

Personal Network Composition and Cognitive Reflection Predict Susceptibility to Different Types of Misinformation

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Abstract

Despite a rapid increase in research on the underpinnings of misinformation susceptibility, scholars still disagree about the relative impacts of social context and individual cognitive factors. We argue that cognitive reflection and identity-based network homogeneity may have unique influences on different types of misinformation. Specifically, identity-based network homogeneity predicts bias that is related to any type of identity-based information (i.e., political rumors), and cognitive reflection is more tailored toward truth discernment (i.e., fake news headlines). We conducted our study using an online sample (N = 214) split evenly between Democrats and Republicans and collected data on personal network composition, cognitive reflection, as well as susceptibility, sentiments, and sharing behavior in relation to political rumors and misinformation, respectively. Results demonstrate that where network homogeneity predicts belief and sharing in both political rumors and fake news headlines, cognitive reflection only predicts belief and sharing of fake news headlines. Social vs. cognitive factors for predicting different types of misinformation are discussed.

Keywords

ego networks, politics, misinformation, identity, homogeneity, cognitive reflection

Introduction

Misinformation currently represents one of society's most pressing global challenges (World Economic Forum, 2018); and unfortunately, the COVID-19 pandemic has only exacerbated the problem along with its societal consequences (Frenkel et al., 2020; Tardáguila, 2020; Zarocostas, 2020). As a large proportion of misinformation is shared on social networks (Lazer et al., 2018), this prompts the question of whether the composition of news on consumers' social networks might impact the likelihood of falling for misinformation on one's own news feed. For example, studies on persuasion have shown that we are more likely to be persuaded by sources perceived to be similar to us (Chaiken & Maheswaran, 1994; Metzger et al., 2003), and recent work on

misinformation shows that individuals are more susceptible to misinformation from politically similar sources (Traberg & van der Linden, 2022). As research has found that social media users often aggregate in homogeneous clusters of likeminded individuals, otherwise known as echo-chambers (Cinelli et al., 2021), this prompts the question: Previous work has shown how politically motivated reasoning can create a bias for processing information to fit one's ideology (Kahan et al., 2017) and shared agreement among one's personal network can bolster this identity bias process (Facciani & Brashears, 2019; Stets et al., 2021). Beyond susceptibility to fake news headlines, individuals with higher political homogeneity in their personal networks have also been shown to be more likely to agree with vague political rumors that supported their political group (Facciani, 2020).

At the same time, cognitive style has also been shown to be a predictor for truth discernment, that is, the ability to correctly detect misinformation minus false alarms (Pennycook & Rand, 2020). Specifically, individuals who score lower on cognitive reflection measures are worse at discerning between what is accurate vs. inaccurate (Pennycook & Rand, 2019). Additionally, priming individuals to reflect on accuracy goals can decrease the likelihood of sharing fake news (Pennycook et al., 2020). Both identity bias and cognitive style have therefore independently been found to predict behaviors related to believing and sharing misinformation. However, despite the existence of evidence for the influence of both social and cognitive factors on misinformation susceptibility, researchers adopting a cognitive perspective have expressed that the identity perspective is merely a “popular claim” that is challenged by the existence of cognitive effects (e.g. Pennycook et al., 2021, p. 1). Similarly, researchers adopting an identity perspective argue that while cognitive factors may be at play when it comes to truth discernment, identity factors may better explain biased fake news judgments (Batailler et al., 2022; Van Bavel et al., 2021).

We argue cognitive reflection and partisanship may in fact have *unique* influences on different types of misinformation. While researchers have previously argued that where partisanship may better predict bias that is related to any type of identity-based information and that cognitive reflection is more tailored toward truth discernment (Batailler et al., 2022; Van Bavel et al., 2021), research has yet to formally examine the relative impacts of these factors on different types of misinformation. In this study, we first examine the predictive powers of both identity bias and cognitive style, but importantly, we further evaluate whether and how shared ideological agreement in one’s personal networks can bolster these identity biases. We find that network homogeneity accounts for a unique and potentially broader explanation of belief and sharing misinformation stimuli compared to cognitive reflection.

Background

Defining and Measuring Misinformation

While some researchers rely on source-based definitions, that is, defining misinformation according to whether or not the source is fictitious or lacks credibility (e.g. Grinberg et al., 2019; Pennycook et al., 2021), other researchers use content-based definitions, defining misinformation according to whether the content is false or misleading

(Roozenbeek et al., 2022; Traberg, 2022; Traberg et al., 2022). However, social scientists generally agree that misinformation represents information that is inaccurate, false, or misleading regardless of the intent (Pennycook & Rand, 2021; Traberg, 2022). The range of misinformation includes misleading hyperpartisan headlines to completely untrue fake news. An example of hyperpartisan news was the headline that Nancy Pelosi vowed to raise taxes if Democrats won the US House in 2018. The reality was more nuanced as Pelosi discussed negotiating taxes with the Republicans at an event, but she did not explicitly say she would raise them (Politifact, 2021). Fake news examples are often more straightforward because there is not even a kernel of truth in them, such as Pope Francis endorsing Donald Trump during the 2016 Presidential election (Factcheck.org, 2016).

Explicitly fake news spreads quickly and pollutes the information ecosystem (Grinberg et al., 2019), and this is especially true for political fake news (Vosoughi et al., 2018), but it is a small portion of the average American’s overall media diet (Allen et al., 2020). Hyperpartisan and misleading news, including unsubstantiated political rumors, account for the majority of misinformation as they are far more common (Bradshaw et al., 2020; Faris et al., 2017). However, both types of misinformation can be dangerous as demonstrated by the harmful false information spread during the COVID-19 pandemic (Roozenbeek et al., 2020). In addition to misinformation’s harmful effects on public health, political misinformation and polarization also threaten the stability of democracies (Graham & Svobik, 2020). To combat misinformation, it is important to identify the factors that help explain what makes people susceptible to it.

Partisanship

Our identities can help us make sense of our social worlds by adhering to their values, roles, and scripts (Burke & Stets, 2009). We also can form identities around groups that we belong to (Tajfel et al., 1979). These identities based on group memberships can inspire us to protect our group while denigrating opposing groups (Stets & Burke, 2000). This protection of our social group and the motivation to follow the roles associated with our identities can also bias information-processing.

Political identities are a common example of this identity bias process. Growing political polarization and partisanship are crucial factors that increase the spread of false information. Negative feelings toward

the political outgroup have been steadily increasing over the past few decades in the United States (Finkel et al., 2020). Greater political polarization in our information ecosystems creates a feedback loop where individuals are exposed to political misinformation from their networks or media sources and then they share this misinformation to others in their network, increasing both polarization and the strength of partisan identities (Van Bavel et al., 2021). Research has shown that both Democrats and Republicans are more likely to interpret information in a way that supports their own political group (Ditto et al., 2019). Misinformation was again central in the 2020 Presidential Election and 59% of the Republicans agreed that believing the election was stolen was important to their political identity (CNN, 2021). Additionally, when one's political identity is made more salient to partisans, they report even stronger partisan beliefs (Unsworth & Fielding, 2014). Research has further found that political biases may impact which sources we accept falsehoods from. For instance, Bauer and Clemm von Hohenberg (2020) found that individuals are more likely to believe fake news from sources that had reported politically congruent news in the past, and Traberg and van der Linden (2022) found that social media users were more likely to perceive headlines from politically congruent sources as reliable due to perceiving those sources as more credible. This may in part be because perceived similarity with sources plays a role in both the persuasion (Chaiken & Maheswaran, 1994; Metzger et al., 2003) and the advice-taking process (Marks et al., 2019). That is, individuals are more likely to be persuaded by or accept information from sources they perceive to be similar on some characteristic, such as sharing similar political attitudes (Marks et al., 2019).

Not only does political identity influence our information processing, but it can motivate individuals to share misinformation to attack their political outgroup (Rathje et al., 2021). The subjective importance of identities also plays a role in how strongly they can influence our behavior (Ervin & Stryker, 2001; Stets & Serpe, 2016). For example, Democrats and Republicans who strongly identified with their political group perceived greater political polarization (Westfall et al., 2015). Additionally, vaccine skeptics who agree that their anti-vaccine identity is very important to them are the most likely to endorse misinformation regarding vaccines (Motta et al., 2021). Given the social nature of misinformation, it is important to understand the specific conditions where misinformation and networks are the strongest.

Networks and Misinformation

Homophily is the phenomenon that describes how individuals who share characteristics are more likely to associate with each other (McPherson et al., 2001). Both Democrats and Republicans prefer homogenous networks (Pew Research Center, 2014) and prefer to watch media that supports their politics (Pew Research Center, 2020). As mentioned above, it has been theorized that network composition creates a feedback loop that exacerbates misinformation and partisan identity (Van Bavel et al., 2020). Individuals are also motivated to share misinformation in order to attack their outgroup and signal ingroup identity (Rathje et al., 2021), which further polarizes their networks. This is consistent with previous work that has shown that people will adapt their politics to match their personal networks overtime (Lazer et al., 2010) and that a group discussion with those who supports one's politics will increase polarization (Keating et al., 2016). However, it appears that the type of network tie matters for determining these effects. Superficial exposure to opposing views will not break the echo chamber effect. Bail et al. (2018) paid Democrats and Republicans to follow social media accounts that shared opposing political information for 1 month. Neither group reduced their polarization, and Republicans were even more polarized afterward. Consistent with these findings, partisans are often motivated to attack their political outgroup on social media instead of having nuanced discussions of policy (McPhetres et al., 2021). When investigating non-social media connections, Robison et al. (2018) found that increased diversity in one's network who they discuss political matters with did not reduce polarization either. Importantly, political discussants or social media accounts are not particularly close to the individual.

Facciani and Brashears (2019) evaluated if the political diversity in one's group who they discuss "important matters" with would influence political beliefs. Those who we discuss "important matters" with tends to record people in our networks who we have particularly meaningful social interaction with (Brashears, 2014). Facciani and Brashears (2019) found that having just one person with different politics in one's "important matters" network was associated with significantly less extreme political beliefs for both Democrats and Republicans. In a subsequent networks study also using the "important matters" item, Facciani et al. (2023) found that the political composition of one's network predicted their attitudes toward vaccination. Specifically, Facciani et al. (2023) found that more positive attitudes toward

vaccination were predicted by having a greater proportion of Democrats in one's network and more negative attitudes toward vaccination were predicted by a greater proportion of Republicans in one's network. Thus, personal network structure does appear to influence how an individual processes political information, but only when the network is especially meaningful to them. This is because the closeness of social ties is crucial for identity formation and belief commitment (Cooley, 1902; Smith & Emerson, 1998).

Stets et al. (2021) argue that shared identity meanings help foster homophily, and interactions with our network reinforce and perpetuate network homogeneity. As described above, individuals have a motivation to maintain consistency between their identities and their behaviors. When individuals are in a network of close social connections who share their identity, those individuals further verify one's identity, and the individual also verifies the identities of people in their network. As these social bonds strengthen among people with a shared identity, so does the sense of "we-ness" and the social distance from other people who do not share their identity (Stets et al., 2021). This identity may also become more personally important to an individual when more people in their network share that identity with them.

For example, if an individual identifies as a Democrat, they are often motivated to support their Democrat identity with their behaviors. This could involve supporting Democratic politicians, sharing pro-Democrat news in their networks, and sharing positive stories about Democrats (and negative stories about Republicans) with their close associates. If this individual's personal network is entirely comprised of other Democrats, those Democrats are also sharing pro-Democrat information with the individual. Crucially, the social foundation of their identity is constantly being supported by those in their network, potentially increasing the importance of that Democratic identity. Thus, both the identity verification feedback loop for the individual and the identity support from their homogenous network may compound each other.

Cognitive Reflection and Misinformation

In addition to political identities and networks, the Dual-Process Model of Reasoning has been consistently linked to belief in false information (Pennycook & Rand, 2019, 2020). Dual-Process Models of Reasoning assert that there are two main categories of cognitive processes, which are often differentiated between Type 1 and Type 2. Type 1

involves a cognitive process that is fast and intuitive, whereas Type 2 refers to thinking that is slower and more deliberate (Evans & Over, 1996; Sloman, 1996), with work showing that some individuals have a tendency to engage in one style of thinking more than the other (Liberali et al., 2012).

The Cognitive Reflection Task (CRT) is a popular method for determining one's preferred cognitive style (Frederick, 2005), with higher scores corresponding with more Type 2 thinking patterns and lower scores with Type 1 styles (i.e., lower cognitive reflection). Pennycook and Rand (2021) have consistently found that individuals scoring low on the CRT are more likely to believe and share false information. Additionally, Pennycook et al. (2020) found that asking people to judge the accuracy of headlines can decrease people's tendency to share fake news. Pennycook and colleagues (2021) also found that employing simple accuracy nudges as people use Twitter made them less likely to share false information. However, subsequent studies have found such accuracy nudges have only worked among Republicans (Rathje et al., 2022).

Pennycook and Rand (2019) found that lower CRT scores predicted the perceived accuracy of fake news even when the fake news headlines aligned with participant's politics. However, Batailler et al. (2022) reanalyzed Pennycook and Rand's (2019) study and separated the general ability to identify real vs. fake news and the partisan biases in evaluating news as real or fake. Batailler et al. (2021, p. 7) found "participants were better in discriminating between real news and fake news when the headlines were congruent with their political ideology than when they were incongruent with their political ideology." When the data was analyzed in this fashion, it was clear that partisan bias played a major role in how participants evaluated the misinformation stimuli in the study.

The debate between partisan identity bias and cognitive reflection may benefit from comparing how both factors predict different types of misinformation stimuli. Cognitive reflection may better explain overall truth discernment and partisan bias may be more indicative of overall biased beliefs related to one's political identity (Gawronski, 2021). Thus, the present study aims to evaluate the impact both partisan bias and cognitive reflection have on different types of misinformation.

The Present Study

Our study aims to test the influence of network homogeneity and cognitive reflection on judgments of two different types of misinformation: vague

political rumors and published fake news headlines. We propose that network homogeneity and the subsequent identity verification process should create bias for any type of information that provides an opportunity to support one's identity. We further propose that this identity protection should have a broader influence on processing political information than cognitive reflection processes that are more focused on discerning truth from falsehoods.

Facciani (2020) found that Democrat and Republican participants judged brief political rumors as more likely if their own political group was engaging in a positive behavior (i.e., helping) and their opposing group was engaging in a negative behavior (i.e., bullying). As this identity bias was exacerbated by having a completely homogenous network, we predict that this bias may also apply to processing both unverified political rumors and fake news headline that either support one's own group or attack one's opposing group. However, we predict that cognitive reflection should *only* predict bias in judging the likelihood of fake news headlines, but not political rumors. Both the political rumors and fake news headlines provide an opportunity for identity verification. However, only the fake news headlines provide an opportunity for truth discernment as the social scenarios are purposely vague and allow the participant's identity bias to impact judgment.

Stets et al. (2021) argue that shared identity within one's network increases the sense of "we-ness" and the social distance from other people who do not share their identity (Stets et al., 2021). The sense of community among those who share one's identity is a central factor for how important that identity can be to them (Brenner et al., 2014). We test this idea by applying it to political identities and networks. We hypothesize that participants with a completely homogenous network will have higher ratings of the subjective importance of one's political identity. Research has shown that partisans exhibit both bias for their ingroup and against their outgroup (Amira et al., 2021). If network homogeneity bolsters this effect, we should observe that both Democrats and Republicans will rate their own group more positively than the outgroup when they have a politically homogenous network.

H1: Network homogeneity increases participants' self-reported importance of political identity.

H2: Democrats and Republicans with homogenous networks will rate their ingroup more positively than their outgroup.

Beyond evaluation ratings, we also predict that network homogeneity will influence the likelihood judgments of social scenarios involving political groups. Having a politically homogenous network should be positively associated with the likelihood of believing one's own group is engaging in a positive behavior as well as believing one's outgroup is engaging in a negative behavior. We also predict that participants with homogenous networks will be more likely to want to share the politically biased rumors as well. This leads us to the following formal hypotheses:

H3a: Both Democrats and Republicans with a politically homogeneous network will be more likely to rate politically congruent rumors as true (compared to those without a politically homogeneous network).

H3b: Both Democrats and Republicans with a politically homogeneous network will be more likely to report sharing politically congruent fake headlines (compared to those without a politically homogeneous network).

In addition to homogeneity influencing the likelihood of political rumors, we also predict that homogeneity will be positively associated with judging fake news headlines as more likely when they support one's political ingroup as well as being more likely to indicate sharing politically congruent fake news headlines:

H4a: Both Democrats and Republicans with a politically homogeneous network will be more likely to rate politically congruent fake headlines as true (compared to those without a politically homogeneous network)

H4b: Both Democrats and Republicans with a politically homogeneous network will be more likely to report sharing politically congruent fake headlines (compared to those without a politically homogeneous network)

We do not predict cognitive reflection will be associated with political rumor likelihood. Political rumors provide an opportunity for partisans to support their political ingroup. Cognitive reflection is particularly relevant for the perceived accuracy of fake news (Gawronski, 2021) and should not be relevant for a broader bias that involves estimating the likelihood of political rumors or a desire to share such rumors.

H5a: Cognitive reflection not related to politically congruent rumor belief. Cognitive reflection should

not be associated with politically congruent rumor likelihood

H5b: Cognitive reflection not related to politically congruent rumor sharing: Cognitive reflection should not be associated with politically congruent rumor sharing

We do assert that cognitive reflection should still predict believing and sharing fake news headlines for both Democrats and Republicans as it involves discerning truth from falsehoods (Pennycook & Rand, 2019).

H6a: Cognitive reflection predicts politically congruent fake news belief. Decreased cognitive reflection will be associated with an increase of believing politically congruent fake news for Democrats and Republicans

H6b: Cognitive reflection predicts fake news sharing. Decreased cognitive reflection will be associated with an increase of sharing politically congruent fake news for Democrats and Republicans

Methods

Subjects

We recruited 107 Democrats and 107 Republicans to complete our online study. Participants were recruited from *Prolific*, which is a website that connects participants to studies and pays them for their completion (Palan & Schitter, 2018). Participants were 62% female, 67% white, $M_{age} = 34.06$ ($SD = 12.71$), 49% Christian identified, 52% had a bachelor's degree or higher, and 39% had an income of 75,000 USD per annum or higher.

Procedure

After providing informed consent, participants listed up to six names with whom they discuss "important matters" with. After providing each name, the participant was asked if this name was a Democrat, Republican, Independent, or other. Next, participants completed three cognitive reflection tests, followed by a rating of Democrats and Republicans using Affect Control Theory's procedure described below. Then participants judged the likelihood of political social scenarios happening, rated the accuracy of fake headlines as well as their likelihood of sharing both. Finally, they answered demographic and political ideology questions.

Measures

Network Homogeneity/Ego Networks

Matching the number of names given who matched the respondent's political identity provided us with a measure of political homogeneity. A homogenous network is defined as an ego network wherein all share the same political identity as the respondent. Conversely, a heterogeneous network is one that has at least one alter who differs in political identity compared to the respondent. This method by Facciani and Brashears (2019) aligns with the underlying theory of the sacred umbrella (Smith & Emerson, 1998), which asserts total homogeneity provides protection against the uncertainty that can arise from opposing ideological stances within one's personal network.

Cognitive Reflection

Cognitive reflection was measured by the sum of correct responses to the reworded three-item CRT (Shenhav et al., 2012) and the non-numerical four-item CRT (Thomson & Oppenheimer, 2016). Combining the sum of these two measures has been used in other misinformation research (Pennycook & Rand, 2019), and we use the sum of correct answers of these two measures as cognitive reflection in our study.

Cultural Sentiments

Participants rated Democrats and Republicans using Affect Control Theory's procedure measuring different cultural sentiments (Heise, 2007; Osgood et al., 1957). The scales ranged from -4 to 4 from a label of infinitely bad (-4) to infinitely good (4) to capture how positively or negatively participants felt about these groups. Evaluation ratings served as a measure for feelings of warmth toward a political group, which is a common measure for affective polarization (Iyengar et al., 2019).

Scenario Judgments

Participants were asked to judge the likelihood of eight total social scenarios taking place (see Supplementary Material), and they were split evenly between the Democrat and Republican engaging in both the "good" and "bad" behaviors (i.e., "Democrat bullies a person" vs. "Democrat helps a person"). These social scenarios were used by Facciani (2020) and demonstrated insignificant political bias for both

Democrats and Republicans. After reading each scenario, participants were asked to judge how likely this event was to occur as it was described and how likely they were to share it with someone else (both measured on a 1–7 likelihood scale). Since these social scenarios were identical for all participants, we could combine Democrats and Republicans into one sample for our analyses by calculating if the scenario targeted the participant’s ingroup or outgroup.

Fake News Judgments

Participants were exposed to eight headlines with four having a pro-Democrat bias and four having a pro-Republican bias. These headlines were collected from previously validated studies (Pennycook et al., 2021) and Politico’s fact-checking website. Participants were asked to rate how likely they were to share the headlines. Unlike the social scenarios, these headlines were not direct contrasts for each political group (Democrat bullies Republican and Republican bullies Democrat are interchangeable, but “Donald Trump Jr. Sets The Record For most Tinder Left-Swipes in One Day” and “92% of left-wing activists live with their parents, Study: 1 in 3 also unemployed” are not.” Thus, the fake headlines were analyzed while separating Democrats and Republicans instead of a broader ingroup vs. outgroup analysis of all participants. Participants were asked to imagine they saw each headline on social media and they were asked how likely they thought the headline was true (on a 1–7 Likert scale) as well as how likely they would be to share the headline on social media (also using a 1–7 Likert scale).

Demographics

Participants were firstly asked how socially and economically liberal or conservative (1–7 Likert scale for each and a single score was generated from the average of both scores) they were along with a series of demographic questions. In addition to the questions about one’s ideology and political affiliation (verifying that the participant was indeed a Democrat or Republican as they reported on Prolific), we also asked how important their political identity was to them on a scale of 1–5.

Results

Homogeneity Effects

We first evaluated if having a completely homogeneous network predicted the importance

Table 1. Hypothesis summary list.

Hypothesis
<i>H1: Homogeneity increases importance of political identity.</i>
<i>H2: Homogeneity increases ingroup evaluation.</i>
<i>H3a: Homogeneity increases political rumor bias.</i>
<i>H3b: Homogeneity increases sharing political rumor bias.</i>
<i>H4a: Homogeneity increases fake headline bias.</i>
<i>H4b: Homogeneity increases sharing fake headline bias.</i>
<i>H5a: Cognitive reflection not related to rumor belief.</i>
<i>H5b: Cognitive reflection not related to rumor sharing.</i>
<i>H6a: Cognitive reflection predicts fake news belief.</i>
<i>H6b: Cognitive reflection predicts fake news sharing.</i>

Table 2. Homogeneity predicts political identity importance.

	Political identity importance
Network homogeneity	0.527** (3.28)
Number of alters	0.011 (0.23)
Higher liberalism	0.038 (0.89)
Democrat identification	0.214 (0.80)
Constant	2.392** (7.32)
N	214

of political identity and ingroup and outgroup evaluation. Combining both samples, 42% of the participants had a completely homogenous network, which was consistent with previous research (Facciani, 2020; Facciani & Brashears, 2019). There was not a significant difference in network homogeneity between Democrats and Republicans ($b = 0.10$, $t(213) = 1.53$, $p = 0.128$). Our ordinary least squared regression model (Table 2) found that network homogeneity significantly predicted higher importance of political identity ($b = 0.527$, $t(213) = 3.28$, $p < 0.001$). This supports *H1: Network homogeneity increases participants’ self-reported importance of political identity.*

Our next ordinary least squared regression model (Table 3) found that participants with a completely homogenous network had significantly higher ingroup evaluation ($p < 0.01$) and lower outgroup evaluation ($p < 0.01$). This supports *H2: Democrats and Republicans with homogenous networks will rate their ingroup more positively than their outgroup.*

After observing that network homogeneity influences evaluations toward political groups, we analyzed if network homogeneity also predicted judgments and sharing of our two types of

misinformation. We first evaluated whether network homogeneity predicted belief and sharing of political rumors. We found that (Table 4) network homogeneity predicted a higher likelihood of believing the helping rumor ($b = 0.19$, $t(213) = 1.74$, $p = 0.083$) as well as the desire to share it ($b = 0.25$, $t(213) = 2.52$, $p = 0.013$). However, network homogeneity did not have any significant association with the bullying rumor or the desire to share in our sample. While the main homogeneity variable was dichotomous, we also measured the impact of proportional homogeneity as a robustness check (see Figure 1).

Thus, these findings partially support *H3a: Both Democrats and Republicans with a politically homogeneous network will be more likely to rate politically congruent rumors as true* and *H3b: Both Democrats and Republicans with a politically homogeneous network will be more likely to report sharing politically congruent fake headlines.*

Next, we evaluated whether network homogeneity predicted belief in fake news headlines (Table 5). We found that network homogeneity did predict belief in conservative fake news headlines for Republicans ($p < 0.05$; one-tailed), but not in Democrats. Figure 2 illustrates how a greater percentage of Republicans in our Republican participant's network predicted higher belief in conservatively biased fake news.

Additionally, network homogeneity did not predict the likelihood to share fake news headlines for either Democrats or Republicans. Thus, we find partial support for *H4a: Both Democrats and Republicans with a politically homogeneous network will be more likely to rate politically congruent fake*

Table 3. The influence of network homogeneity on political group ratings.

	Ingroup evaluation	Outgroup evaluation
Network homogeneity	0.581** (2.69)	-0.670** (-2.61)
Number of alters	0.105 (1.53)	0.035 (0.43)
Higher liberalism	-0.096~ (1.66)	-0.058 (-0.84)
Democrat identification	0.625~ (1.74)	-0.286 (-0.67)
Constant	1.295** (2.95)	-0.931~ (-1.78)
N	214	214

Table 4. The influence of network homogeneity on political rumor likelihood and sharing.

	Ingroup helping rumor belief	Outgroup bullying rumor belief	Share ingroup helping rumor	Share outgroup bullying rumor
Network homogeneity	0.191~ (1.74)	0.055 (0.47)	0.256* (2.52)	0.081 (0.72)
Number of alters	-0.001 (-0.02)	0.007 (0.20)	0.037 (1.15)	-0.005 (-0.14)
Higher liberalism	-0.034 (-1.18)	-0.021 (-0.66)	-0.059* (-2.17)	-0.064 (-2.14)
Democrat identification	0.133 (0.73)	0.289 (1.46)	0.201 (1.19)	0.359~ (1.92)
Constant	0.614** (2.75)	0.453~ (1.88)	0.288 (1.39)	0.670** (2.93)
N	214	214	214	214

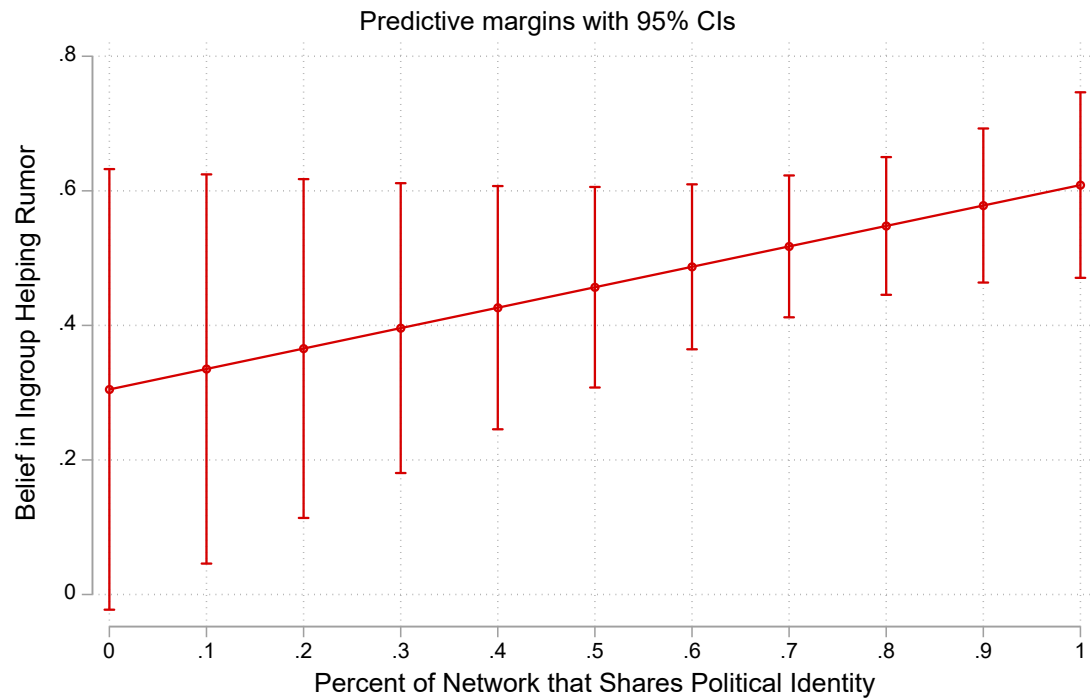


Figure 1: Increased political network homogeneity predicts higher belief in political rumor.

Table 5. The influence of network homogeneity on fake news headlines (Democrats and Republicans).

	Liberal fake news	Share liberal fake news	Conservative fake news	Share conservative fake news
Network homogeneity	-0.257 (-1.19)	0.147 (0.54)	0.465~ 1.69	0.012 (0.04)
Number of alters	0.07 (0.99)	0.078 (0.88)	0.001 (0.01)	-0.116 (-1.23)
Higher liberalism	0.075 (1.36)	0.024 (0.35)	-0.168* (-2.14)	-0.064 (-0.74)
Constant	3.52** (5.67)	2.55** (3.25)	4.064 (7.43)	3.48** (5.70)
N	107	107	107	107

headlines as true, but fail to find any support for H4b: *Both Democrats and Republicans with a politically homogeneous network will be more likely to report sharing politically congruent fake headlines.*

Cognitive Reflection

An OLS regression failed to find any significant difference between CRT scores between Democrats and Republicans ($p > 0.05$). Homogeneity predicted

belief and sharing in half of our political rumors. We predicted that cognitive reflection should not predict belief in political rumors or sharing at all. This is precisely what we found as cognitive reflection was not related to any political rumor belief or sharing (Table 6), which supports H5a: *Cognitive reflection not related to rumor belief* and H5b: *Cognitive reflection not related to rumor sharing*.

We found that cognitive reflection predicted belief in fake news (see Table 7), but this was only the

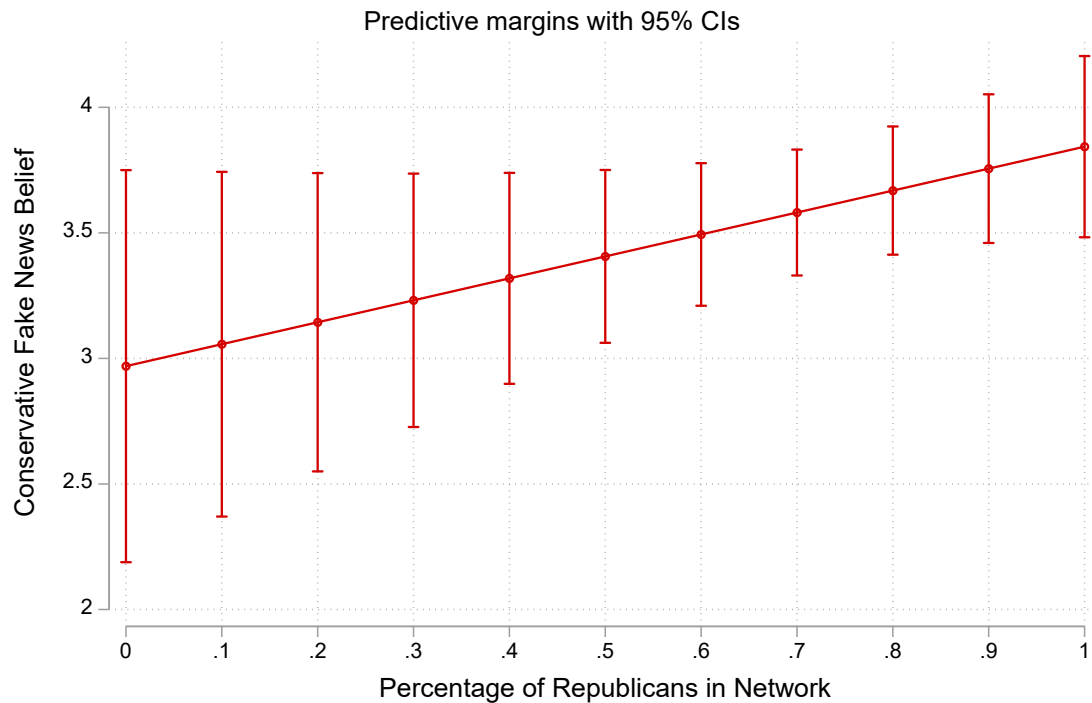


Figure 2: Republican network homogeneity predicts belief in conservative fake news.

Table 6. Cognitive reflection does not predict political rumors likelihood.

	Ingroup helping rumor	Outgroup bullying rumor	Share ingroup helping rumor	Share outgroup bullying rumor
CRT scores	-0.19 (-0.71)	-0.011 (-0.37)	0.020 (0.79)	0.016 (0.59)
Higher liberalism	-0.012 (-0.76)	0.019 (1.06)	-0.029~ (-1.86)	-0.165 (-0.97)
Constant	0.690 (4.69)	0.443 (2.80)**	0.411** (2.98)	0.495 (3.28)
N	214	214	214	214

CRT, Cognitive Reflection Task.

case for Republicans ($p < 0.05$; one-tailed). Figure 3 illustrates how higher CRT scores (combined versions) predict lower belief in conservative fake news.

However, cognitive reflection did not predict belief in fake news headlines for Democrats or sharing behaviors for either political group. Thus, we found partial support for *H6a: Cognitive reflection predicts politically congruent fake news belief* and failed to find support for *H6b: Cognitive reflection predicts politically congruent fake news sharing*. Finally, we ran an exploratory regression model to see if cognitive

reflection could predict network homogeneity and found a nonsignificant relationship between the two variables (see Supplementary Materials).

Discussion

Political polarization and misinformation are growing problems in our society and their prevalence has been linked to a variety of social factors. It has been posited that both networks and cognitive reflection play a role, but to the best of our knowledge, this

Table 7. Cognitive reflection predicts fake news headline belief in Republicans.

	Liberal fake news	Share liberal fake news	Conservative fake news	Share conservative fake news
CRT scores	-0.026 (-0.46)	-0.083 (-1.15)	-0.115~ (-1.82)	-0.040 (-0.57)
Higher liberalism	0.068 (1.23)	0.038 (0.56)	-0.190* (-2.44)	-0.077 (-0.88)
Constant	3.90 (7.44)	3.20 (4.90)	4.72** 11.95	3.11 7.00
N	107	107	107	107

CRT, Cognitive Reflection Task.

Table 8. Summary of hypotheses results.

Hypothesis	Result
H1: Homogeneity increases importance of political identity.	✓
H2: Homogeneity increases ingroup evaluation.	✓
H3a: Homogeneity increases political rumor bias.	PS: Only for helping rumor
H3b: Homogeneity increases sharing political rumor bias.	PS: Only for helping rumor
H4a: Homogeneity increases fake headline bias.	PS: Only for Republicans
H4b: Homogeneity increases sharing fake headline bias.	PS: Only for Republicans
H5a: Cognitive reflection not related to rumor belief.	✓
H5b: Cognitive reflection not related to rumor sharing.	✓
H6a: Cognitive reflection predicts fake news belief.	PS: Only for Republicans
H6b: Cognitive reflection predicts fake news sharing.	PS: Only for Republicans

Note: ~, not supported; ✓, fully supported; PS, partially supported.

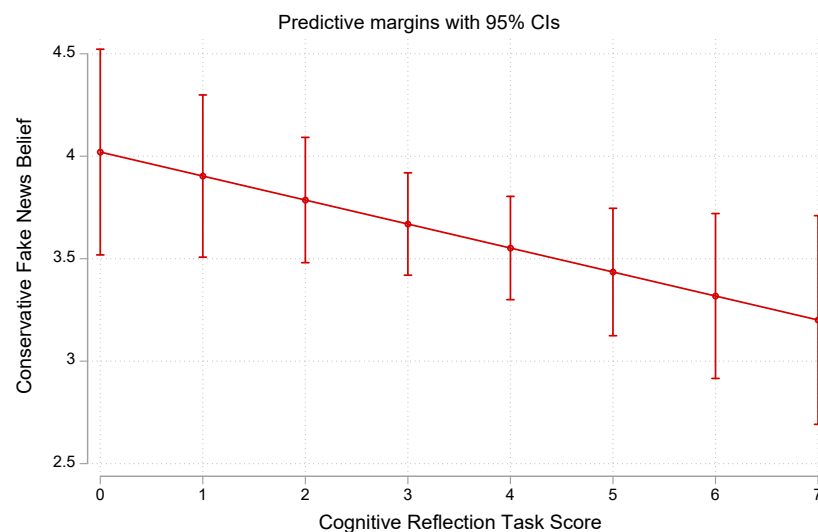


Figure 3: Higher cognitive reflection predicts lower belief in conservative fake news in Republicans.

is the first study to formally test the effect of both variables on susceptibility to both misinformation and political rumors, and to assess whether their effects are dependent on the type of misinformation stimuli. Supporting our predictions, we firstly find that political identity predicts belief in and sharing of fake news and beliefs in political rumors for both Democrats and Republicans.

Our analyses further reveal that network homogeneity predicts higher importance of one's political identity. It could be that having a homogeneous network of likeminded individuals contributes to the individual perceptions that their ingroup is superior or it may be that those who already have a strong partisan identity seek out networks that support their political beliefs. Further work is needed to determine causality, but we find that strength of identity is an important factor to consider.

Next, we find that network homogeneity predicts a higher belief in and sharing of the political rumor regarding helping behavior, but not bullying behavior. As such, it may be the case that the alters that individuals interact with on a regular basis not only contribute to the positive evaluations of one's ingroup, but they also increase the desire to uphold this perception on social media through sharing of positive content, albeit unverified, about one's ingroup. Interestingly, network homogeneity also predicted higher belief in fake news, but only for Republicans and did not predict sharing fake news likelihood. Although our data does not directly inform us about the underlying reasons for this relationship, it is certainly interesting to note this apparent asymmetry between the political left and right, in terms of whether network homogeneity predicts higher belief in fake news that supports ones' political identity. This suggests that while having a homogeneous group of close individuals whom one discusses important matters with may increase polarization and bias in the lens through which Republicans evaluate news, the same may not hold for Democrats, whose susceptibility may be better explained through other factors not taken into account in this study.

Interestingly, we further found that cognitive reflection predicted belief in fake news for Republicans, but not for Democrats (and it did not predict sharing likelihood by either group). As such, it seems that Republicans may be more susceptible to misinformation when they engage in heuristic processing of information, whereas this type of processing does not predict Democrats believing misinformation. Cognitive reflection also did not predict any belief or sharing likelihood for the political rumors. Thus, our research suggests that cognitive

reflection may apply to a different (and potentially narrower) set of misinformation, while network homogeneity may apply to a broader set, potentially due to it being connected to identity verification.

These findings are interesting seen in relation to previous research, which has suggested that cognitive reflection is one of the main predictors of belief in and sharing of misinformation online (Pennycook & Rand, 2019). Importantly, researchers focusing on the cognitive factors of misinformation susceptibility suggest that the key to solving the misinformation problem lies in nudging individuals to process news in a systematic, rather than heuristic manner (Pennycook et al., 2021). We here find that heuristic processing only predisposes Republicans—however, Rathje et al. (2022) showed that accuracy nudges do not work for Republicans specifically. As our results show that Democrats' susceptibility to misinformation is not increased via heuristic processing, this suggests that researchers may need to consider alternative interventions to better target both sides of the aisle.

Limitations and Future Research

Our study collected data from participants recruited on the Prolific platform. While Prolific offers a more diverse sample than other online samples (Perry et al., 2018), it still lacks enough diversity to be considered generalizable. Given the differently structured networks of marginalized groups (Facciani & McKay, 2022), racial and gender identities could be important factors to consider in this identity, networks, and belief process. Furthermore, this study only evaluates political groups in the United States, and it is unclear if these findings would replicate in other countries.

This study was also limited by its lack of causality. It could be that homogenous networks bolster identity verification, which in turn increases polarization and susceptibility to misinformation. Future research could determine causality with an experimental or longitudinal design. However, determining causality is often, as would be the case here, at the expense of ecological validity. For example, it is difficult to experimentally manipulate the close ties and networks that individuals establish and the interactions and relationships that are important to them in the real world as these may have developed over a lifetime. However, given that prior research has shown that exposure to like-minded individuals increases polarized attitudes (Keating et al., 2016) and people will adapt their politics to match their personal networks overtime (Lazer et al., 2010), it seems likely that individuals will adjust their beliefs to match their

associations they deem particularly important. Future research could study additional aspects of identity verification (and mutual identity verification) to gain more insight on the relationship between identity, networks, and belief. While this research found that network homogeneity may have a broader impact than cognitive reflection, further study is necessary to draw more confidence for that conclusion.

Additionally, future studies could assess a greater variety of types of misinformation along with a great sample of misinformation stimuli to generate greater confidence in how network effects vs. cognitive styles influence misinformation. Our results are consistent with previous work that have found Republican samples more likely to believe and share fake news compared to Democrats (Garrett & Bond, 2021). This may be due to conservative fake news spreading more widely in the information ecosystem (Zhang et al., 2022) and is another incentive for evaluating a variety of types of misinformation. Finally, this study was entirely comprised of self-report survey data. Our understanding of network homogeneity effects would benefit from also evaluating real-world data such as individual's sharing and liking behavior on social media.

Conclusion

Our study found that greater identity-based network homogeneity predicts higher evaluation of one's own political group as well as the likelihood of believing and sharing politically congruent fake news and rumors. Cognitive reflection only predicted likelihood of believing fake news headlines, not believing political rumors. This study thereby provides a framework for understanding how identity and network processes may predict unique types of misinformation beliefs.

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