therefore, exposure should not be equated with belief (e.g., Altay et al., 2023).

Previous research specifically on disinformation about science suggests that effects depend on the source, issue, and context. Individuals are more susceptible to false information when they see the source of this information as credible (Ecker et al., 2022), and as politicians hold a position of power, they are considered credible sources of information (Swire-Thompson, Ecker, Lewandowsky, & Berinsky, 2020). Research indicates that citizens rely on political cues to form opinions about multifaceted policies, especially

when direct knowledge is limited and issues are polarized (Guisinger & Saunders, 2017). The public's reliance on politicians' cues in complex scientific debates becomes evident from the key role politicians have played in the spread of mis- and disinformation about climate change (Farrell, McConnell, & Brulle, 2019; Oreskes & Conway, 2010). Previous research suggests that politicians who spread anti-science disinformation on less complex and more settled scientific issues are less impactful (Egelhofer, 2023).

This study argues that exposure to anti-science disinformation increases misperceptions. It focuses on anti-science disinformation related to a highly complex issue that was heavily debated at the time of our study (Tullis, 2023). The public is expected to have limited direct knowledge of this issue and to rely more heavily on cues from politicians. Therefore, we expect participants to be especially vulnerable to disinformation exposure on this issue.

Additionally, we expect that disinformation not only influences beliefs when phrased as a blatant claim but also when it is phrased as a suggestion or question. Individuals may be even more likely to remember suggestive disinformation because they are encouraged to make their own inferences and therefore build a richer mental representation of the false claim (Rich & Zaragoza, 2016). Possibly, individuals are less likely to detect a false claim phrased as a suggestion or question as disinformation and therefore less likely to reject it. Finally, research on the continued influence effect suggests that a false claim and its negation are stored separately in memory. Therefore, an individual who reads a fact-check sometimes continues to remember the false claim without its negation if the negation is lost from memory (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). A similar thing might occur when an individual is exposed to suggestive disinformation: They may remember the false claim without remembering that the claim was phrased as a suggestion or question.

The majority of previous research on subtle forms of mis- and disinformation is in line with these expectations. Allen et al. (2024) found that factually accurate but misleading content, which, for example, casts doubt on the effectiveness of vaccines, increased misperceptions. Lyons and colleagues (2019) tested the effects of exposure to a news article that contained implicit cues to conspiracy theories about the Zika virus. This article included evidence that supported a conspiracy theory without making explicit conspiracy claims. They found that these cues increased conspiracy beliefs. Other studies showed that implicit references to false claims in news reports (Rich & Zaragoza, 2016) and news headlines (Ecker et al., 2014) increased misperceptions, and that implicit references to false claims in news articles about fairtrade increased belief in those claims (Tay et al., 2022). However, Lyons and Workman (2022) failed to replicate these findings in a different context and only found an effect of explicit cues to conspiracy theories about voting fraud on conspiracy belief, but no effect for implicit cues.

Consistent with most previous studies, we expect that individuals exposed to suggestive disinformation from a politician about a scientific issue will be more likely to believe the false claim. Therefore, we hypothesize:

H1: When individuals are exposed to blatant (a) and suggestive (b) disinformation, they have stronger misperceptions than individuals who do not see disinformation claims.

Perceived Credibility Politician

In the current political climate, where anti-science rhetoric is increasingly prominent (Mede & Schäfer, 2020), politicians may benefit from spreading disinformation. Spreading disinformation can make politicians look more authentic as it shows a willingness to breach conventional political norms (Hahl, Kim, & Zuckerman Sivan, 2018). Consequently, individuals may perceive politicians who spread disinformation as more credible. Additionally, politicians may seek to avoid accusations of spreading disinformation by phrasing false claims more subtly (Hinterleitner & Sager, 2023). Thus, by spreading suggestive disinformation, they can benefit from spreading disinformation and avoid harm to their reputation caused by a disinformation accusation.

The effects of disinformation exposure on the politician's perceived credibility are likely issue-specific. Egelhofer (2023) found that politicians who spread anti-science disinformation about less complex and more settled scientific issues were perceived as less credible. A politician's reputation may be harmed by spreading false information about issues that are already perceived as settled by the public. However, on more complex issues that are still debated, people look for elite cues to inform themselves (Guisinger & Saunders, 2017). Here, a politician potentially benefits from employing anti-science rhetoric. Therefore, we expect the following:

H2: When individuals are exposed to blatant disinformation (a) and suggestive disinformation (b), they perceive the politician spreading the disinformation to be more credible than individuals who do not see disinformation claims.

Science Trust and Perceived Credibility University

Additionally, we expect that exposure to disinformation harms individuals' perceptions of the scientific organization attacked by the disinformation claim and general trust in science. As a result of the politician's cue that a scientific finding cannot be trusted, individuals may think that the researchers involved or their scientific institution are untrustworthy. These negative feelings toward the scientific institution may spill over to science distrust. Indeed, Zapp (2022) found that exposure to populist discourse, which often discredits scientific expertise, was associated with greater skepticism toward the benefits of science. However, previous studies show that effects depend on the issue at hand. Whereas Egelhofer (2023) found limited effects of anti-science disinformation about female leadership and electric cars on attitudes toward scientists, Hameleers and Van der Meer (2021) found that anti-science communication about climate change had a negative effect on the public's evaluation of scientists. Since we study the effects of disinformation on a similarly complex issue as Hameleers and Van der Meer (2021), we expect that disinformation harms attitudes toward scientific organizations and general trust.

Spreading suggestive disinformation is also expected to decrease science trust and the perceived credibility of researchers and research institutions. Previous work on science-related disinformation shows that continuing to ask questions or suggest alternatives, even after scientific consensus is reached, can effectively undermine the perceived credibility of scientific organizations (Oreskes & Conway, 2010). Kreps

and Kriner (2020) found that when politicians emphasized the uncertainty of scientific models in the context of the COVID-19 pandemic, science distrust increased. Therefore, we hypothesize:

H3: When individuals are exposed to blatant disinformation (a) and suggestive disinformation (b), they perceive the university associated with the accurate claim to be less credible than individuals who do not see disinformation claims.

H4: When individuals are exposed to blatant disinformation (a) and suggestive disinformation (b), they have lower trust in science than individuals who do not see disinformation claims.

Individual Differences

Ideology

We expect that the effects of exposure to disinformation on misperceptions, science trust, the perceived credibility of the politician, and the perceived credibility of the university will be stronger for individuals with right-wing political leanings. Research from the United States shows that right-leaning individuals more often hold misperceptions, as most disinformation aligns with conservative ideology (González-Bailón et al., 2023; Lewandowsky et al., 2017). In line with the theory of motivated reasoning, individuals are more likely to believe claims that confirm their preexisting beliefs (Kunda, 1990; Taber & Lodge, 2006). Rightist politicians more often reject scientific findings, particularly in areas like climate science and nature conservation, which often conflict with rightist neoliberal values, such as limited government intervention (Oreskes & Conway, 2010). Therefore, we expect the following:

H5: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on misperceptions for more rightist individuals than for individuals with less rightist attitudes.

H6: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on the perceived credibility of the politician for more rightist individuals.

H7: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on the perceived credibility of the university for more rightist individuals.

H8: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on science trust for more rightist individuals.

Education

We also expect that the effects of disinformation exposure will be stronger for lower-educated individuals. There is strong evidence that educational attainment decreases the likelihood of individuals believing in misinformation (Hwang & Jeong, 2023; Pennycook & Rand, 2021; Scherer et al., 2021). The association between education and susceptibility to misinformation also holds across various kinds of disinformation (Scherer et al., 2021). It is expected that higher-educated individuals are less susceptible to

disinformation about science, as education equips people with the knowledge and skills to critically engage with scientific findings (Gauchat, 2008; Hwang & Jeong, 2023) and socializes them in an environment where science is valued. Therefore, higher-educated individuals may be less easily persuaded by disinformation about science, and more likely to reject anti-science communication. We thus expect the following:

H9: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on misperceptions for lower-educated individuals than higher-educated individuals.

H10: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on the perceived credibility of the politician for lower-educated individuals.

H11: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on the perceived credibility of the university for lower-educated individuals.

H12: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on science trust for lower-educated individuals.

Populist Attitudes

We anticipate that the impact of disinformation claims will be particularly pronounced among individuals with populist attitudes. Generally, populism can be understood as a morally loaded revolt against the elites (Mede & Schäfer, 2020). Here, scientific experts and institutions are viewed as being part of said "corrupted elites" and perceived as a social threat, whose expertise is not only undemocratic but also goes against the commonsense of the "good and virtuous" people. Individuals with populist tendencies tend to harbor more negative attitudes toward science (Huber, Greussing, & Eberl, 2021), rendering them more susceptible to anti-science messaging and disinformation. Therefore, we expect the following:

H13: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on misperceptions for more populist individuals than for individuals with less populist attitudes.

H14: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on the perceived credibility of the politician for more populist individuals.

H15: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on the perceived credibility of the university for more populist individuals.

H16: Exposure to blatant (a) and suggestive (b) disinformation has a stronger effect on science trust for more populist individuals.

The Different Effects of Suggestive and Blatant Disinformation

Whether suggestive disinformation has a similar, stronger, or weaker effect compared with blatant disinformation remains unclear. On the one hand, suggestive disinformation may be more

convincing, as its "just asking questions" strategy may come off as less harmful than blatant disinformation. On the other hand, suggestive disinformation may be too subtle to fully convince individuals. Previous research has drawn different conclusions about the relative strength of the effects of exposure to blatant and implicit mis- and disinformation on misperceptions. Lyons et al. (2019) found that implicit cues to conspiracy theories had weaker effects than explicit cues, whereas Rich and Zaragoza (2016) and Tay et al. (2022) found no difference between the effects of implicitly and blatantly false information in news articles. Moreover, there has been no research on the differences between the effects of blatant and suggestive disinformation on the perceived credibility of the disinformation source (i.e., the politician), the perceived credibility of the contested source (i.e., the university), and science trust. Therefore, we ask the following research question:

RQ1: To what extent does exposure to suggestive disinformation have a different effect on individuals' misperceptions, perceived credibility of the politician, perceived credibility of the university, and science trust than blatant disinformation?

We also do not know to what extent these effects are different for rightist, lower-educated and more populist individuals:

RQ2: To what extent does exposure to suggestive disinformation have a different effect on individuals' misperceptions, perceived credibility of the politician, perceived credibility of the university, and science trust than blatant disinformation for rightist, lower-educated, and more populist individuals?

Methods

We preregistered and conducted a survey experiment in the Netherlands in April 2023 (see https://osf.io/k4vcu/?view_only=a19ca3ae35444aa38b88a169eee7120a).[1] The experiment was included in the second wave of a two-wave panel study. The panelists were fielded by I&O research (a renowned Dutch research agency) to be largely representative of the Dutch population in terms of age, gender, education, and region. A sample of 2,093 respondents was recontacted for the second wave, resulting in 1,606 respondents who participated in our experiment. There was no disproportional dropout on any of the quotas. Participants were incentivized with panel points for each wave, which they could spend on a gift card or donation to a charity. Hard-to-reach groups received more panel points. A power analysis indicated that the number of respondents was sufficient to test our hypotheses (Appendix A; see https://osf.io/2hz84/?view_only=cd3768886ffa48d49696e88d8427c503).

Treatments

This study employs a between-subjects design. We created one control and two experimental conditions, one for blatant disinformation and one for suggestive disinformation. We pretested two versions of the experimental conditions among a nonrepresentative sample of associates of the authors (N = 70).

[1] Small differences between the hypotheses and analyses and the preregistration are explained and justified in Appendix I.

Participants completed a short survey in which they were invited to share their thoughts on the stimuli in text boxes. Based on these responses, we chose the more explicit versions of each treatment. The experimental material consisted of a fictional online news article on Nu.nl, one of the most-read news sources in the Netherlands. In each of the articles, participants read about a fictional Dutch member of parliament, Robin Jansen, who responds to a research report about the nitrogen crisis published by researchers from Leiden University. In one condition, Robin Jansen claims the outcome of the report is false (blatant disinformation); in another condition, Robin Jansen questions the outcome of the report (suggestive disinformation); and in the control condition, Robin Jansen supports the outcome of the report (accurate information). A fictional politician was chosen to avoid introducing partisan bias. The layout, structure of the text, and images are constant across the treatment. To prevent speeding and to ensure that respondents read the stimulus attentively, the click-through button was delayed for 20 seconds. See Appendix B for an overview of the stimuli.

Measures

In wave 1 of the survey, participants were asked about their education ("What is the highest education you have followed?"; participants could choose one of seven categories). We asked all other measures during the second wave, when the experimental stimuli were administered. Before the experimental manipulation, participants were asked to place themselves on an 11-point left-right scale. Lower scores represented more leftist ideology, while higher scores represented more rightist leaning. One hundred and thirty-six respondents did not answer this question. Additionally, populist attitudes were measured before the experimental manipulation through three items on a 7-point scale (Cronbach's α = 0.75; e.g., "Politicians in parliament should be led by the opinions of ordinary people"; Akkerman, Mudde, & Zaslove, 2014). Participants were then exposed to the stimuli.

After the stimuli, all outcome variables were measured on a 7-point scale. Misperceptions were measured with "How do you assess the claim that is made in the news article?" and that is repeated below: "25 to 30 percent of Dutch nature reserves that are sensitive to nitrogen are affected more than anticipated." Responses were reverse coded, so higher scores represented stronger misperceptions. Second, the perceived credibility of the politician and the university, respectively, were measured through "How do you assess the credibility of Member of Parliament Robin Jansen/the University of Leiden?" Finally, trust in science was measured using a battery of four statements (Cronbach's α = 0.85; e.g., "We can trust science to make discoveries about the world around us"). We selected the four items from a battery of questions commonly used to measure science trust (Nadelson et al., 2014).

To test the validity of the treatment, a manipulation check was included at the end of the survey ("What did MP Robin Jansen say about the research report published by Leiden University?"; Appendix C). See the appendix for an overview of the measurements and scales, the descriptive statistics of the sample (Appendix D), and the correlations between the outcome variables (Appendix E).

Analyses

We used ordinary least squares (OLS) regression with dummy variables for both experimental conditions to test our hypotheses. All outcome variables and moderators were treated as continuous variables in the analyses. For the measures with multiple items, we used the mean scores of the items.

Results

Descriptives

The descriptive statistics for the relevant variables are displayed in Table 1. There were no significant differences between the three different experimental conditions concerning age $F(2, 1603) = .161$, $p = .852$; gender (2) = 2.972, $p = .226$; ideology $F(2, 1467) = .153$, $p = .858$; populist attitudes $F(2, 1603) = 2.636$, $p = .072$; or education level $F(2, 1603) = 0.042$, $p = .958$.

Table 1. Descriptive Statistics for Experimental Conditions.

Condition	*N*	Age	Percentage Female	Ideology	Populist Attitudes	Education Level
Blatant disinformation	523	52.1	49.1	4.93	3.21	4.80
Suggestive disinformation	551	51.6	53.2	4.96	3.19	4.82
Accurate information	532	52.2	54.1	5.01	3.36	4.80
Total	1,606	52.0	52.7	4.97	3.25	4.81

Main Effects

Table 2 shows that there was no significant effect of exposure to either blatant ($b = .134$, $p = .13$) or suggestive disinformation ($b = .028$, $p = .75$) on misperceptions. Thus, H1a and H1b were rejected. Contrary to our expectations, the results show that exposure to blatant disinformation had a significant, negative effect on the perceived credibility of the politician ($b = -.791$; $p < .001$). We found no significant effect for the group exposed to the suggestive disinformation claim. The direction of this effect was also negative ($b = -.140$; $p = .10$). Thus, we rejected H2a and H2b.

We found no evidence for the effect of blatant ($b = -.061$, $p = .46$) or suggestive ($b = -.030$, $p = .71$) disinformation on the credibility of the university. Consequently, H3a and H3b were rejected. Similarly, we rejected H4a and H4b, as there was no significant effect on trust in science for both the blatant ($b = -0.072$, $p = .29$) and suggestive ($b = -.071$, $p = .29$) conditions. In line with Table 2, we observed only a significant difference between the effects of the blatant and suggestive disinformation conditions on the credibility of the politician (results of the models with the blatant condition as a reference category are

displayed in Appendix F). Hence, participants saw politicians who spread blatant disinformation as less credible than politicians who spread suggestive disinformation.

Table 2. Unstandardized Effects of Exposure to Suggestive or Blatant Disinformation.

Model	Misperceptions	Credibility Politician	Credibility University	Trust in Science
	b	*b*	*b*	*b*
Intercept	3.564***	4.049***	5.141***	4.244***
	(0.062)	(0.060)	(0.058)	(0.048)
Accurate information	Ref.	Ref.	Ref.	Ref.
Suggestive disinformation	0.028	−0.140	−0.030	−0.071
Blatant disinformation	(0.087)	(0.084)	(0.081)	(0.067)
	0.134	−0.791***	−0.061	−0.072
	(0.882)	(0.085)	(0.082)	(0.068)
R^2	0.002	0.058***	0.000	0.000

Note. N = 1,606. Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Moderators

Next, we turn to the interaction effects of political ideology, populist attitudes, and education level. We inspect both the coefficients and marginal effects plots for each moderator to rule out the possibility of contingent moderation at certain levels of the moderator (Brambor, Clark, & Golder, 2006). All marginal effect plots for the interaction effects are displayed in Appendix G.

First, we focus on the effects of political ideology. We found no significant interaction effect between ideology and suggestive or blatant disinformation exposure on misperceptions, leading to a rejection of H5a and H5b (see Appendix G1). As displayed in Model 1 in Table 3, we observed a smaller negative effect of exposure to blatant disinformation and exposure to suggestive disinformation on the credibility of the politician for right-wing individuals ($p < .001$), rejecting H6a and H6b. As can be seen in Figure 1, this means that the negative effect of disinformation on the perceived credibility of the politician was weaker for more rightist individuals and that the most rightist individuals even saw the politician spreading the blatant or suggestive disinformation claim as more credible than the politician spreading accurate information. Moreover, the effects for the most leftist and rightist individuals were asymmetrical. For the most leftist individuals, suggestive disinformation had a weaker negative effect on the perceived credibility of the politician than blatant disinformation, while for the most rightist individuals, blatant and suggestive disinformation had a similarly positive effect on the perceived credibility of the politician. We also observed a small but statistically significant interaction effect between ideology and blatant disinformation exposure on the perceived credibility of the university. This indicates that the effect of being exposed to a blatant disinformation claim had a slightly greater negative effect on the perceived credibility of the university for more rightist individuals than for more leftist individuals (i.e., credibility goes down more when the disinformation claim holds true to your political preference). Therefore, H7a was supported. We rejected H7b, as this interaction effect was not found for the suggestive disinformation condition (result displayed in

Appendix G2). We found no significant interaction effect with ideology for suggestive or blatant disinformation on trust in science, thus rejecting H8a and H8b (see Appendix F3).

Table 3. Unstandardized Effects of Exposure to Disinformation on Credibility Politician Including Interaction Effects.

Model	1	2	3	4
Intercept	5.453***	3.330***	5.781***	5.767***
	(0.231)	(0.269)	(0.242)	(0.335)
Accurate information	Ref.	Ref.	Ref.	Ref.
Suggestive disinformation	−1.509***	1.019***	−1.751***	−2.045***
	(0.207)	(0.300)	(0.228)	(0.468)
Blatant disinformation	−2.745***	1.303***	−3.231***	−3.051***
	(0.212)	(0.301)	(0.233)	(0.476)
Ideology	−0.236***	−0.023	−0.019	−0.182***
	(0.278)	(0.017)	(0.016)	(0.028)
Populist Attitudes	0.017	0.017	−0.394***	−0.285***
	(0.029)	(0.030)	(0.049)	(0.050)
Education	−0.056*	0.160***	−0.067**	0.029
	(0.025)	(0.043)	(0.025)	(0.043)
Ideology*Suggestive	0.269***			0.208***
	(0.038)			(0.038)
Ideology*Blatant	0.387***			0.273***
	(0.039)			(0.040)
Education*Suggestive		−0.241***		−0.072
		(0.059)		(0.060)
Education*Blatant		−0.433***		−0.182**
		(0.059)		(0.071)
Populist*Suggestive			0.483***	0.364***
			(0.065)	(0.069)
Populist*Blatant			0.744***	0.544***
			(0.049)	(0.071)
R^2	0.12***	0.094***	0.135***	0.17***

Note. N = 1,470. Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Next, we turn to the role of education. We found no significant interaction effects between disinformation exposure and education on misperceptions. Upon further inspection of the marginal effects plots for these interaction effects (see Figure G1 in the appendix), we found a significant difference between the blatant and suggestive conditions for those scoring low on the education-level variable. This means that

lower-educated individuals had stronger misperceptions when they were exposed to blatant disinformation than when they were exposed to suggestive disinformation, but there was no difference between either of these conditions and the accurate information condition. However, the number of observations in this category was limited (Table D3 in the appendix), and the effect was small. Thus, we rejected H9a and H9b (Appendix G1). As displayed in Model 2 in Table 3, we found a significant moderation effect of education level on the perceived credibility of the politician making the disinformation claim, with a stronger negative effect for individuals with a higher education level ($p < .001$), rejecting H10a and H10b. Similar to the moderation effect of ideology, Figure 2 shows that the negative effect of disinformation on the perceived credibility of the politician was weaker for lower-educated individuals and that the lowest-educated participants saw the politician spreading the blatant or suggestive disinformation claim as more credible than the politician spreading accurate information. For the highest educated, suggestive disinformation had a weaker negative effect on the perceived credibility of the politician than blatant disinformation, while for the lowest educated, blatant and suggestive disinformation had a similarly positive effect on the perceived credibility of the politician. We found no evidence of an interaction effect with education on either the credibility of the university or trust in science, leading to rejection of H11a and H11b and H12a and H12b (see Appendices G2 and G3).

Turning to the moderating effect of populist attitudes, we found no significant interaction effects for populism on misperceptions, rejecting H13a and H13b (Appendix G1). The negative effect on the credibility of the politician was significantly smaller ($p < .001$) for individuals with stronger populist attitudes, rejecting H14a and H14b (Model 3 in Table 3). Figure 3 shows that individuals with the strongest populist attitudes perceived a politician spreading blatant or suggestive disinformation as more credible than a politician who spread accurate information. The effects for individuals with the strongest and weakest populist attitudes were also asymmetrical. For individuals with the weakest populist attitudes, suggestive disinformation had a weaker negative effect on the perceived credibility of the politician than blatant disinformation, while for individuals with the strongest populist attitudes, blatant and suggestive disinformation had a similarly positive effect on the perceived credibility of the politician. There were no significant interaction effects between populist attitudes and disinformation exposure on perceived credibility of the university and science trust (see Appendices G2 and G3). Thus, we reject H15a and H15b, and H16a and H16b.

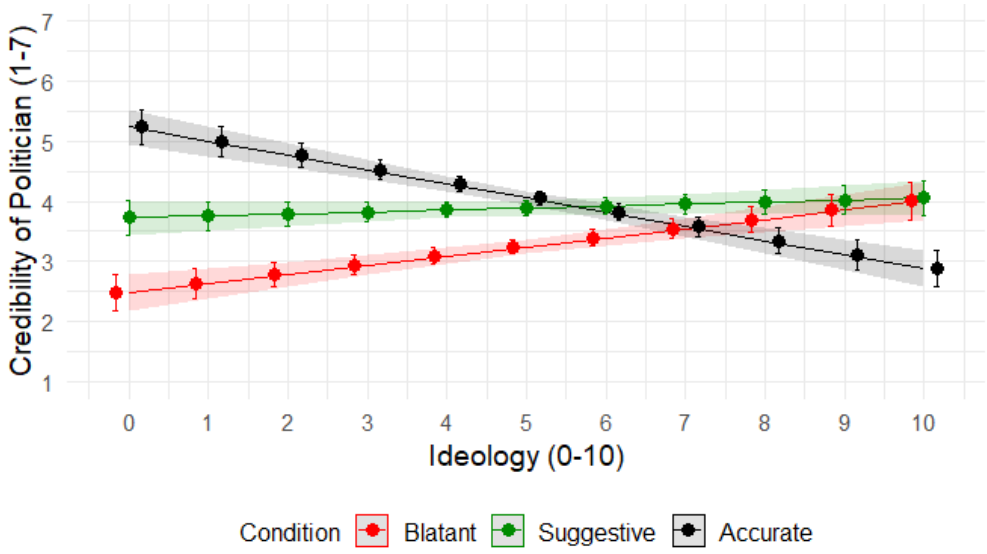

Figure 1. Marginal effects plot for the effect of the experimental conditions on perceived credibility of the politician at different levels of political ideology.

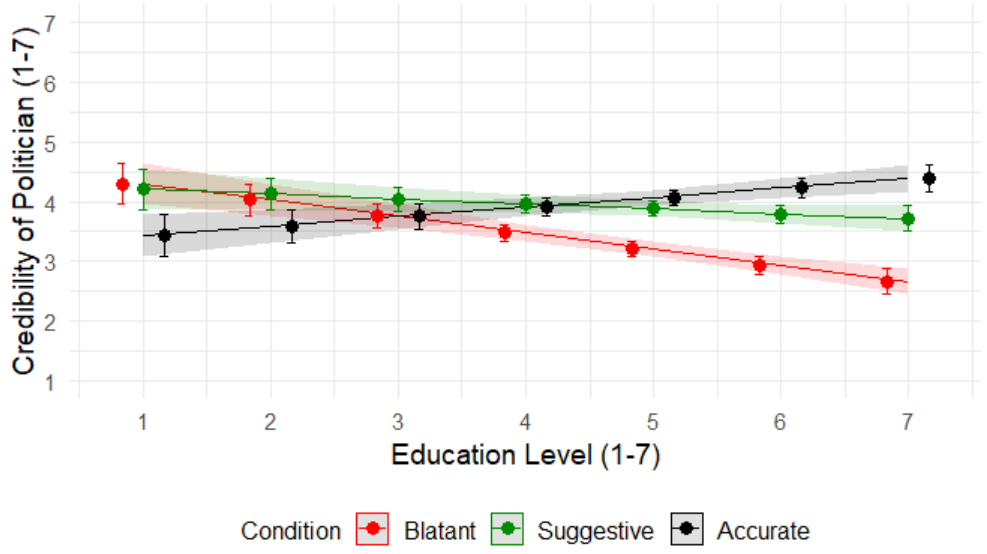

Figure 2. Marginal effects plot for the effect of the experimental conditions on perceived credibility of the politician at different levels of education.

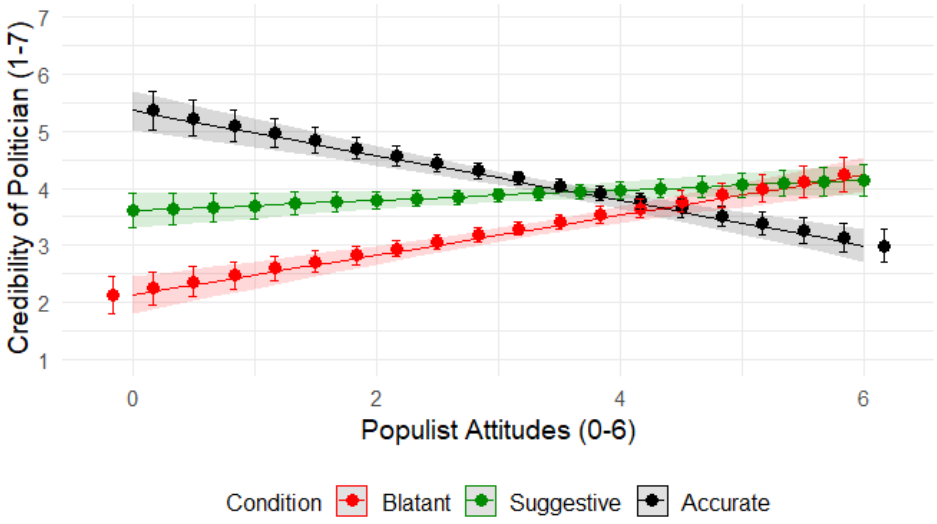

Figure 3. Marginal effects plot for the effect of the experimental conditions on perceived credibility of the politician at different levels of populist attitudes.

When running all three interaction effects in the same model for predicting the credibility of the politician (Model 4 in Table 3), we observed that populist attitudes and ideology retained a statistically significant interaction effect. However, the size of the interaction effect for education diminished and lost significance for the suggestive disinformation condition, meaning that, when including all interactions, there was no different effect of exposure to suggestive disinformation versus exposure to accurate information for individuals with different levels of education.

To further support our analysis, we controlled for perceived knowledge of the nitrogen crisis as a robustness check (see Appendix D1 for the measurement). This did not significantly alter the outcome of any analysis (see Appendix H).

Discussion

This study examined the differential effects of blatant and suggestive disinformation. Hence, it responds to recent calls by misinformation scholars to shift focus toward implicit types of false information, which are more prevalent and, therefore, impactful than explicit mis- and disinformation (Allen et al., 2024; Altay et al., 2023). Using a between-subjects experiment, we delved into the implications of blatant and suggestive disinformation exposure for misperceptions, trust in science, and the credibility of both scientific organizations and actors spreading disinformation.

Our study challenges prevailing fears about the dissemination of anti-science disinformation and its reception by the general public. Contrary to common assumptions, we found that, at the general level, participants exhibited a distinct aversion toward politicians who openly propagated blatant falsehoods. Moreover, attitudes toward science were not affected by exposure to either type of disinformation. Trust in

science remains high and stable in the Netherlands (Rathenau Instituut, 2021), suggesting that the general public is not receptive to anti-science rhetoric or even repelled by it.

This conclusion is partially supported by previous research. Similar to our findings, Egelhofer (2023) found that politicians who attack scientists are seen as less trustworthy by the general public and that attitudes toward science were not affected by the politician's attack. However, Hameleers and Van der Meer (2021) found that anti-science communication about climate change increased negative attitudes toward scientists. Because Hameleers and Van der Meer examined the effects of anti-science communication spread through a news article with more elaborate argumentation, their findings suggest that more elaborate and persuasive anti-science communication can harm attitudes toward science.

Our findings also raise concerns. We found that spreading suggestive disinformation did not harm the politicians' perceived credibility. Thus, politicians who spread false claims may avoid reputational harm by suggestively spreading these claims. We also found strong differences in science trust and the perceived credibility of the university between those with low and high populist attitudes and those with left-leaning and right-leaning attitudes, respectively. This speaks to a wider and somewhat concerning trend where attitudes toward science are significantly moderated by ideology or party identification (Rathenau Instituut, 2021).

Similarly, our study reveals different effects on the perceived credibility of the politician based on political leanings, populist attitudes, and educational background. We found that the negative effect of disinformation on the perceived credibility of the politician was particularly pronounced among individuals with left-leaning ideologies, lower populist attitudes, and higher education levels. The negative effect of disinformation exposure on perceived credibility among these individuals was stronger for blatant than for suggestive disinformation. For individuals with very strong populist and rightist attitudes and who were lower educated, we found, however, that they viewed the politician spreading disinformation to be more credible, regardless of whether the disinformation was blatant or suggestive. We contend that especially right-wing populist politicians have an incentive to spread disinformation, as their core audience seemingly rewards such communication style. Our findings imply that for these politicians, it may be beneficial to do so in a more unobtrusive manner to minimize potential backlash effects from the general public. These findings are partially in line with previous work. Egelhofer (2023) demonstrated that the perceived trustworthiness of a politician attacking science was less damaged among individuals with anti-elitist attitudes, but, contrary to our findings, also found that politicians attacking science were still seen as less trustworthy by this group.

Moreover, and contrary to our expectations, we did not find that individuals exposed to the disinformation claims in both treatment groups exhibited higher levels of belief in the disinformation claim stated. Our findings indicate that lower-educated individuals may respond differently to blatant and suggestive disinformation; however, the effects were small and based on a limited sample. We invite future researchers to pay attention to this, for instance, through oversampling this group.

Our overall null findings are in line with previous work (e.g., Altay et al., 2023; Marwick, 2018) that has criticized a "magic bullet" understanding of mis- and disinformation, which assumes that people

generally accept the claims put forward by mis- and disinformation. Generally, previous experimental studies have repeatedly shown that people process information in a biased fashion and that the persuasive effects of political messages are therefore generally limited (e.g., Albarracin & Shavitt, 2018; Hart & Nisbet, 2012). Instead, the effects of mis- and disinformation exposure on misperceptions should be understood as highly dependent on source, topic, and social and political context (Li & Yang, 2024; Marwick, 2018).

Thus, the content and context of the disinformation presented in our study may explain why we did not replicate the effects found in previous studies, both on blatant (Li & Yang, 2024) and implicit mis- and disinformation (e.g., Lyons et al., 2019). First, the disinformation included in our study focused on the Dutch nitrogen crisis, an issue that, at the time of our data collection, was highly visible on the media agenda and thus quite salient to the public. Although we expected participants to be susceptible to disinformation about this issue because of its complexity, which may have made participants more vulnerable to elite cues (Guisinger & Saunders, 2017), individuals may have already been stable in their views before our experimental treatment. We expect that mis- and disinformation are especially likely to affect misperceptions about less salient issues. Indeed, prior research showed an effect of implicit conspiracy cues on conspiracy beliefs about an issue (the Zika virus) that was likely not salient in its U.S. sample (Lyons et al., 2019), but not on conspiracy beliefs about issues salient in the U.S. public (election fraud) at the time (Lyons & Workman, 2022). Second, as mentioned above, the disinformation presented in our study had an anti-science component, which may have made participants more likely to reject the disinformation. Disinformation that does not attack institutions that are generally trusted (Rathenau Instituut, 2021) may be more likely to produce misperceptions. Finally, as individuals are more likely to believe false claims from a politician they support (Swire-Thompson et al., 2020), participants may not believe the disinformation claims if they do not know the politician. Participants may also see a scenario with a real-life politician as more realistic. This argument is supported by previous research that found an effect on misperceptions of disinformation spread by a real-life politician (e.g., Barrera, Guriev, Henry, & Zhuravskaya, 2020).

Limitations

Although this article adds important knowledge to existing literature, it is not without limitations. The experimental manipulation might have been too subtle. Participants may have missed some important cues indicating whether the text contained blatant or suggestive disinformation. Future research should further explore the effect of disinformation at different levels of explicitness, but it should also consider that individuals may not pick up subtle disinformation cues. Researchers will therefore have to find a balance between designing a more subtle, possibly more ecologically valid, disinformation cue and designing a manipulation that is not missed by participants.

Additionally, disinformation claims may have effects beyond what this study looked at. For example, suggestive disinformation may have a long-term effect on misperceptions and science trust. If politicians continuously spread suggestive disinformation, they may create uncertainty around (scientific) facts. Moreover, even if suggestive disinformation does not affect misperceptions, it may affect how certain individuals are about their beliefs. Therefore, future research should examine the long-term effects of suggestive disinformation on misperceptions, belief certainty, and science trust.

Implications

We contend that this article has made significant contributions to our understanding of the effects of different forms of disinformation. Contrary to popular belief, we found that people were overall more negative of politicians who spread disinformation and that disinformation did not affect attitudes toward science or misperceptions. This means that, in some contexts, anti-science disinformation may not be as dangerous as sometimes thought. At the same time, we believe that researchers and policymakers should be attentive to how politicians may use suggestive disinformation as a successful strategy. In many political contexts, there is a very real possibility that citizens are exposed to political figures who undermine scientific claims by spreading suggestive disinformation. Although we did not find that suggestive disinformation increased misperceptions, our findings suggest that suggestive disinformation can be persuasive for people on the far right of the political spectrum and with populist attitudes and lower education, who found a politician who spread suggestive disinformation more credible than a politician who spread accurate information. As our findings show that spreading suggestive disinformation leads to less reputation harm than spreading blatant disinformation, especially among the less populist, leftist, and higher educated, our study suggests that by spreading suggestive disinformation, politicians may be successful in persuading portions of the public while avoiding some of the negative backlash they may experience when spreading blatant disinformation. We hope that our novel approach of incorporating claim framing serves as a starting point for other researchers to explore the role that framing can play in the persuasiveness of disinformation claims.

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