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The impact of political ideology, knowledge and participation on electoral conspiracy endorsement

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From voting fraud to Russian interference, electoral conspiracy theories have circulated on social media since the 2016 United States presidential election with alarming magnitude. Previous conspiracy studies have primarily focused on psychological causes that contribute to the conspiracy mentality, and the discussion on political antecedents of conspiracy endorsement remains lacking. This study selects popular conspiracies reflecting various political ideologies and conducts multiple survey rounds (n = 500) to compare and contrast the effect of partisan affiliations on conspiracy endorsement. Drawing from the extant literature from psychology, communication, and political science and using two-way and three-way interaction models, this study examines three political antecedentspolitical ideology, knowledge, and participation-and their interactive effects on conspiracy endorsement. The results indicate that individuals with higher levels of political affiliation and knowledge illustrate stronger conspiracy endorsement, and this effect is stronger for conservatives than liberals. Additionally, increased political participation reduces the endorsement of conservative conspiracies and heightens the endorsement of liberal ones among both conservatives and liberals.

KEYWORDS

electoral conspiracy, motivated reasoning, cognitive dissonance, partisanship, political ideology

1. Introduction

From voting fraud to Russian interference, the electoral conspiracy theories circulated on social media since the 2016 presidential election in the United States are overwhelming. Allegations regarding the corrupt activities of Biden's son Hunter and claims that Trump sought to collude with Ukraine to expose possible corruption appeared as the new conspiracies that characterized the already remarkable and dramatic 2020 presidential election. According to Pew Research in 2020, almost half of American adults have heard of QAnon, and around two-thirds of Americans strongly believe that mail-in voting leads to election fraud (Mitchell, 2020a,b; Pew Research Center, 2020). The emergence of hyperpartisan media and misinformation, the ever-polarized American society, declining trust in institutions, and Trump's frequent attacks on legacy media as the "fake news" all contributed to the proliferation of conspiracy theories in the digital age (Albertson and Guiler, 2020; Alter, 2020).

Unlike the political conspiracy theories studied in previous research, such as "birtherism" and government officials having advance knowledge of the 9/11 attacks (which are more likely to be false beliefs) (Sunstein and Vermeule, 2009), more believable conspiracies have emerged in the past 5 years, influencing the studies on motivated reasoning that explain conspiracy endorsement (Miller et al., 2016). The studies on such liberal conspiracies as Russian interference and vote suppression in the general election face challenges in reaching a significant conclusion, due to their believability and endorsements from both Democrats and Republicans (Miller et al., 2016). The prominence of liberal conspiracies which turned out to be true also leads to a tendency to unliterally investigate the conservative conspiracy theories, producing research

results that cannot be generalized to both parties and different ideologies. To address this deficiency, this study selected popular conspiracies reflecting different political ideologies and conducted multiple survey rounds to arrive at a balanced result, comparing and contrasting the effect of different partisan affiliations on conspiracy endorsement.

Previous conspiracy studies primarily focus on the psychological factors contributing to conspiracy endorsement (Miller et al., 2016). As such, research has found that people with a conspiracy mentality see random events as connected and display a high level of distrust toward powerful societal groups (Brotherton et al., 2013; Bruder et al., 2013; Imhoff and Bruder, 2014; Imhoff and Koch, 2017). Other psychological studies have emphasized selective exposure and motivated reasoning as ways for audiences to avoid cognitive dissonance when they endorse ideologically consistent theories (Miller et al., 2016; Hendricks et al., 2019). When considering the strength of political ideology in a political context, people with a stronger commitment to a political ideology are more likely to endorse ideologically consistent conspiracies and reject dissonant ones (Miller et al., 2016).

However, a comprehensive discussion on individual-level political antecedents, such as political ideology, knowledge, and participation, as well as the interactive effect between these factors on political conspiracy endorsement, is still lacking (Miller et al., 2016). This study draws on the extant literature in psychology, communication, and political science and conducts econometric modeling, providing a systematic examination of the interactive factors between the three political determinants and their impact on political conspiracy endorsement.

Political science and communication studies have thoroughly explored the relationship between misinformation, political knowledge, and political participation (White et al., 2006; Valenzuela et al., 2019). Viewing conspiracy as an extreme type of misinformation (Sunstein and Vermeule, 2009), this study considers the arguments from misinformation studies and applies them to conspiracy theories. Both political knowledge and political participation play important roles in conspiracy endorsement (Miller et al., 2016; Phadke et al., 2020). While the studies on political knowledge reach a consistent conclusion that it positively relates to conspiracy endorsement, only misinformation studies explore the interaction effect of participation. Addressing the gap in the literature on the intercorrelation between political participation and conspiracy endorsement, this study extends the research on misinformation and considers Phadke et al.'s (2020) argument on social aspects of conspiracy adoption, to study the role of participation as well as the three-way interaction of knowledge, participation, and ideology with conspiracy endorsement. Taken together, this study seeks to address following research questions:

RQ1: How is the strength of political ideology associated with conspiracy endorsement?

RQ2: What is the interaction effect of political knowledge and political participation on endorsing ideologically consistent and ideologically dissonant conspiracies?

RQ3: How does political participation moderate the effect of political knowledge on conspiracy endorsement?

RQ4: How does the effect of these political antecedents (ideology, knowledge, and participation) differ for liberals and conservatives?

Through three rounds of survey data collection (two rounds of pilot surveys and one round for the main survey) and econometric modeling, this study sheds light on the differences between liberal and conservative Americans in respect to conspiracy endorsement and the interaction effect of political participation and knowledge. This study first confirms multiple conventional beliefs that people tend to endorse ideologically aligned conspiracy theories and political knowledge amplifies the effect of ideology on conspiracy endorsement. While previous studies are concerned that political knowledge and political participation might collectively strengthen the ideologically consistent conspiracy endorsement, this study identifies that political participation reduces the amplifying effect of political knowledge on ideologically consistent endorsement of conservative conspiracies.

2. Literature review

Political science and communication scholars have been concerned that political ideologies, knowledge, and participation all strengthen people's belief in conspiracy theories, which has a normatively negative implication for the democratic progression. While multiple studies have confirmed that political knowledge amplifies the effect of ideology on conspiracy endorsement, there lack of a review on the mechanism of the interaction effect between political participation and political knowledge on the on ideologically consistent conspiracy endorsement.

2.1. Political ideology and partisanship in the U.S. context

Because this study emphasizes an understanding of conspiracy endorsement across different political ideologies, it is essential to contextualize ideologies in the U.S. political system before discussing the political antecedents of conspiratorial beliefs. In the U.S. context, citizens generally classify themselves based on a leftright political spectrum, with the left indicating more liberal and the right indicating more conservative beliefs and with Democrats more to the left and Republicans more to the right (Adams, 2001). American liberalism is associated with being progressive, with preserving human, social, and civil rights and viewing the big government as an instrument to promote social and economic equality (Jeffries, 1990; Hartz, 1991). American conservativism believes in promoting the status quo and embracing economic liberalism and social conservativism. Conservatives support limited government and market independence while promoting individual liberty and traditional social values (Lipsman, 2007; Farmer, 2008; Aberbach, 2011).

In addition to Democrats and Republicans, independent voters voters who are not affiliated with any parties in the U.S.—have been more prominent in the recent elections (Bartels, 2000). Though they lack official party affiliation, most of them lean toward a party in the U.S. (Norrander, 1989) and are referred to as Independent Democrats (or lean-Democrats) or Independent Republicans (or lean-Republicans). According to Pew Research Center (2021), "<10% of the public has no partisan leaning."

In recent decades, the country has experienced an increasingly polarized political landscape as the association between political ideology and partisanship has increased among U.S. voters (Lupton et al., 2017). This polarization trend indicates that liberals and conservatives are more commonly sorted into Democrats and Republicans, respectively, and the average ideologies of the two parties are moving toward more extreme sides of the political spectrum (Hill and Tausanovitch, 2015). These sorting and divergence phenomena make it more important to understand how stronger ideology and partisanship affect voters' perception of political conspiracies and how political factors have asymmetric effects on liberals' and conservatives' conspiracy endorsement.

Liberal and conservative ideologies are commonly associated with the issue positions of voters and political parties (Walgrave and Lefevere, 2013). As the electoral conspiracies selected in this article do not capture or reflect the issue positions of individuals, this study uses a naïve assumption for the association between partisanship and ideology, viewing liberals as Democrats and conservatives as Republicans in the U.S. context; accordingly, stronger political ideology associates with stronger partisanship. Additionally, Downs's economic theory of democracy (1957) suggests that political ideologies are often used as a heuristic shortcut and partisan cues for voters; thus, in a time-sensitive survey response, this study can operationalize pro-Democrat statements as liberal and pro-Republican statement as conservative. This study also recognizes that these definitions of political ideologies, such as left and right, and conservative and liberal, have very different meanings outside the context of the U.S.

2.2. Psychological causes for conspiracy endorsement

Numerous studies have investigated misinformation circulated on social media, including psychological factors of misinformation endorsement, the diffusion of misinformation, and its consequences for a democratic society (Weeks and Gil de Zúñiga, 2019; Li, 2020). Although some studies would categorize conspiracy under the broad category of misinformation (Sunstein and Vermeule, 2009), conspiracy deserves its own focus because of its unique characteristics, especially in a year of overwhelming political conspiracies circulating through the 2020 general election. "Conspiracy theory" is the attempt to explain a series of concurrent but unrelated events as secret plots that powerful people and secret organizations design and manipulate (Sunstein and Vermeule, 2009; Banas and Miller, 2013). The "super conspiracy" argues that "everything is connected and controlled by a secret world elite or deep state" (Hendricks et al., 2019, p. 98), so democracy is an illusion and any sort of political participation is meaningless (Imhoff et al., 2020). Unlike general misinformation, conspiracy is difficult to debunk by fact-checking because of its self-sealing nature, which means the well-designed conspiracy can incorporate or write off every counterargument (Sunstein and Vermeule, 2009; Bolter, 2019).

Psychological scholars argue that conspiracy satisfies the epistemic need for certainty, reducing uncertainty by making sense of concurrent events and identifying the connection between them. For some people, this pattern recognition can overreact to the point that they see a pattern in any set of seemingly random events (Imhoff et al., 2020). Imhoff et al. (2020) describe this phenomenon as "conspiracy mentality," arguing that the endorsement of certain

conspiracies correlates with belief in other conspiracies and the potential for people with this type of mentality to endorse even contradictory theories (Wood et al., 2012). Such a believer has a high level of dislike and distrust of powerful societal groups, suspecting that powerful figures always have bad intentions and are responsible for any negative consequences in society, from economic downturns to environmental crises.

While conspiracy mentality theory suggests that believers would endorse contradictory conspiracy theories, other psychological perspectives, such as theories of cognitive dissonance, selective exposure and motivated reasoning, contend that audiences would endorse an ideologically consistent conspiracy and reject a dissonant one (Miller et al., 2016). Hendricks et al. (2019) illustrate this cognitive-dissonance phenomenon-the uncomfortable feeling from exposure to facts that contradict an audience's predisposed beliefsand propose two types of information processing to avoid this discomfort: selective exposure and motivated reasoning. In the case of conspiracy, selective exposure describes audiences picking for consumption the information that aligns with their pre-existing belief in a negative portrayal of the opposing party, paying less attention to debunking messages. Sunstein and Vermeule (2009) believe that when audiences lack multiple sources of political information, they are more likely to accept conspiracy theories. U.S. audiences tend to select left-leaning and right-leaning media sources, based on their ideologies and party affiliation. In the extreme case, the far-right network One American News notoriously pushed the "Pizzagate" conspiracy theory during the Trump administration, promoting the conspiratorial mindset among Republicans (Breland, 2020).

The concept of motivated reasoning is first mentioned to explain an audience's endorsement of misinformation, but its effect of endorsing conspiracies could be far more influential. When audiences are unavoidably exposed to contradictory messages, motivated reasoning would assist them in arriving at their directional conclusion, by maintaining their previous perception and only accepting the facts that confirm their prior opinions, consistent world-values, and conspiratorial thinking (Hendricks et al., 2019). As an extreme type of misinformation, conspiracy also has a stronger emotional appeal when the issue it explains is intentionally picked for its sensationalism (Sunstein and Vermeule, 2009; Weeks and Gil de Zúñiga, 2019). This emotional appeal can further amplify motivated reasoning by impairing the audience's criticalthinking ability, resulting in the failure to revise conspiratorial views (Hendricks et al., 2019).

2.3. Electoral conspiracy theory

Before one can understand the interaction effects of political knowledge and participation, it is essential to illustrate that citizens engage in ideologically aligned conspiracy endorsement. Since ideologies serve as a heuristic shortcut and as partisan cues for voters (Downs, 1957), political scientists have frequently observed that individuals sort themselves into ideologically consistent beliefs either because of motivated reasoning or as party cheer leading.

Most conspiracy theories are associated with a certain political ideology (Hendricks et al., 2019). Audiences engage in motivated reasoning by endorsing political conspiracies that are ideologically consistent with their party affiliation and rejecting the ideologically dissonant ones (Miller et al., 2016; Uscinski et al., 2016). In this case, partisanship serves as a predisposition that drives people to negatively portray the opposing party (Edelson et al., 2017). The emotional features associated with conspiracy theories could further enhance partisan bias in political information processing (Weeks and Gil de Zúñiga, 2019).

Albertson and Guiler's (2020) research on the conspiratorial rhetoric of election interference demonstrates that partisan and emotional reactions congruently lead to the endorsement of partisanaligned conspiracies. Selecting the 2016 U.S. presidential election for an empirical study, the authors identify Democrats endorsing statements of Russian interference and Republicans endorsing Democrat interference in evaluating the conspiracies. An election itself is emotional, heightening anxiety and uncertainty in a society because the result is out of voters' control (Kitchens et al., 2010), especially in the case of election interference and vote-rigging. This unsettling period would also strengthen partisanship endorsement of conspiracies. The losing party is also more likely to believe in election fraud than the elected party (Edelson et al., 2017), and this trend was found throughout the Democrat and Republican parties, respectively in the 2016 and 2020 elections. In a close race, when conspiratorial beliefs question election integrity, the peaceful transition becomes questionable (Albertson and Guiler, 2020).

As the 2020 general election is remarkable in the same way but more unusual and divided than the 2016 election, this study selected electoral conspiracy theories, including election interference, voterigging, Russian and Ukraine collusion, and the "deep state," for studying conservative and liberal conspiracies. This study proposes the following hypothesis:

H1a: The strength of political ideology is positively associated with endorsement of ideologically consistent conspiracies, and negatively related to endorsement of ideologically dissonant conspiracies.

Saunders and Abramowitz's (2004) research on ideological realignment in electoral activities identifies ideology as more salient among Republicans than Democrats. As previous studies observed, conservative ideology is psychologically associated with a high level of need for certainty and tends to have more biased selective exposure and motivated reasoning (Jost et al., 2003; Miller et al., 2016). In this case, motivated reasoning strengthened by partisan bias is expected to be stronger for Republicans than Democrats. Therefore, this study proposes the following hypothesis:

H1b: Both positive and negative correlations identified in H1a are greater among Republicans than Democrats.

2.4. Conspiracy endorsement and political knowledge

As individuals ideologically endorse congruent conspiratorial beliefs, they have a desire to protect their worldviews by leveraging accessible knowledge (Duran et al., 2017). Previous studies have consistently concluded that political knowledge is positively associated with conspiracy and misinformation endorsement. Miller et al. (2016) concluded that knowledge is not a panacea

for adjusting conspiratorial thinking; instead, because conspiracy theories provide a twisted version of reality or of actual events that have occurred (or are occurring), political knowledge exacerbates partisan conspiracy endorsement. With more knowledge, audiences more easily make connections between unrelated events (Miller et al., 2016).

Knowledgeable individuals are also more interested in politics and hold onto ideology more strongly, actively seeking out political information to solidify their preexisting beliefs. However, in Miller et al.'s (2016) study, the amplifying role of knowledge on conspiracy endorsement was only significant among conservatives and not liberals. White et al. (2006) conceptualize political knowledge as political information, using Carpini and Keeter's (1993) eight-item political-knowledge index for measurement. Their study observes that an audience with greater exposure to political information knows more about politics, but also suffers from a greater risk of exposure to and influence by misinformation.

Noticing the consistent relationship between political knowledge and conspiracy endorsement and the asymmetrical role of knowledge on liberals and conservatives, this study tests the following hypothesis:

H2: Political knowledge will have an amplifying effect on ideologically consistent conspiracy endorsement, and the correlation between knowledge and conspiracy endorsement is greater for Republicans than Democrats.

2.5. Conspiracy endorsement and political participation

Having identified the particular type of person who is more susceptible to conspiracy theories-one who is both more ideologically motivated and highly knowledgeable-this study further discusses an underexplored political variable (Miller et al., 2016): political participation and its interaction effect on ideology and knowledge during conspiracy endorsement. Previous studies on misinformation and political participation have proposed several types of paradoxical relationships between the two (White et al., 2006; Valenzuela et al., 2019). White et al. (2006) demonstrate that exposures to both misinformation and political information tend to increase individuals' levels of political participation-specifically, electoral participation. When people know more about politics, they know more opportunities for their involvement and, consequently, increase their level of participation. However, exposure to misinformation results in behaviors that differ from those of informed or uninformed others. Even if they base political knowledge on misinformation, those who are thus exposed form a misconception, confident that they know more than others, becoming more motivated to fix others' incorrect beliefs and supporting their views through political engagement.

Valenzuela et al. (2019) argue that political engagement results from political news consumption on social media and contributes to the dissemination of misinformation through social media. Citizens who actively participate in political affairs also tend to have a strong party affiliation and, thus, according to motivatedreasoning theory, they are more likely than the average person to endorse and share misinformation. The authors pose a challenging dilemma, namely, that of simultaneously encouraging political participation and reducing exposure to misinformation through social media.

Although the paradoxical relationship between misinformation and political participation is well-studied, as an extreme type of misinformation, conspiracy demonstrates a more complex intercorrelation between the two (Imhoff et al., 2020). Similar to misinformation, exposure to conspiracies also promotes false confidence in believers who think that they know more about politics and seek to actively change others' opinions or even increase their followers' engagement, leading to a higher level of political participation (White et al., 2006). However, endorsing conspiracies is also associated with higher levels of distrust in politics, including the federal government, state government, law enforcement, media, and people in general (Miller et al., 2016). This mistrust would limit believers' active political engagement because they lose faith in democratic processes (Imhoff and Koch, 2017). Additionally, through a deterministic mindset, conspiracy believers try to make sense of a series of random events by persuading themselves that everything happens as determined by secretive actions and manipulated by authoritative figures (Imhoff and Bruder, 2014). This deterministic mindset also discourages them from political engagement, depicting any kind of democratic activity as a waste of time. Furthermore, Imhoff et al. (2020) observe that the conspiracy mentality could decrease normative, legal forms of political engagement but increase non-normative engagement, such as aggressive and violent behaviors, due to mistrust of the political system and the wish to change the status quo through extreme conduct.

Phadke et al.'s (2020) study on the conspiracy community also provides the theoretical grounding for thinking that political engagement could promote the endorsement of conspiracy, by arguing for the influence of social aspects on conspiracy adoption. For instance, by identifying community activities in subReddit conspiracy forums, Phadke et al. (2020) observe that high levels of political participation in the online sphere demonstrate a greater echo-chamber effect within conspiracy communities, enhancing participants' adherence to selective exposure and motivated reasoning. Socializing in political discussion also leads to greater chances of peer pressure that forces users to endorse ideologically consistent conspiracies (Sunstein and Vermeule, 2009).

Regarding conspiracy endorsement, Phadke et al.'s (2020) discussion of social aspects of conspiracy adoption could be the best theoretical explanation for the amplifying role of participation on the effect of political knowledge. The authors notice that conspiracy communities engage in collective sensemaking, where each participant could ultimately contribute to fabricating and refining a secret plot that aligns with their collective identities. Sunstein and Vermeule (2009) describe this phenomenon as group polarization, proposing that a group discussion ends up with a more extreme position after its members have engaged in political deliberation. With more political knowledge, users could more actively participate in the community discussion, contributing to collective sense-making and solidifying their beliefs in secret plots. At the same time, participation pushes users to increase their political information-seeking behavior and sophistication level, strengthening the amplifying role of knowledge on conspiracy endorsement.

Following Phadke et al.'s (2020) conspiracy-adoption theory, one can say that political participation enhances political sophistication acquired by political knowledge on conspiracy endorsement; thus, this study proposes the following hypothesis:

H3a: Political participation will have an amplifying effect on ideologically consistent conspiracy endorsement.

H3b: Political participation and political knowledge will have a joint amplifying effect on ideologically consistent conspiracy endorsement.

3. Method

3.1. MTurk survey for electoral studies

Numerous studies have proven the validity of using Amazon's Mechanical Turk (MTurk) survey for studying voting behaviors and conspiracy endorsement (Gerber et al., 2014; Franks and Scherr, 2015; Miller et al., 2016). For instance, Miller et al. (2016) examined the motivated reasoning effect on ideological conspiracy endorsement and observed that an MTurk survey was able to replicate the results of American National Election Studies (ANES) for both liberals and conservatives. Gerber et al. (2014) have suggested that the MTurk sample even provides distinct advantages for studying U.S. voting behavior compared to the Cooperative Election Study (CCES), a nationally stratified sample online survey platform. Particularly, MTurk raises less concern that its respondents have been frequently primed by political considerations from engaging in previous political surveys (Gerber et al., 2014). Although MTurk has been criticized by social science scholars due to its tendency of recruiting more young people and Democrats and producing biased samples (Gerber et al., 2014; Franks and Scherr, 2015), it non-etheless provides reliable access to a demographically diverse sample of voting-age participants in the United States as compared to other convenience samples, such as student samples (Buhrmester et al., 2011; Berinsky et al., 2012; Levay et al., 2016). Multiple attention checkers (e.g. "Please select 'agree' to show you are paying attention to this question") have been added to the survey design to counteract the negative aspect of MTurk (Aguinis et al., 2021).

3.2. Three-wave sequential design

This study conducted two pilot rounds and one main round of survey data collection through a sequential exploratory design. The three-wave survey data collection spanned the period from October 31, 2020, to November 20, 2020. MTurk was used for three rounds of survey distribution.

One major challenge faced by conspiracy studies is the asymmetrical nature between liberal and conservative conspiracies. For instance, participants may find the statement "Trump coerced Ukraine in demonizing Biden" more believable or closer to reality than "federal departments undermine Trump's administration." Regarding the former, Trump has already admitted to his conversation about Biden with the Ukrainian president, while for the latter "deep state" statement, a person needs to believe in the collusion and backchanneling at a systematic and even bipartisan level for the conspiracy to be true. Miller et al. (2016) and Schneider and Haas (2021) also observed similar patterns in their studies. To my knowledge¹, there is no systematic metadata analysis examining circulated political conspiracies and selecting unbiased ideological statements for conspiracy studies, particularly due to the ongoing and novel nature of conspiracy theories. Inspired by Pennycook and Rand's (2019) work, which reaches a satisfactory agreement and level of accuracy by using crowdsourcing approach to label misinformation statements, this study uses a similar design to determine the ideological scale of statements by crowdsourcing the task to MTurk.

This study selected MTurk for conducting three waves of survey analysis due to its multifunctional nature and strength in collecting both crowdsourcing and survey data. By conducting a sequential exploratory design on the same platform, this study ensures that participants who annotated conspiracy statements shared the same demographic pool and characteristics with participants who answered the survey. In other words, each wave was sampled from the same population distribution.

As defined previously, political ideology has commonly been used by voters as a heuristic shortcut and as partisan cues on political issues (Downs, 1957). The purpose of the first-round survey was to operationalize the association between each conspiracy statement and its partisan nature using crowdsourcing on MTurk. A second wave of ideological conspiracy selection and labeling was conducted to ensure the representativeness and robustness of the statements selected for the main survey, which measures participants' conspiracy endorsement.

3.3. First-wave pilot survey experiment

The first pilot round is a survey experiment designed to test the wording of comparable conspiracy statements, to validate the framing of the statement to be familiar to the audience as highlighting the salient features of political ideology. A study with the description "Political Statements" was distributed from October 31, 2020, to November 1, 2020, to recruit 107 participants (63 Republicans and 18 Democrats) from MTurk. The experimental survey tested 26 conspiracy statements circulated online based on two criteria: "do you expect more Democrats or Republicans would endorse the conspiracy" and "do you think the conspiracy are pro-Republican or pro-Democrat in nature." Examples of experimental statements from this survey were: "There was a coordinated effort across various federal departments and agencies to undermine Trump's administration" and "Unelected government officials, referred to as the 'Deep State,' have been working to undermine the Trump administration." The survey compared which statement is more familiar and more likely to be endorsed by Republicans. The fact that most respondents can identify the relationship between certain conspiracy statements and their partisanship association indicates that participants from the MTurk pool are familiar with the circulated conspiracies listed in the survey, proving the validity of conducting surveys of electoral conspiracy endorsement on MTurk.

3.4. Second-wave pilot survey

The second pilot round is a survey designed to test how each conspiracy statement highlights the salient feature of political ideology and how likely participants would be to endorse these ideologically consistent conspiracy theories. The study was renamed "Election Statements," in response to the unbalanced sample overrepresenting Republicans in the first round. The study was distributed from November 1, 2020, to November 8, 2020, to recruit 145 participants (42 Republicans and 33 Democrats) from MTurk. The same criteria were used for testing conspiracy statements. The second pilot survey used 13 conspiracy statements, based on the validation results from the first pilot survey.

3.5. Third-wave main survey

A study with the description "Survey about Election Statements" was distributed from November 20, 2020, to November 27, 2020, to recruit 500 participants (197 Republicans and 218 Democrats²) from MTurk. The main survey used nine conspiracy statements (four conservative conspiracies and five liberal conspiracies) based on the validation of the second pilot survey. Participation was limited to participants located in the United States with a past MTurk approval rating above 70%. The majority of participants (94.9%) voted in the 2020 presidential election, and 39.4% of participants were Latinos.

The majority of questions used a 5-point or 7-point Likert scale, ranging from "strongly agree" to "strongly disagree." The data was pre-processed during the analysis by standardizing all answers on a scale from 0 to 1. The survey contains 28 questions and measures the following variables.

3.6. Dependent variables

Conspiracy Endorsement is measured by how likely participants would be to endorse conspiracy theories that are ideologically consistent or ideologically dissonant with their beliefs. Inspired by Miller et al.'s (2016) study, this study selected conspiracy theories based on the following criteria: (1) They fit the definition of conspiracy outlined in this study; (2) they are circulated on social media during the 2020 presidential election and are relatively familiar to participants; (3) they are relevant to the general election and politically ideological. Though it has been overwhelming during the general election, the super conspiracy theories like QAnon were excluded because of their extremism. Nine conspiracy statements fitting the description above were selected. Participants' endorsement

¹ The lack of metadata analysis for circulated conspiracy theories has been raised at the 2021 AEJMC Annual Conference *Filter Bubbles and Conspiratorial Thinking* panel.

² The numbers here differ from the ones in the demographic table. Republicans here include lean-Republican and Independents and Democrats include lean-Democratic Independents.

of three statements that are conservative and two that are liberal were averaged and recoded from 0 to 1 to create *Conservative Index* and *Liberal Index*, respectively.

3.7. Explanatory variables

The primary independent variables for this study are political ideology, political knowledge, and political participation.

Political ideology was measured in two ways for robustness testing: recoding the 7-point ideology measure from "extreme liberal" to "extreme conservative" and the 7-point party-affiliation measure from "strong Democrat" to "strong Republican," by standardizing on a 0-to-1 scale and converting to dummy variables.

Political Knowledge was measured by an eight-item politicalknowledge index designed by Carpini and Keeter (1993). The answer was labeled "1" if respondents got it right, and the total score was calculated and standardized on a 0–1 scale to create a knowledge index.

Political Participation was measured by asking participants' frequency of participating in the following political activities: Contacted a public official; Worked for parties of candidates; Signed a petition; Voted in national elections; Participated in demonstration; Wrote letters to public official or newspaper about a political issue; Worked with others to solve a local problem; Argued with a stranger about politics; Donated money; Sent a message on Internet about a political issue. A composite analysis was conducted on the 10 political activities and received an excellent *Cronbach's Alpha* 0.93. However, the score would increase to 0.94 if the item "Voted in national elections" was removed from this composite. A composite political-participation index with nine items (excluding "Voted in national elections") was formed by averaging the answers of all activities and standardizing on a 0–1 scale.

3.8. Control variables

Previous studies demonstrate the relationship between conspiracy mentality and psychological factors, as well as the emotional reaction that the partisan conspiracies trigger in motivated reasoning (Albertson and Guiler, 2020; Phadke et al., 2020; Mancosu and Vegetti, 2021). Based on the comprehensive list of control variables that White et al. (2006) and Miller et al. (2016) propose, this study selected the following psychological indicators as control variables:

Trust of federal government, state government, and law enforcement;

Confidence on understanding political issues;

Internal Efficacy, the belief that individual can make difference in politics;

External Efficacy, the belief that the government cares about the interests of people;

Need for Cognition of handling complex task;

Need for Evaluation of having more opinions than an average person.

Demographic information, including ethnicity, age, family income, educational level, and religiosity were also selected as control

variables. The dummy variables of gender, ethnicity, and educational level were created for econometric modeling.

3.9. Econometric modeling

This study conducted econometric modeling to identify the interaction effects of ideological strength, political knowledge, and political participation on conspiracy endorsement. Methodologically, this study adopted, revised, and extended Miller et al.'s (2016) two-way interaction and three-way interaction models of the interaction effect of political knowledge and trust, by adding new explanatory

TABLE 1 Descriptive statistics for demographics.

| Variable | Category | N (N = 410) | % of sample | | | |
|--------------|--|----------------|----------------|--|--|--|
| Age | | 368 | Avg. 37.8 | | | |
| Gender | Gender | | | | | |
| | Male | 245 | 59.9 | | | |
| | Female | 158 | 38.6 | | | |
| Educational | l | | | | | |
| | Less than high school degree | 2 | 0.5 | | | |
| | High school graduate | 18 | 4.4 | | | |
| | Some college but no degree | 17 | 4.2 | | | |
| | Associate degree in college | 22 | 5.4 | | | |
| | Bachelor's degree in college | 209 | 51.1 | | | |
| | Master's degree | 136 | 33.3 | | | |
| | Doctoral degree or professional degree (JD, MD) | 4 | 1.0 | | | |
| Partisanship |) | | | | | |
| | Strong republican | 104 | 25.4 | | | |
| | Weak republican | 23 | 5.6 | | | |
| | Leaning republican | 27 | 6.6 | | | |
| | Independent | 71 | 17.4 | | | |
| | Leaning democratic | 34 | 8.3 | | | |
| | Weak democrat | 24 | 5.9 | | | |
| | Strong democrat | 121 | 29.6 | | | |
| Vote in 2020 | | 388 | 94.9 | | | |
| Vote in 2016 | | 377 | 92.2 | | | |
| Residential | California | 104 | 25.4 | | | |
| | Indiana | 68 | 16.6 | | | |
| | Washington | 54 | 13.2 | | | |
| | Florida | 20 | 4.9 | | | |
| | Texas | 18 | 4.4 | | | |
| | New York | 13 | 3.2 | | | |
| Ethnicity | | | | | | |
| | Spanish, Hispanic, or Latino | 161 | 39.4 | | | |
| | Not Spanish, Hispanic, or Latino | 248 | 69.6 | | | |

TABLE 2 Independent sample t-tests for conservative and liberal conspiracy theories.

| | Republican mean (SD) | Democrat mean (SD) | t (df) | | | |
|---|----------------------|--------------------|----------------|--|--|--|
| Conservative statements | | | | | | |
| Federal departments and agencies undermine Trump's administration | 2.68 (1.05) | 2.12 (0.90) | *** 4.83 (300) | | | |
| Biden's corrupt activities related to his son Hunter Biden | 2.70 (1.00) | 2.35 (1.00) | **2.96 (300) | | | |
| Vote-by-mail fraud in 2020 election | 2.58 (1.04) | 2.36 (1.04) | *0.83 (300) | | | |
| Conservative index | 0.66 (0.22) | 0.56 (0.23) | *** 3.77 (323) | | | |
| Liberal statements | | | | | | |
| Trump coerced Ukraine in demonizing Biden | 2.46 (0.99) | 2.70 (0.85) | **-2.15 (300) | | | |
| Russian interfered the 2020 presidential election* | 2.68 (0.88) | 2.73 (1.02) | -0.47 (324) | | | |
| Russia has damaging information about Trump | 2.66 (0.95) | 2.96 (0.83) | **-2.80 (299) | | | |
| Liberal Index | 0.64 (0.21) | 0.71 (0.18) | ***-3.08 (300) | | | |

 $^{***}p < 0.001, \, ^{**}p < 0.01, \, ^{*}p < 0.05.$

Due to its non-significant t value, the Russian interference statement was excluded in composing the liberal index.

variables and applying the model to the electoral context. Although Miller et al. (2016) make a distinction between party affiliation and political ideology, this study used these two types of measurement interchangeably and conducted a robustness test on both party-affiliation and political-ideology scales, to verify the generalizability and replicability of this analysis.

4. Results

Table 1 shows the descriptive statistics for the demographics of survey respondents recruited from MTurk. As previous studies observe, MTurk provides a relatively balanced sample of politicalsurvey respondents by age, gender, ethnicity, education, and partisanship (Buhrmester et al., 2011). In this study, more than half of the participants were males, and more than half had earned a bachelor's degree. Republicans, Democrats, and Independents achieved relatively equal sample sizes, including both lean-Republican and lean-Democratic Independent respondents. States in which participants could vote included California with onefourth of the respondents. The only demographic group in the sample that may not have reflected its typical representative political participation was Hispanics, at around 40% of survey participants. A possible explanation of this over-representation is that the MTurk survey was distributed during the COVID-19 lockdown in the United States, and more Hispanics experiencing unemployment might have completed MTurk tasks for the monetary incentives. The dummy variable "Hispanic" (Spanish, Hispanic, or Latino) was used to control ethnicity.

A series of independent sample *t*-tests were conducted to compare the endorsement of Republicans and Democrats on conservative statements and liberal statements, based on a 5point Likert scale. A conservative index and a liberal index were created, based on three conservative statements and two liberal statements, respectively, and standardized on a 0–1 scale. Table 2 shows that Republicans have higher levels of endorsement for all conservative statements and the conservative index than Democrats, and Democrats have higher levels of endorsement for all liberal statements and the liberal index than Republicans. All t values received significant scores, except the Russian interference statement, which was excluded in composing the liberal index.

Table 3 provides the regression results for the effects of ideology (measured by Conservative), political knowledge, participation, and their interaction on conspiracy endorsement. Conservative as a measurement for political ideology significantly positively correlates with the endorsement of the conservative index and negatively correlates with the endorsement of the conservative index. Adding knowledge as a interaction variable shows a significant positive relation with enhancing the effect of ideology, but the result is not significant for the liberal index. Adding participation as an interaction variable shows a significant negative relation with the interaction effect of ideology and knowledge for the conservative index. Political participation enhances the interaction effect of ideology and knowledge for the liberal index, but the result is not significant. Additionally, knowledge and participation demonstrate a strong significant correlation with each other. Overall, econometric modeling provides more reliable results for the conservative index than the liberal index because all three models for the conservative index receive much higher R-Squares than the liberal index.

Figures 1–3 show the result of separating the effect of three variables (ideology, knowledge, and participation) for Democrats and Republicans. Figure 1 shows that, both groups demonstrate a positive relationship between the strength of partisanship and endorsing ideologically consistent conspiracies and a negative relationship between partisanship and endorsing ideologically dissonant conspiracies, which confirms H1a. Specifically, partisanship has a stronger effect for Republicans than Democrats, aligning with H1b.

Figure 2 shows that, political knowledge is only found to have a significant amplifying role in enhancing the effect of ideology on conservative conspiracy endorsement among both Republicans and Democrats, but no effect on liberal conspiracy endorsement. Figure 2 partially confirms H2 because knowledge does not have an amplifying effect on liberal conspiracy endorsement.

In contrast with H3a, participation has not been found to have a significant effect on ideological conspiracy endorsement, though it has a non-significant positive effect on the conservative index and a negative effect on the liberal index, as Table 3 indicates. Partially confirming H3b, participation reduces the effect of knowledge on TABLE 3 Two-way and three-way interaction models: Effect of ideology, knowledge, participation, and their interaction on conspiracy endorsement.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|--|--------------------|---------------|--------------------|---------------|--------------------|---------------|
| Variables | Conservative index | Liberal index | Conservative index | Liberal index | Conservative index | Liberal index |
| Conservative | 0.161*** | -0.128*** | -0.136*** | -0.0558 | -0.299* | 0.198 |
| | (0.0364) | (0.0416) | (0.0464) | (0.0559) | (0.174) | (0.215) |
| Knowledge | 0.0415 | 0.0255 | -0.253*** | 0.0333 | -0.955*** | 0.0791 |
| | (0.0369) | (0.0419) | (0.0617) | (0.0743) | (0.197) | (0.244) |
| Participation | -0.0424 | 0.0734 | -0.0265 | 0.0667 | -0.756*** | 0.156 |
| | (0.0644) | (0.0730) | (0.0613) | (0.0738) | (0.259) | (0.321) |
| Conservative \times knowledge | | | 0.407*** | -0.00887 | 0.902*** | -0.368 |
| | | | (0.0723) | (0.0871) | (0.243) | (0.301) |
| Conservative \times participation | | | | | 0.416 | -0.418 |
| | | | | | (0.298) | (0.370) |
| Knowledge \times participation | | | | | 1.423*** | -0.0895 |
| | | | | | (0.370) | (0.459) |
| Conservative \times knowledge \times participation | | | | | -1.096** | 0.603 |
| Participation | | | | | (0.432) | (0.536) |
| Trust | 0.311*** | 0.117* | 0.329*** | 0.109* | 0.293*** | 0.100 |
| | (0.0555) | (0.0632) | (0.0532) | (0.0643) | (0.0522) | (0.0650) |
| External efficacy | -0.0570 | 0.0459 | -0.0771 | 0.0511 | -0.0802 | 0.0338 |
| | (0.0762) | (0.0865) | (0.0725) | (0.0873) | (0.0707) | (0.0879) |
| Cognition | -0.103 | 0.106 | -0.113 | 0.103 | -0.119 | 0.120 |
| | (0.0830) | (0.0943) | (0.0790) | (0.0953) | (0.0771) | (0.0959) |
| Confidence | -0.106 | -0.0466 | -0.0668 | -0.0637 | -0.0433 | -0.0515 |
| | (0.0664) | (0.0755) | (0.0632) | (0.0763) | (0.0615) | (0.0767) |
| Evaluation | 0.0946 | -0.0406 | 0.0974 | -0.0505 | 0.0508 | -0.0627 |
| | (0.0745) | (0.0846) | (0.0707) | (0.0852) | (0.0692) | (0.0860) |
| Internal efficacy | -0.192*** | -0.0165 | -0.177^{***} | -0.0320 | -0.209*** | -0.0436 |
| | (0.0578) | (0.0655) | (0.0541) | (0.0651) | (0.0529) | (0.0657) |
| Religiosity | 0.155*** | -0.0585 | 0.137*** | -0.0694 | 0.111** | -0.0723 |
| | (0.0477) | (0.0542) | (0.0451) | (0.0544) | (0.0442) | (0.0549) |
| Income | 0.0833** | -0.0470 | 0.104*** | -0.0317 | 0.0853** | -0.0291 |
| | (0.0386) | (0.0437) | (0.0364) | (0.0438) | (0.0356) | (0.0441) |
| Gender_male | -0.0158 | 0.00142 | -0.0190 | -0.00450 | -0.0176 | -0.000454 |
| | (0.0181) | (0.0206) | (0.0171) | (0.0207) | (0.0167) | (0.0208) |
| Education_high school | 0.254** | -0.103 | 0.238* | -0.121 | 0.207* | -0.138 |
| | (0.129) | (0.146) | (0.122) | (0.147) | (0.119) | (0.148) |
| Education_some college | 0.248* | -0.120 | 0.234* | -0.131 | 0.172 | -0.148 |
| | (0.131) | (0.148) | (0.124) | (0.149) | (0.122) | (0.151) |
| Education_associate degree | 0.303** | -0.130 | 0.275** | -0.135 | 0.247** | -0.143 |
| | (0.128) | (0.145) | (0.121) | (0.146) | (0.118) | (0.147) |
| Education_bachelor's degree | 0.232* | -0.145 | 0.220* | -0.159 | 0.203* | -0.174 |
| | (0.124) | (0.141) | (0.118) | (0.142) | (0.115) | (0.142) |

(Continued)

TABLE 3 (Continued)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---------------------------|---------|----------|---------|----------|----------|----------|
| Education_master's degree | 0.313** | -0.0980 | 0.295** | -0.108 | 0.268** | -0.128 |
| | (0.125) | (0.142) | (0.119) | (0.143) | (0.116) | (0.144) |
| Education_doctoral degree | 0.355** | -0.0297 | 0.324** | -0.0414 | 0.333** | -0.0621 |
| | (0.160) | (0.181) | (0.152) | (0.183) | (0.148) | (0.183) |
| Constant | 0.109 | 0.786*** | 0.289** | 0.799*** | 0.763*** | 0.779*** |
| | (0.143) | (0.163) | (0.140) | (0.169) | (0.191) | (0.236) |
| Observations | 388 | 387 | 389 | 388 | 389 | 388 |
| R-squared | 0.368 | 0.072 | 0.434 | 0.068 | 0.473 | 0.077 |

 $^{***}p < 0.001, \, ^{**}p < 0.01, \, ^{*}p < 0.05.$

Standard errors in parentheses.





conservative conspiracy endorsement for both Republicans and Democrats, as Figure 3 indicates. Since knowledge does not have any effect on liberal-index endorsement, participation directly increases the endorsement on the liberal index for both parties.

4.1. Robustness testing

Since the survey is observed to have a self-report bias, such as deflecting or inflating scores (Dvir-Gvirsman et al., 2014), a series



of robustness tests was conducted to verify the robustness and replicability of econometric modeling. Both excluding and including control variables provide consistent patterns of regression results (Table 3). Both party-affiliation and political-ideology measurements result in similar trends (Figures 1–3), though partisanship generally has a stronger effect than ideology. Though interaction models in Figures 1–3 require a dummy variable of partisanship (Democrats vs. Republicans) to produce separate results for the two parties, the regression model in Table 3 has been tested with both dummy variables and continuous variables for conservative measurement, and they reach a consistent conclusion.

5. Discussion

Inspired by Miller et al.'s (2016) two-way and three-way interaction models, this study adopts an econometric approach and reaches the following conclusions. Partisans have been observed to sort their believes based on ideological alignment, confirming the findings of previous studies (Miller et al., 2016). The endorsement pattern strikingly differs for conservatives and liberals across all these political factors. Specifically, ideologically consistent conspiracy endorsement is stronger for conservative conspiracies, and partisanship strength is positively associated with ideological endorsement. Thus, this study also confirms that partisanship explained by motivated reasoning aligns with ideologically consistent endorsement (Saunders and Abramowitz, 2004; Edelson et al., 2017).

Similar to previous research, this study also found a positive effect of knowledge on ideologically consistent conspiracy endorsement, only among conservative conspiracies. Although the survey design selected liberal conspiracy statements with more salient ideology, the two conspiracies, Trump's coercion of Ukraine and Russia's damaging information about Trump, may still have a strong association with reality as discussed previously. Additionally, considering Trump a controversial figure for both parties, all Republicans may not support anti-Trump statements and, thus, those would create noise in data collection. Overall, conservative conspiracies are more effective in identifying the effect of knowledge on strengthening motivated reasoning.

Political participation also demonstrates different effects for conservative and liberal conspiracies. Differing from H3b, high levels of participation reduce the effect of knowledge on both ideologically consistent and dissonant endorsement of conservative conspiracies. Unlike Phadke et al.'s (2020) argument on social aspects of conspiracy adoption, participation reduces the exacerbating effect of knowledge on conservative conspiracy endorsement. One possible explanation, drawn from Sunstein and Vermeule's (2009) research, could be that conspiratorial thinking is more likely to influence people who are exposed to limited sources of information. Audiences with high levels of both political knowledge and participation may be exposed to diverse sources of information, reducing the strengthening effect of knowledge on conspiracy endorsement. Critical thinking capability may also encourage more informed participants with better access to an array of information sources to query the evidence in conspiracy narratives.

Additionally, high participation levels increase endorsement by both Republicans and Democrats for liberal conspiracies. Since the selected liberal conspiracies in this study are more likely to be true conspiracies, people with high levels of both political knowledge and participation may be closer to the "fact" of politics and strong endorsement of true conspiracies, disregarding party affiliation. While this study only provides a preliminary explanation, additional research on this interesting observation is worthwhile.

Taken together, this study first confirms several conventional beliefs that are consistent with previous findings: ideologically motivated individuals endorse conspiracy statements that are ideologically aligned with their predispositions; this ideologically aligned endorsement is more substantial for those with stronger party affiliations and political ideologies; political knowledge has an amplifying effect on ideologically aligned conspiracy endorsement.

Second, this study identifies an asymmetrical effect of political causes for liberals and conservatives. Political ideology and knowledge were observed to have stronger effects on conspiracy endorsement among conservatives than liberals. This may result from a higher need for uncertainty and stronger motivated reasoning and selective exposure among conservatives in the U.S. (Jost et al., 2003; Miller et al., 2016).

Both Miller et al. (2016) and Edelson et al. (2017) found that political ideology and knowledge have a stronger effect on conspiracy endorsement among conservatives than liberals. Because both studies were conducted during the Obama administration, they hypothesized that these two political factors tended to have a stronger effect on individuals from the losing party (Republican at that time) than those from the elected party (Democrats at that time). However, this study found that conservatives were more affected by ideology and knowledge when the Republican was the elected party at the time the survey was conducted, weakening the previous losingparty argument (Miller et al., 2016; Edelson et al., 2017). Therefore, this study proposes a different interpretation for the stronger effect of ideology and knowledge on conservatives: the psychological characteristics of conservatives discussed above, including a higher need for uncertainty, motivated reasoning, and selective exposure, all of which contribute to these asymmetric patterns.

Lastly, this study also found asymmetry in the joint effect of political knowledge and participation on conspiracy endorsement between conservative and liberal conspiracies: participation increases the endorsement of liberal conspiracies, but not conservative conspiracies. Therefore, this study concludes that the nature of statements is more likely to generate a distinctive endorsement pattern among conservative and liberal conspiracy theories than the political ideologies of the voters. From a normative perspective, the negative joint effect of political knowledge and participation on conservative conspiracy endorsement suggests a promising direction for alleviating the endorsement of the more extreme conspiracies, enhancing partisans' trust and belief in the U.S. electoral system.

6. Limitations and future directions

This study is limited in several aspects. Regarding the political misinformation survey, Lopez and Hillygus (2018) raise a concern about survey trolls, particularly that respondents may engage in partisan cheerleading or answer in a humorous way to endorse a piece of "fake news," even though they do not actually believe it. Future studies could add verification questions to the survey design, to identify the survey trolls and improve the quality of data collection. Also, due to resource limitations, this study only collected 500 responses from the main survey distribution; for an econometric approach, a larger dataset could provide considerably more robust and generalizable results. To address this deficiency, this study conducts a robustness test, utilizing both party-affiliation and political-ideology scales to verify the robustness of the results. Lastly, similar to the challenges that previous research faced, liberal conspiracies selected in this study are closer than conservative conspiracies to true conspiracies. Although this study has conducted two rounds of pilot surveys to achieve a relatively balanced conspiracy selection, future studies could also take the believability associated with liberal conspiracies into consideration and validate the wording and conspiracy selection through survey and experiment design.

7. Conclusion

This study argues that previous conspiracy studies have primarily focused on psychological causes, such as conspiracy mentality, cognitive dissonance, and motivated reasoning, that contribute to conspiratorial beliefs, while the discussion of political antecedents of conspiracy endorsement is lacking. Drawing from the extant literature in psychology, communication, and political science and using econometric modeling, this study provides insights into the interactive effects of three political antecedents of conspiracy endorsement, namely, ideology, knowledge, and participation.

Theoretically, this study fills the gap left by previous studies on political participation and misinformation; namely, it identifies the amplifying effect of political participation on conspiracy endorsement, thus going beyond the misinformation studies. This is also one of the very few articles that comprehensively explores the interaction effect of political participation on ideological conspiratorial beliefs across both liberal and conservative conspiracies. To contextualize its findings, this study identifies a particular type of people who are more vulnerable to conspiracy theories: individuals with both strong partisan affiliation and political knowledge. This leaves us with a practical concern as the combination of these two features makes such people more easily manipulated by political elites through media priming (Zaller, 1992), especially since the chance of being trapped in the echo chamber is substantially higher in the digital media age (Cinelli et al., 2021). On the positive side, being both politically knowledgeable and active could moderate the motivated reasoning these partisans experienced through being exposing to reality and diverse information sources.

Methodologically, this study adopts, revises, and extends Miller et al.'s (2016) two-way and three-way interaction models, using econometric modeling to test the intercorrelation between conspiracy endorsement, participation, and knowledge. Additionally, future studies could operationalize the nature of conspiracy statements (i.e., the partisan and ideological association of these political conspiracies) through crowdsourcing annotation.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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