Title Page with Author details

That's interesting! The role of epistemic emotions and perceived credibility in the relation between prior beliefs and susceptibility to fake-news

Angela Rijo[*, a, b], Sven Waldzus[*, c]

[*] Corresponding author; emails acger@iscte-iul.pt, angelarijo@lip.pt

[a] Instituto Universitário de Lisboa (ISCTE-IUL)

[b] Social Physics and Complexity research group.

[c] Instituto Universitário de Lisboa (ISCTE-IUL)/CIS-IUL

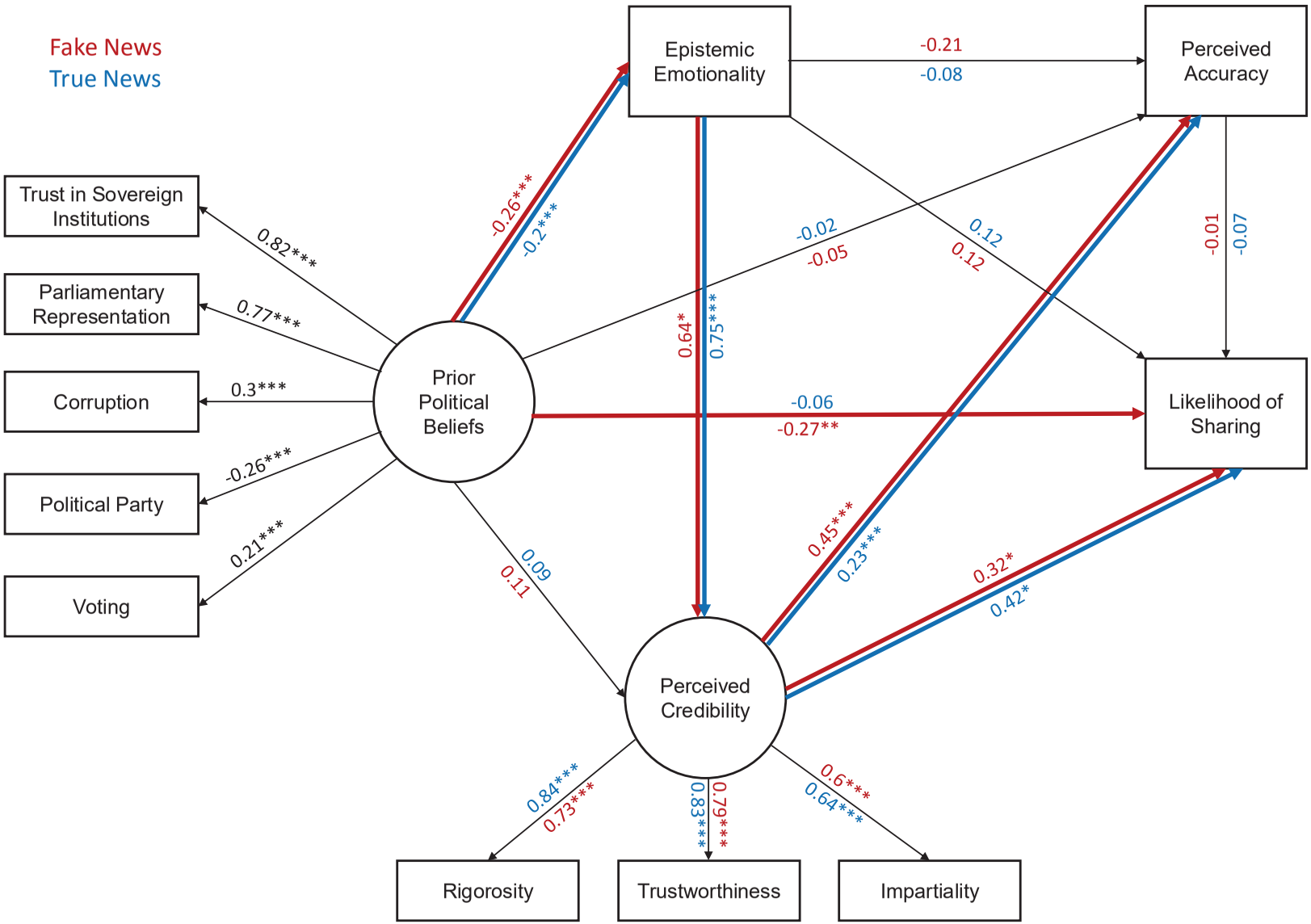
Declarations of interest: none.

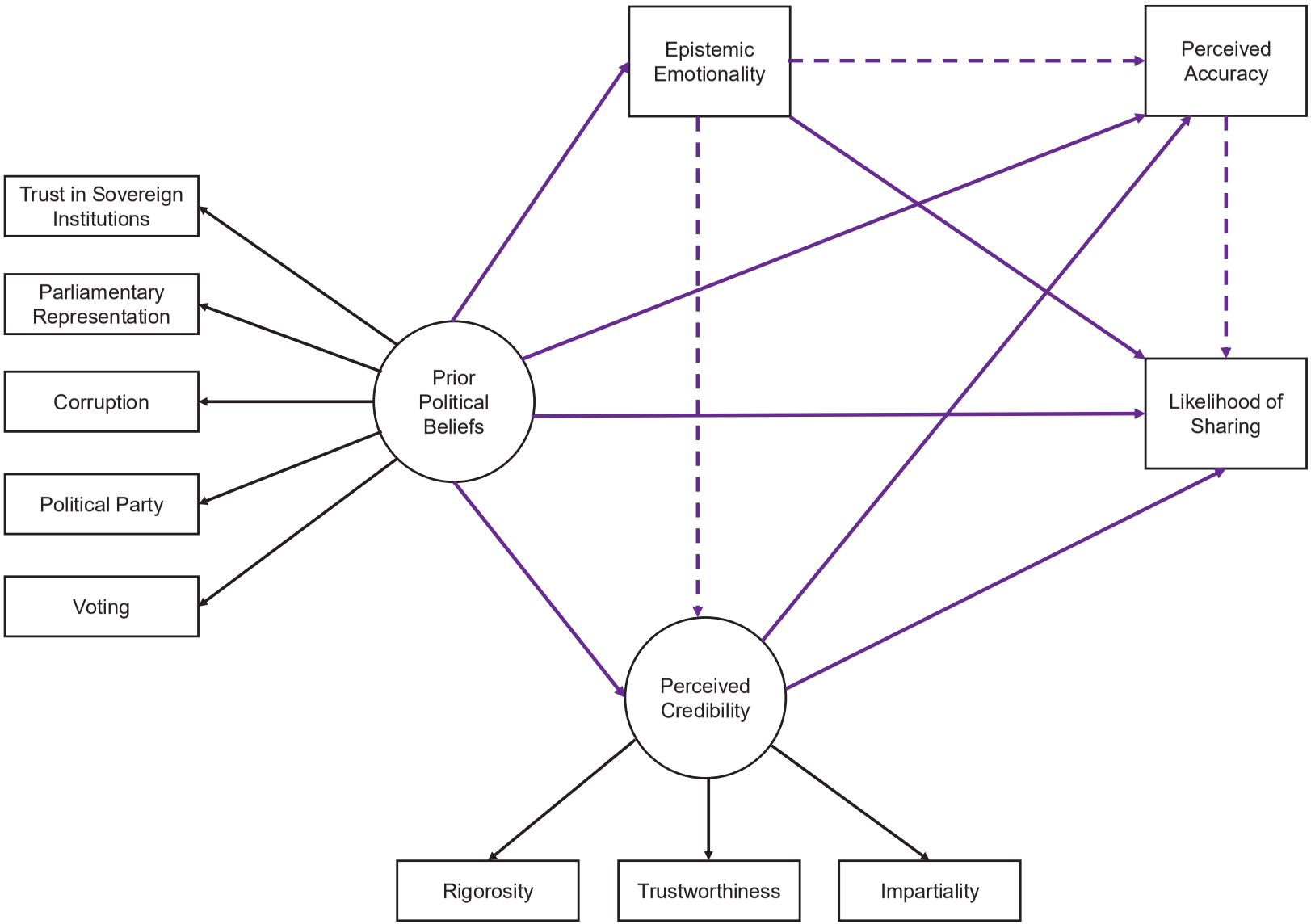
Acknowledgements

We express our gratitude to Media Lab, more specifically to Inês Narciso and José Moreno for providing us the categorized Facebook posts; and to SPAC — Social Physics and Complexity research group, more specifically to Joana Gonçalves de Sá, Cristina Mendonça, José Reis, and Paulo Almeida, for reviewing the manuscript.

Figure

Click here to access/download;Figure;models.pptx




Epistemic Emotionality
Perceived Accuracy
Trust in Sovereign Institutions
Parliamentary Representation
Corruption
Political Party
Voting
Prior Political Beliefs
Likelihood of Sharing
Perceived Credibility
Rigorosity
Trustworthiness
Impartiality

That's interesting! The role of epistemic emotions and perceived credibility in the relation between prior beliefs and susceptibility to fake-news

Abstract

The present research examines processes involved in how people believe and share news posts on social media. We tested whether the relation between individuals' previous political beliefs and judging the accuracy of and willingness to share fake and true news is mediated by epistemic emotional response (surprise and interest) and perceived credibility (trustworthiness, rigorosity, impartiality). In a within-subjects experiment, we presented ten publications (5 true, 5 fake) with political content, extracted from Facebook, to 259 Portuguese participants. The results showed that fake and true news were processed in a similar way. Emotional response and perceived credibility did not only depend on the content, but also on previous beliefs. Negative beliefs about the political system increased emotional response to true and false news, which in turn increased perceptions of credibility, leading to higher accuracy attributions and willingness of sharing news (true or false). The most distinctive difference between the participants interactions with fake and true news was that participants willingness to share fake news was not entirely explained by emotional response and credibility perceptions. We conclude that people seem to rely on emotional cues, appraised with regard to previous beliefs, and on emotionally biased credibility indicators to guess whether news are true or worth sharing.

Keywords: fake news, epistemic emotions, previous beliefs, perceived credibility, sharing.

The global problems that derive from the freedom to create content online and the facility to spread it, culminated in an epidemic of bad information, or as it has been called: an *infodemic* (Zarocostas, 2020). In the recent years, the world witnessed a growing concern about the dangers that fake news represent for the public health and the social fabric of nations, because they corrupt our ability to respond to real problems. With trust in traditional mass media suffering an erosion (Lazer et al., 2018), social media has set the stage for the growth of marginal and self-proclaimed anti-system populist political movements (Waisbord, 2018) and anti-science movements (Hotez, 2020). These movements are often fuelled by content circulating online that is, in itself, false, fabricated, misleading, provided in a false context, or implying a false connection, in sum, content with some degree of falsehood and more broadly known as *fake news* (Wardle & Derakhshan, 2018). At the same time, addressing this problematic while acknowledging the risks that raising the level of scrutiny on social media represents to the freedom of speech, makes this a very challenging problem to tackle. Some studies suggest that sharing fake news on social media is a rare activity (Guess et al., 2019). For instance, one study concluded that only a minority of

Facebook users engages in fake news sharing (Allen et al., 2020). However, these studies usually do not capture the full range of erroneous news related content circulating online (Pennycook & Rand, 2021). It has been demonstrated that fake news in Twitter travel faster, deeper and wider than true news (particularly so if the news are political) – and this is not because of bots, but because of humans (Vosoughi et al., 2018; see, however, Juul & Ugander, 2021). Relatedly, information cascades on Facebook seem to run deeper when rumours are concerned (Friggeri et al., 2014). And fake news in the months after the 2016 USA elections were found to have generated more interactions with social media users than true news (Lazer et al., 2018).

Fake news can serve different purposes, such as satire, maximizing revenues, political propaganda, promoting conspiracy theories, or cause damage to the reputation of an entity — being it an individual, a group, or an organization. While we use the term *fake news* in this paper, we need to acknowledge its politicization, due to appropriation by different political groups that use it to discredit the adversaries' views or ideologies (Brummette et al., 2018). In this paper, the term fake news is used in the sense of the Cambridge dictionary's definition[1]: "false stories that appear to be news, spread on the internet or using other media". According to the same dictionary, they are "usually created to influence political views or as a joke", but the motivation with which they are created is not in the focus of the current research. Instead, the current research attempts to explain how people active on social media end up believing in and/or sharing fake news.

Psychological research has attempted to determine the psychological factors and processes involved in believing and further spreading of fake news from various theoretical grounds. This literature has been mainly following two distinct accounts of cognitive theory to explain how people are deceived by fake news: (i) the classical account to reasoning, arguing that it is a lack of analytical thinking that makes people susceptible to fake news (Tandoc, 2019; Bago et al., 2020), and (ii) the motivated reasoning account, arguing that people reason to arrive at pre-determined self-serving conclusions, that reasoning is goal oriented and can have various motivations, e.g., directional versus accuracy goals (Druckman, 2019). The two approaches can equally well account for some of the existing findings in fake news research. For instance, previous beliefs may have an influence on believing or sharing of news, but that does not necessarily imply that the reasoning itself must be biased by a motivation to achieve a preferred outcome. Previous beliefs can also influence the individuals' reasoning because, when lacking effort and attention, news recipients may rely on cues, biased by their beliefs, that discredit true news or give credibility to fake news (Petty & Cacioppo, 1986). When the domain is political fake news, research often misses the necessary measures to distinguish between these two processes. For instance, researchers have asked people with which political party or candidate

[1] https://dictionary.cambridge.org/dictionary/english/fake-news

they identify the most (Pennycook & Rand, 2019), or for their political beliefs in the end of the survey (Pennycook & Rand, 2020) and then calculated how such partisanship influences their reception of political news. However, they have not – to the best of our knowledge – been asking what participants assumptions on the current state of political affairs are, prior to being presented with the news items. Only the latter would allow distinguishing the previous beliefs related to the news at stake (i.e., beliefs potentially responsible for motivated reasoning) from other beliefs that could, for instance, refer to source credibility or other cues potentially responsible for heuristic biases due to lack of reasoning.

Research intending to distinguish between the two approaches has been, so far, less supportive of the motivated reasoning account (i.e., biased processing due to a preference for reaching a certain conclusion), but more supportive of the classical approach, showing that deception occurs due to lack of analytical reasoning (Pennycook & Rand, 2019; Pennycook et al., 2021; Pennycook & Rand, 2021; Sindermann et al., 2020). Moreover, one problem with the existing evidence for motivated reasoning was outlined by Mandel (2014), applying a Bayesian framework. According to such framework, beliefs or assumptions (priors) about reality have a certain personal likelihood of being true, which depends on the individual's degree of certainty or confidence about them, and inform the personal probability of a given event (Mandel, 2014). For instance, people may differ in their believe in whether politicians in general are corrupt. This general belief most likely will inform the estimated likelihood that a particular politician A is corrupt, and thereby influence the estimated likelihood of A being involved in a particular corruption case Z (prior: A is involved in Z with a likelihood of p_0). The Bayesian framework would assume that after being confronted with new information (a true or false accusation by a news-outlet stating that A is involved in Z) the final belief (A is involved in Z with a likelihood of p_1) is informed by the previous belief simply because it is a continuation of the prior (A is involved in Z with a likelihood of p_0) + the change in belief due to the new information. If the resulting belief (posterior: A is involved in Z with a likelihood of p_1) is incompatible with the implication of the news item, the news item will be considered false. If it is compatible, it will be considered true.

The Bayesian approach is to a certain degree reconcilable with both the classic approach and the motivated reasoning approach. Most importantly, however, it allows for an alternative and more fine-grained explanation of why prior beliefs may influence believing in fake news (and news in general) than the explanation by heuristic biases (classical approach) or wishful thinking (motivated reasoning approach). While the motivated reasoning approach would assume that prior beliefs may bias the reasoning because individuals are motivated to confirm their belief, it is also possible that priors bias the reasoning in the absence of motivation by the outcome. First, priors regarding the content of the message can exert influence on the information processing if

they impact the weighting of the additional information encountered. Second, priors regarding news credibility may credit or discredit a certain message (i.e., rendering it more or less informative) for instance depending on its source, or on whether the message is impartial in its conclusions or justified by rigorous investigation. Although both of these processes can be motivated by desire for a particular outcome (motivated reasoning) or heuristics (classical approach), they can also be influenced by other factors depending on people's previous beliefs and will reflect on the degree to which the encountered message will be integrated, rejected, or ignored (Druckman, 2019).

Without dismissing the relevance of the classical cognitive approach and the idea of motivated reasoning, the current research aims to contribute to the understanding of believing and sharing of fake news through such a Bayesian approach. In a broader sense, we examine two factors that may be influenced by prior beliefs and determine how people deal with news items providing new information: Epistemic emotions (i.e., emotion relating to the perceived quality of knowledge and the processing of information; Pekrun and Stephens, 2012) and perceived credibility.

Epistemic emotionality. Communication on social media does not allow for in-person face-to-face interaction but, despite this, emotions can be transmitted on social media on a massive scale (Kramer et al., 2014). The literature on the effect of emotions on susceptibility to fake news has been growing, and it has been mainly focusing on the effect of emotions on accuracy beliefs. It has been demonstrated that heightened emotionality is positively correlated with deception by fake news and negatively with ability to distinguish true from false (Martel et al., 2020). These results stood for a variety of mood dispositions, accounted for by the PANAS scale (Watson et al., 1988), but not for those emotions that are closer to analytical thinking, namely: "interest", "alert", "determined", and "attentive". Thus, when emotions are related to epistemic experiences, they seem to elicit different processes. Moreover, no significant relationship emerged between emotionality and belief in true news, except for "attentive" and "alert" (Martel et al., 2020). It is worth noting, however, that there may have been floor effects driving the results, due to low reported emotionality, as the authors noted. Another study suggested that the reason why fake news spread faster than true news is their increased novelty and newness, as a piece of information that was previously unknown about the world (Vosoughi et al., 2018). This aspect of novelty translates into increased surprise and disgust in participants emotional responses to fake news, while responses to true news inspire other emotions such as joy and trust (Vosoughi et al., 2018). Such results indicate that emotions that raise the individual's attention levels may play a distingt role in the process of deception by fake news.

According to appraisal theories of emotions, epistemic emotions are - like all emotions - elicited not only through the events themselves but through the subjective evaluations (appraisals) that individuals make of those events or situations. These appraisals are drawn upon previous acquired beliefs, motives, thoughts, or values (Scherer et al., 2001). Thus, given their influence on responses to news content, epistemic emotions may play an important role in the relation between prior beliefs and believing and sharing of fake news.

Perceived credibility. The abundance of information people are exposed to online makes social media a very fertile ground to rely on cognitive heuristics (Metzger & Flanagin, 2013, Metzger et al., 2010). According to the elaboration likelihood model, when the information is not directly relevant and/or individuals lack prior knowledge on the subject, have low motivation and/or are unable to elaborate upon the information, they tend to engage in the peripheral rather than the central route of information processing (Petty & Cacioppo, 1986). In this situation individuals look for heuristic cues that help them validate the information (Petty & Cacioppo, 1986). One of the most studied heuristic cues that people rely on is source credibility. In fact, the influence of credibility in the formation or actualization of individuals' attitudes is more pronounced when the individuals lack the prior knowledge and strong prior attitudes on the topic of interest (Kumkale et al., 2010). It has been found that including source reputation ratings next to the news articles influences their believability, with lower source ratings leading to lower belief in both fake and true news (Kim & Dennis, 2018). Individuals are also more likely to share content that they perceive as credible and trustworthy (Buchanan & Benson, 2019; Stefanone et al., 2019). Source credibility depends both on the new incoming information and on the judgements of what constitutes a credible source; the latter differs according to held beliefs (e.g., an individual who distrusts science will not consider a scientific paper as a credible source, and because of that new information presented by a scientific paper will not be taken into account, (Druckman, 2019)). Also, the perceived news source credibility can be heightened when the message is favourable to the individual's previous beliefs about the content of the message. One study proved that the perceived credibility of public opinion polls depends on the favourability of the reported results for the individual's positioning on the issue (Kuru et al., 2017). Another study found that checking a source's credibility as a strategy against misinformation may not be as effective as previously assumed, because individuals tend to trust sources that reinforce their beliefs (Tsang, 2020). Thus, while source credibility as such may be an important heuristic hat people use when processing information, particularly if they lack motivation or capacity for more systematic thinking, the perception of credibility of a certain news item may depend on other factors, including prior beliefs. According to the Bayesian approach presented above, the perception of credibility (or the lack thereof) should inform to which degree people take the provided information of a certain news item into account when deciding to believe or share this news item.

Belief versus Share. Pennycook et al. (2021) found a dissociation between headlines veracity and sharing intentions, with the effect of veracity being significantly more prominent in belief than in sharing. However, it seems intuitive that people would share news because they believe in them, that is, because they mistake them to be true. Yet, evidence tells a different story; research has been finding that the belief that a certain news content is true does not entirely explain why people are willing to share it (Pennycook & Rand, 2021, Pennycook et al., 2021, Pennycook et al., 2020). More specifically, one study found that only 33% of false headlines' shared were headlines that participants believed to be true (Pennycook et al., 2021). One reason for this partial disconnection is that individuals are not paying attention. Consistent with this reasoning, shifting participants' attention to an accuracy reminder at the start has been found to raise the participants' accuracy rates (Pennycook et al., 2020; Pennycook et al., 2021), and adding a warning to the news, advising that the content had been disputed by third party fact-checkers, reduced participants' intentions to share the fake news (Pennycook et al., 2018). However, another recent study found that exposition to fact-checking videos improves truth discernment, but it does not reduce fake news sharing (Bor et al., 2020), providing further evidence of the disconnection between accuracy judgements and sharing. Moreover, truth discernment and fake news sharing seem to have different correlates. Bor et al. (2020) found that individuals that are better in telling true from false (truth discernment) have a higher digital literacy and score higher on cognitive reflection; while individuals that share fake news more tend to be older. Political identity, however, seems to be associated with both sharing and discernment, with individuals closer to the Democrats being better at discerning true from fake news, and individuals closer to the Republicans being more prone to sharing fake news (Bor et al., 2020). Contrary to such evidence, another study found that belief in fake news was a predictor of willingness to share fake news (Pereira et al., 2018); but, overall, the research points to a partial disconnection between what people believe in and what they are willing to share. Such a disconnection suggests that individuals are willing to share content independent of whether they believe it to be false or true.

The present research

With this study, we address the question of how people interact with false and true news, in terms of how they believe and share them. More precisely, we examine how individuals' prior political beliefs relate with truth discernment and likelihood of sharing fake and true news with politically relevant content. We also tested the mediating role of perceived credibility and epistemic emotional responses in the relationship between prior beliefs and dealing with news posts. We analysed to which degree individuals' prior beliefs influence their judgements on how interesting and surprising the news are, as well as their judgements on the news' credibility, and

how these epistemic emotional responses and perceptions of credibility influence believability and likelihood of sharing.

We considered the following previous political beliefs: preferred political party, trust in sovereign institutions, degree to which participants think the elected deputies represent them, perceived corruption and voting behaviour. We considered these prior beliefs because they were relevant in the social and political discourse at the time of data collection. They all share that they are indicators of how critical people were at the time of data collection towards the functioning of the political system in the country, which spoke directly to the content of the news items presented in the study. These news items generally referred to content that implied or pointed to a certain dysfunction of the political system.

In terms of epistemic emotionality, we looked at the influence of previous beliefs on feelings of interest and surprise, and their influence on believing in and sharing of the presented news. We considered interest and surprise because of their importance in fostering knowledge exploration and/or the pursue of epistemic goals (Vogl et al., 2019). Both interest and surprise are emotions related to an aspect of knowledge and, despite some controversy, both have the components that had been argued to define emotions[2] (Silvia, 2008). Interest is an emotion that causes attentional efforts towards an object, process or event. It has significant long-term adaptive functions, which include motivating people for autonomous exploration and learning (Silvia, 2001, 2008). Interest is close to an aspect of analytical thinking (Martel et al., 2020), and that fact has been in the root of some disagreement on whether interest accounts for an emotion. Disagreement, however, is not uncommon across theories of emotions, which does not have to be problematic, once these contradicting views reflect different taxonomies (Silvia, 2001; Griffiths, 2008). What is important for the current research is that, because of its potential to motivate epistemic processing and to raise attention, interest should increase the weight that is given to the information conveyed by a certain news item in the Bayesian process described above. Surprise, on the other hand refers to a sense of astonishment and wonder that one feels toward the unexpected (Mellers et al., 2013). It has been classically considered to be one of the basic universal emotions (Ekman et al., 1983), but its close ties with a belief-based experience in terms of how people make predictions and draw probabilities of events relate surprise to both beliefs and emotions (Mellers et al., 2013). According to the Bayesian perspective, surprise is a consequence of the potential impact that a certain piece of information has on the prior beliefs, which depends of its objective singularity (Itti & Baldi, 2009), and its transformative power (Baldi

[2] A contemporary perspective on emotions is that emotions motivate activity and compel people to take action (Ridderinkhof, 2017). They are characterized by three components: one is subjective and related to individual differences on how emotion is experienced, another is physiological and refers to measurable physical reactions, at last, emotions have an expressive component, which refers to behavioural responses.

& Itti, 2010). To impact previous beliefs, the incoming information needs to be relevant, at a close location, and unexpected given all that is known. It seems to be this aspect of novelty, as something that was previously unknown about the world, that increases interest and gives the news an added value that justifies the sharing (Itti & Baldi, 2009). To sum up, both interest and surprise, though for slightly different reasons, should be positively related the tendency to believe and share a certain news item. Interest because it mobilizes and guides attention to the information provided, and surprise because it indicates that the news has an impact on one's belief. In the language of the Bayesian approach, they should have an impact on the weight that is given to the new information that is taken from a certain news item.

In terms of credibility, so far, we have discussed it mainly as source specific, as traditionally studies tend to operationalize the construct as such. However, credibility can also be perceived as an attribute of the story or the media (Srinivasan & Barclay, 2017). While identifying those different aspects is not the major concern of the present research, we were interested in perceived credibility of the presented news items (rather than their source alone) in its broader sense. We rely on three attributes and correlates of credibility: trustworthiness, impartiality, and rigorosity. Trustworthiness and credibility have been used interchangeably in the literature, which speaks to how close the two attributes are to each other; impartiality or the condition of being neutral/unbiased and rigor both add to credibility perceptions (Karlsen & Aalberg, 2021; Young, 2016). Perceived of credibility should, according to our reasoning, have an influence on how much information is actually derived from a certain news-item.

The hypothesized model of the current study can be summarized in four hypotheses (seen in Figure 1).

H1: Epistemic emotional response partially mediates the impact of political prior beliefs on perceived accuracy.

H2: Epistemic emotionality partially mediates the impact of political prior beliefs on likelihood of sharing.

H3: Perceived credibility partially mediates the impact of political prior beliefs on perceived accuracy.

H4: Perceived credibility partially mediates the impact of political prior beliefs on likelihood of sharing the news content.

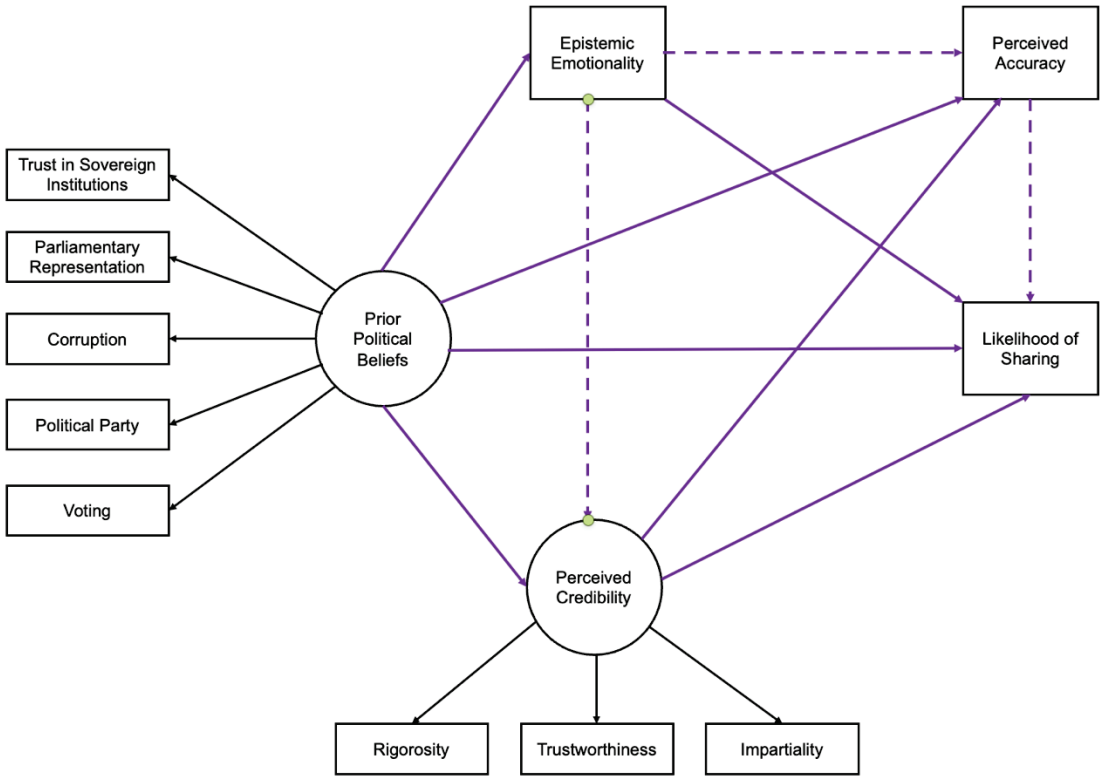
As was implied in the argumentation leading to our hypotheses, this model does not distinguish between the processing of fake news and true news. The Bayesian approach that is the basis of our predictions would not make any different predictions for these two regarding the processes involved. We were, however, interested in whether differences can be identified for these two kinds of news, and therefore explored them in our analyses. The advantage of having a

similar model for both kinds of news is that the relations between the constructs can be directly compared.

Moreover, the hypotheses are not explicit in terms of the direction of the association (positive or negative), due to the somewhat contradictory and unsettled nature of the evidence in the research area of fake news. While the impact of epistemic emotional responses and perceived credibility on believability and sharing can be expected to be positive, it cannot be clearly predicted how prior political beliefs my impact the two mediators. Plausible arguments could be found for both directions, which could allow to test competing hypotheses, but given the pioneering character of this study it seems more straightforward to leave this question open for exploration.

Finally, there were also some other relations between our measured constructs for which we did not have clear hypotheses. For some (e.g., the relation between epistemic emotional response and perceived credibility and the direct relations between prior beliefs and the dependent variables after controlling for the mediators) there was no theoretical basis. For others (e.g., the relation between believing in and sharing news) the previous research had produced inconclusive results. We nevertheless allowed these relations to vary and to be estimated in the statistical model for exploratory purposes.

Figure 1 Hypothesized model (measurement and structure) of the impact of political priors on belief and likelihood of sharing fake and true news posts items.



Note: The measurement relationships are presented in black arrows; the hypothesized structural relationships are presented in purple arrows; and the dashed paths represent the paths that were allowed to occur in the model, without specific hypothesis. Latent variables are presented in a circle.

2 Method

2.1 Participants

The present study involved the estimation of a structural equation model with 3 latent and 17 observed variables. Using Daniel Sopers' A-priori Sample Size Calculator for Structural Equation Models[3], and targeting 80% statistical power and a significance level o .05, the minimum required sample size for the model structure would have to be 156, for the detection of a medium effect it would have to be 119 and for the detection of a small to medium effect 296. We collected data of 317 participants, of which, however, only 259 completed the survey, and were included in the analysis. All participants have Portuguese nationality. Their age was

[3] https://www.danielsoper.com/statcalc/calculator.aspx?id=89

comprised between 17 and 70 years (M = 33,2; SD = 11); 135 participants identified as male, 121 as female, and 3 participants preferred not to answer this question. According to the district of residence and respective population density, participants were classified as living in a rural area (n = 89), or in an urban area (n = 169). Seven participants had nine or fewer years of formal education, 61 had 12 or fewer years of education (n = 61), 105 had obtained graduation, 75 had a master or postgraduation, and 11 had a Ph.D. Sixty-nine participants identified with left-wing parties, 50 with the left-centre party, 22 with the right-centre party, 30 with right-wing parties and 59 with no political party. Thirty participants preferred not to answer this question. Sampling procedure followed convenience and snowball sampling methods. The survey was distributed on Facebook, WhatsApp and Instagram along with a request of forwarding the survey to another acquaintance.

2.2 Materials

The stimuli consisted of ten news posts that had been shared on public Facebook groups, known for their political concerns and for spreading fake news. The posts were extracted via *CrowdTangle*[4]. Using this platform, two social media researchers and fact-checkers extracted over a hundred of Portuguese political-related posts published on open groups between September and December of 2020, and categorized them as being "misleading" (the erroneous information was related to context such as time or place displacements), "fabricated" (the content was false) or "accurate" (Wardle & Derakhshan, 2018)[5]. Posts categorized as misleading were not included in the final selection because we were interested in a dichotomous distinction. Overall, these posts reported to narratives that are not specific to the left or the right, but to polemic topics, namely the issue of corruption among the Portuguese political elites. Out of this sample, we selected five fake news posts and five true news posts (material made available on the OSF project page https://osf.io/5et7q/?view_only=3996f2d1f9f5458ca184cdfeadcbe653). The inclusion criteria were that the selected posts should portray political actors and/or events in a demeaning manner or depict problematic issues of the current democratic system; they should be unequivocally classifiable as true or fake. The posts were presented to participants in a naturalistic way, allowing the study to maintain some ecological validity. Only the pictures and names of the publishing user profiles were retracted, in order to prevent identification. The remaining cues such as likes and reactions were kept.

2.3 Procedure

[4] CrowdTangle is a tool owned by Facebook, intended for social scientist's research on the social network. It allows for data collection and analysis on Facebook's open pages, groups, or profiles.

[5] *Fake news* come in many forms, but can be grouped into three groups: (i) disinformation, which refers to false content shared knowingly so, (ii) misinformation, which refers to false content shared naively so, and (iii) mal-information, which refers to content meant to hurt a certain individual or group reputation (Wardle & Derakhshan, 2017).

Participants were presented with the introductory information on the purpose of the study and then asked for their informed consent, which was followed by the socio-demographic questions (age, biological sex, nationality, area of residence, and academic qualifications). Then, participants were shown a set of five questions about the participants' political beliefs (voting, trust in sovereign institutions, parliamentary representation, corruption, and political party of preference). In the main section of the survey, participants were presented with the news posts, half of them true and half of them false. The order of the presented news was randomized. Following each news post, participants would be asked if it was true or false (dichotomic), how surprising or interesting it was, and how credible, rigorous, and trustworthy it was (continuous measures). After the presentation of all news stories participants were asked if they had made any search on the web to answer the questions, and if they answered the survey on their personal smartphone, personal computer or work computer. Participants were then debriefed and shown their accuracy score, which was based on their correct/incorrect answers on whether the news stories were true or false, and a message of gratitude for their participation.

2.4 Design

The study consisted of a within-subjects experiment containing two conditions (exposure to fake vs. true news posts) and was conducted in a Qualtrics survey distributed on social networks such as Facebook, WhatsApp, and Instagram. To avoid dropout and to promote engagement with the participants the study was designed to have interactive elements and to reduce cognitive load for the participants (Deutskens et al., 2004). First, it was designed in the form of a quiz, so that participants could expect to receive their accuracy feedback at the end of the study as a score and in the form of a famous cartoon. Participants would be attributed the character of (i) detective Sherlock Holmes if they identified correctly more than 70% of the news items as being "true" or "false"; (ii) inspector Gadget if they correctly identified 40 to 70% of the news items; and (iii) Mr. Magoo if they correctly identified less than 40% of the news items.

Second, the survey followed a multiform planned missings design (MPMD), specifically in the section directed to the news posts' evaluation. MPMD presents only a subsample of the stimuli to each participant, which allows to reduce participants' cognitive effort and possible fatigue by reducing the number of items for each participant, without losing too much statistical power for the analysis of the overall sample (Chang & Little, 2018). Each participant was shown six items out of a total of ten news posts, having 60% of the items presented to each participant while getting 100% of information covered. Six forms were created and randomized to be evenly presented to participants (Table 1). The missing data produced by the used multiform-design were missing completely at random (MCAR), as the random distribution of participants to the six forms assured that missing values were not related to the variables or the items themselves (Silvia

et al., 2014), (Rubin, 1976). The resulting missing data was dealt with using the multiple imputation method — a method that allows for the prediction of the missing data based on the observed data, thus making valid inferences (Sterne et al., 2009). The method was run on SPSS 29, where five imputation datasets were created. The EM method (*Estimating Statistics and Imputing Missing Values*, n.d.) was used, in which each iteration ran to calculate the missing values is based on the observed values in the data and draws inferences of maximum likelihood under those observations. The results for all imputations were pooled manually, following Rubin's rules, and used to interpret the results.

Table 1 Schematics for Six-Form Planned Missing Design.

Block / Form	X	A	B	C	D	Information coverage (%)
1	2 items	2 items	2 items	—	—	60
2	2 items	2 items	—	2 items	—	60
3	2 items	2 items	—	—	2 items	60
4	2 items	—	2 items	2 items	—	60
5	2 items	—	2 items	—	2 items	60
6	2 items	—	—	2 items	2 items	60

Note. Each of the blocks (X, A, B, C, D) contained one misinformative item and one true item. The X block was present in all 6 forms and, therefore, its two items were shown to all participants.

2.5 Measures

2.5.1 Previous political beliefs. Following the criteria of theoretical and social relevance (Lee & Vanpaemel, 2018), previous political beliefs were assessed by a set of five questions about participants' preferred political party, trust in Portuguese sovereign bodies, belief in parliamentary representation, perception of corruption and voting behaviour. For *Political Party* participants were asked to select the Portuguese political party they identify with the most. This item was then recoded from left to right (1 being the Portuguese Communist Party, the farthest left Portuguese party with parliamentary representation, and 10 being Chega, the farthest right Portuguese party). For *Trust in Sovereign Bodies* participants were asked "What is your average degree of trust in the Portuguese sovereign bodies? (Courts, President of the Republic, Assembly of the Republic, Government)" and responded on a scale from 1 (Very low) to 7 (Very high). For *Parliamentary Representation* participants were asked "In your opinion, does the group of deputies from parties with parliamentary seats represent the Portuguese population?", responding on a scale from 1 (No, by no means) to 7 (Yes, completely). For *Perceived Corruption* participants

were asked “Corruption is the main problem in the Portuguese political system. Do you agree with this statement?”, responding on a scale from 1 (Entirely disagree) to 7 (Entirely agree). (The scale was later reversed.). For Voting Behaviour participants were asked “In electoral acts, how regularly do you vote?”, responding on a scale from 1 (Never) to 7 (Always).

2.5.2 Perceived Accuracy. Each of the six news items was followed by a binary question on whether participants believed it was true (coded 5) or false (coded 1). Separate accuracy indices for fake and true news were calculated by averaging the scores of (objectively) fake news and, averaging the scores of (objectively) true news, respectively. Higher values indicate that more news were believed to be true, ranging from 1 (indicating that all news were believed to be false) to 5 (indicating that all news were believed to be true). For the manipulation the news items had been classified as objectively true or fake according to the fact-checking.

2.5.3 Epistemic Emotionality. In separate items participants were asked to indicate how interested and how surprised they were in/by each news post on a scale from 1 (Very little) to 7 (Very much). These two variables were averaged to form the composite variable of Epistemic Emotionality. **2.5.4 Perceived Credibility.** Credibility of each news post was measured by three separate items using a scale from 1 (Very little) to 7 (Very much). Participants were asked how trustworthy, how impartial, and how rigorous they believed each news post to be.

2.5.5 Likelihood of Sharing. For each item, following accuracy and credibility measures, participants were asked how probable it was that they would share the news item. The scale ranged from 1 (Very low) to 7 (Very high).

Separate indices of emotionality, credibility and sharing for (objectively) fake and true news were calculated by averaging the scores of news in each category.

3 Calculation

Descriptive statistics, mean-comparisons and correlations between variables were calculated in SPSS29. To test the hypotheses, structural equation modelling (SEM) was conducted on RStudio using Lavaan — a package built to conduct SEM in R programming language (Rosseel, n.d.). The model was constructed under the function sem() and the estimator used was maximum likelihood (ML). In the statistical model we estimated the effect of priorpolitical beliefs on likelihood of sharing the presented news, with epistemic emotionality, perceived credibility, and perceived accuracy as sequential mediators. Prior political beliefs and

Perceived credibility are latent variables and for each of them the path of one indicator was set to 1 to define the scale. Surprise and interest were averaged and entered in the model as observed composite variable entitled Epistemic emotionality, because latent variables do not perform well with less than three indicators. For the same reason, the single indictors of accuracy and sharing were entered as observed variables. In order to be able to compare both conditions, we specified two routes in the model — one for the fake and the other for the true news items — estimating mirrored paths for each. Mirrored concepts were allowed to correlate with each other in the model. Furthermore, all parameters' estimations across imputations were pooled following Rubin's rules for multiple imputation datasets (*Chapter9 Rubin's Rules*, n.d.). For the calculation of the degrees of freedom for the significance tests of regression weights, recommendations by Lipsitz et al., (2002) were followed. Finally, to account for non-normality in the data, indirect effects were estimated using bootstrapping with 1000 bootstrap samples.

4 Results

Correlations between the measured variables (Spearman's Rho) can be found in Table 2. The significance of the mean score differences between the two conditions (see Table 3) was tested in a General Linear Model with repeated measures with condition (true news versus fake news) and type of measure as within subject-factors.

Table 2 Spearman correlations of political beliefs and measures for true and fake news

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Political Party																		
2 Trust Sovereign Bodies	-.098																	
3 Parliamentary Representation	-.136*	.614**																
4 Perceived Corruption	-.058	.267**	.22**															
5 Voting Behaviour	-.125*	.190**	.16**	.095														
6 Surprise true	.119	-.08	-.062	-.047	-.127													
7 Surprise fake	.039	-.138*	-.101	-.158*	-.146*	.521**												
8 Interest true	.053	-.172*	-.136	-.1	-.112	.451**	.325**											
9 Interest fake	.091	-.233**	-.153*	-.119	-.139	.383**	.43**	.5**										
10 Rigorosity true	-.043	-.016	-.03	-.084	-.027	.331**	.242**	.539**	.306**									
11 Rigorosity fake	.010	-.005	.001	-.044	-.056	.208*	.29**	.289**	.37**	.337**								
12 Trustworthiness true	.005	-.059	-.063	-.073	-.113	.321**	.208**	.519**	.324**	.696**	.257**							
13 Trustworthiness fake	-.068	-.022	.009	-.001	-.03	.146	.23**	.204*	.427**	.22**	.584**	.234**						
14 Impartiality true	-.029	-.029	-.048	.034	.039	.321**	.23*	.431**	.255**	.549**	.24**	.558**	.237**					
15 Impartiality fake	-.023	-.092	-.029	.015	-.066	.213*	.31**	.286**	.41**	.224*	.45**	.234**	.473**	.359**				
16 Belief true	.078	-.007	-.042	.063	-.031	.054	-.031	.075	.009	.153*	.01	.187*	-.003	.074	.046			
17 Belief fake	-.074	-.022	-.065	.03	-.023	-.043	.021	-.034	.138	-.003	.26**	.007	.349**	-.031	.181	.085		

18 Share true	.128	-.052	-.033	-.151*	-.096	.212*	.233*	.416**	.239**	.442**	.2*	.374**	.139	.345**	.182**	-.033	-.037	
19 Share fake	.044	-.219**	-.178**	-.174*	-.134	.211**	.245**	.284**	.367**	.233**	.268**	.186**	.254**	.117	.23**	-.055	.123	.356**

Note. * p < 0.05, ** p < .01 (2-tailed). Results pooled over 5 imputations.

Table 3 Mean differences between fake and true news posts, and their statistical relevance seen in the general linear model results columns.

			GLM		
		M (*SD*)	*df*	*F*	*p*
Share	Fake	1.76 (0.62)	1, 258	12.53	< .001
	True	1.91 (0.64)			
Belief	Fake	4.1 (1.23)	1, 258	42.04	< .001
	True	4.39 (1.05)			
Surprise	Fake	3.03 (0.88)	1, 258	9.12	< .001
	True	2.88 (0.83)			
Interest	Fake	2.9 (0.85)	1, 258	72.43	< .001
	True	2.46 (0.82)			
Rigorosity	Fake	2.84 (0.74)	1, 258	75.15	< .001
	True	2.4 (0.74)			
Impartiality	Fake	2.65 (0.74)	1, 258	35.01	< .001
	True	2.35 (0.73)			
Trustworthiness	Fake	2.78 (0.71)	1, 258	36.43	< .001
	True	2.44 (0.73)			

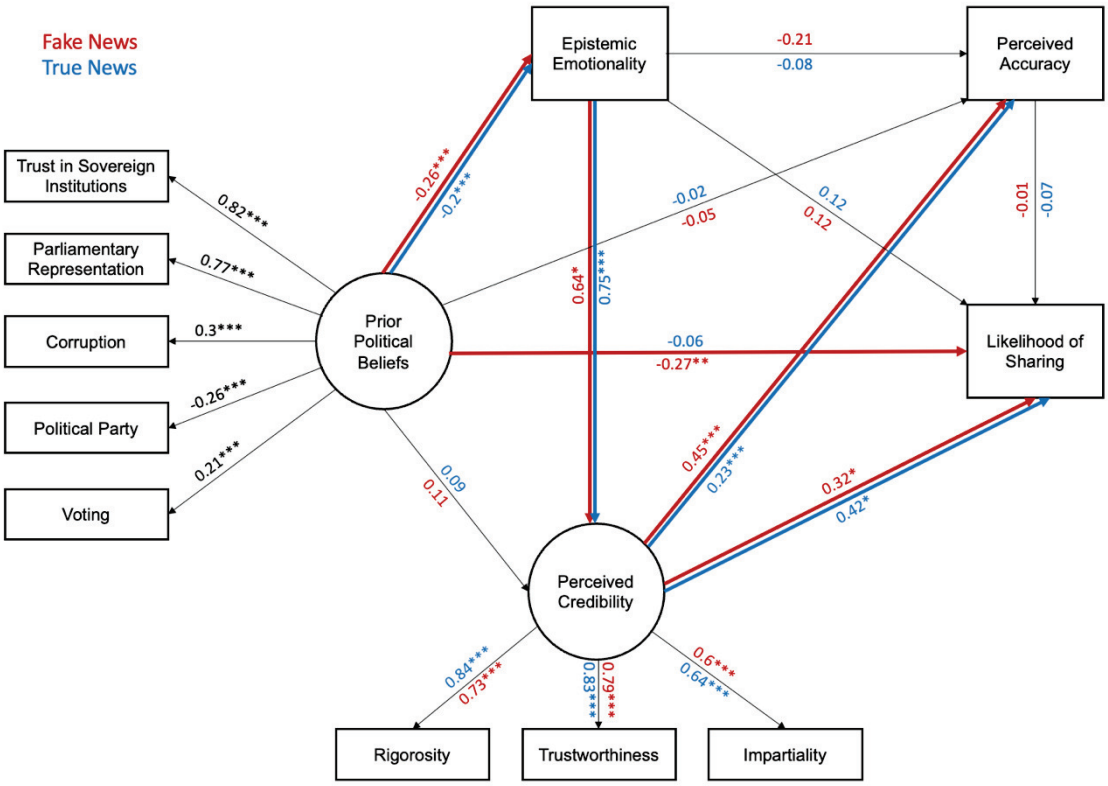
Significant differences were found on all variables, with higher scores for true news than for fake news on accuracy and on sharing, but higher scores for fake news on emotion and credibility measures.

To test the hypotheses, we run the above mentioned model in R, using the Lavaan module. Model fit values revealed a model well-adjusted to data, varying across imputations $131.99 < \chi^2 (98) < 173.92$, $p < .013$; $0.942 <$ Comparative Fit Index (CFI) < 0.972; $0.92 <$ Tucker-Lewis Index (TLI) < 0.962; $0.037 <$ Root mean square error of approximation (RMSEA) < 0.055, $p > 0.3$[6]; Standardized root mean square residual (SRMR) < 0.059[7]. The explained variance of the dependent variables and mediators varied across imputations for Fake News' Perceived Accuracy:.131 $< R^2 < .221$; Real News' Perceived Accuracy: $.020 < R^2 < .073$; Likelihood of Sharing Fake News: $.269 < R^2 < .313$; Likelihood of Sharing Real News: $.262 < R^2 < .339$; Perceived Credibility of Fake news: $.264 < R^2 < .315$; Perceived Credibility of Real News: .350

[6] Lowest *p* value for RMSEA across imputations.
[7] Highest across imputations.

< R^2 < .391; Epistemic Emotionality of Fake News: .065 < R^2 < .091; Epistemic Emotionality of Real News: .033 < R^2 < .058.

Figure 2 Structural and measurement model of the impact of previous political beliefs on accuracy perceptions and likelihood of sharing true versus fake news posts items.



Note. Standardized regression coefficients. *p < .05, **p < .01, ***p < .001

4.1 The model's structure is depicted in Figures 1 and the parameter estimates for true and false news are depicted in Figure 2.

4.2.1 Indirect Effects. The results obtained with the SEM analysis indicate that prior beliefs may indeed influence participants' perceived accuracy of the news posts, but they do so through epistemic emotional cues and perceived credibility of the message. This indirect effect of prior beliefs on perceived accuracy through emotionality and perceived credibility was only statistically significant for fake news posts (β = -0.073, SE = 0.026, p = .007), but not for the true news posts (β = -0.030, SE = 0.019, p < .14). The indirect effect of prior beliefs on likelihood of sharing through epistemic emotionality and perceived credibility was statistically significant for both fake (β = -0.055, SE = 0.017, p = .005) and true news (β = -0.059, SE = 0.016, p < .001). However, because of an unexpected direct effect of political beliefs on likelihood of sharing

misinformation, this mediation was only partial for fake news, whereas it was complete for true news.

5.2.2 Direct Effects. The results indicate that the news items' perceived accuracy in both conditions did not explain the likelihood of sharing when controlling for their shared predictors. Thus, in line with previous results, news items were not more likely to be shared by participants if they were perceived as more accurate. Results also indicate that participants' prior beliefs did not directly influence the perceived accuracy of the fake and true news items, with both direct effects of prior beliefs on Perceived Accuracy being statistically insignificant. There was a significant negative direct effect of priors beliefs on likelihood of sharing fake news items (β = -0.265, *SE* = 0.075, *p* = .007). That is, the more negative were participants' previous political beliefs, the higher was the likelihood of them sharing fake news items. In contrast, the direct effect of prior beliefs on the likelihood of sharing true news items was not statistically significant (β = -0.055, *SE* = 0.036, *p* = .13). Apart from effects mediated by perceived credibility, there was no significant direct effect of emotionality on perceived accuracy and likelihood of sharing either true or fake news items.

In contras to the clear significant differences in means between fake and true news, the regression weights in the SEM model did most of the time not differ between fake news and true news. Some differences were noticeable at face value, such as in the direct effect of prior beliefs on sharing or in the effect of perceived credibility on accuracy. However, these differences were not significant because when these regression weights were constrained to be equal between fake and true news the model fit did no significantly drop.

5 Discussion

The main goal of the current research was to examine the processes that lead to believing and sharing of accurate and fake news posts. Based on previous literature that had identified biased thinking as an important predictor of belief in fake news, we proposed that both attribution of truth to news and sharing intentions should depend on perceived credibility, emotionally epistemic responses, and previous beliefs. Guided by the proposal of a Bayesion process of belief-updating in the face of new information (Mandel, 2014) we hypothesized that epistemic emotions such as interest and surprise and perceived credibility should independently mediate the relation between prior beliefs in the political system and believing as well as sharing of political news posts. We also wanted to explore whether these processes differ between true and fake news. To test these ideas we asked participants in an online experiment for their previous beliefs regarding

the democratic political system, and then exposed them to a set of accurate and fake political news, all with rather negative connotations, asking them to guess whether each news was true or false. We also asked them to indicate how surprising and interesting they found the news posts to be (epistemic emotions), how trustworthy, rigorous and impartial they news post was (perceived credibility) and how willing they would be to share the news on social media.

Preliminary analyses revealed that participants believed most of the presented news (true and fake) but that readiness to share them was relatively low. When interpreting our results, we therefore need to acknowledge that they can be subject to ceiling or floor effects. However, we also found that true news were rated as being more accurate than fake news, and intention to share was also lower for fake news. Fake news, on the other hand, were rated higher on interest and surprise, and, unexpectedly, they were also perceived as being more credible. Note that perceived credibility did not refer to the news content (as the dependent variable of the accuracy ratings did) but to the question whether the news item was trustworthy, neutral and rigorous. The test of the predicted model did support our mediation hypotheses, that were derived from theoretical reasoning, but with a twist. Epistemic emotional response to the news and perceived credibility did play a mediating role in the impact of prior political beliefs on perceived accuracy (H1 and H3, respectively) and likelihood of sharing (H2 and H4, respectively). However, unexpectedly, the relation between epistemic emotionality and perceived accuracy and likelihood of sharing was fully mediated by perceived credibility. Likewise, the relation between prior beliefs and perceived credibility of the presented news was mediated by epistemic emotional response. Both effects combined resulted in a sequential chain mediation, instead of parallel mediation processes as we had predicted. This sequential mediation run from previous beliefs via emotional response and perceived credibility to the outcome variables of accuracy attribution and sharing intention. The reason for this unexpected sequence was that higher epistemic emotionality, in terms of interest and surprise, translated into perceptions of increased credibility (i.e., participants tended to trust more the news posts that elicited more surprise and interest), an effect that occurred both for fake and true news. Because there was a stronger emotional response to fake news than to true news, this effect can also explain why fake news were paradoxically perceived as more credible.

Participants that held more negative views about the political democratic system were more emotional about the two types of news: fake and true. One should keep in mind that we only measured emotions that were linked to epistemic concerns, more specifically, surprise and interest. Other emotions may play a different role in the willingness to believe or share, as they could undermine the detection of fake or bias participants reasoning towards a desired outcome (motivated reasoning). However, in the current research we were particularly interested in the emotions related to epistemic processes, and it seems that they indeed play a crucial role on the

way how previous believes influence how people deal with news. Theoretically we had assumed that they will influence the weight that is given to new information in the upating of prior beliefs, and that might indeed be the case. However, the unexpected mediaton of the emotions' impact by credibility perception seems rather to suggest that these emotions inform how informative the news posts are considered at the first place.

These processes seem to apply in the same way to both true and fake news. The regression coefficients in the structural equation model were not significantly different between fake and true news, even if the descriptive pattern pointed to a slightly larger (unexplained) direct effect from prior beliefs to sharing. Individuals with more negative beliefs about the political system seem to have an additional incentive to share fake news that is not explained by emotion, or credibility, or accuracy perceptions. Previous literature suggested that the purpose of such sharing may be ideology or identity protection motivations (Pereira et al., 2018). Overall, however, these processes were not significantly different between true and fake news in our data. One could argue that this might be due to the fact that participants were unable to distinguish between true and fake news in this study. However, the significant mean differences between fake and true news seem to contradict this explanation. Instead, we would suggest that perhaps the process of dealing with news does not – at least psychologically – differ that much between these two kind of news, even if people are knowledgeable (i.e., tend to believe more in true than in fake news) and socially responsible (i.e., tend to share less fake than true news).

Contradicting common sense, but consistent with previous literature, perceiving news as being accurate did not increase the likelihood of sharing (Pennycook et al., 2021). That is, we found for both true and fake news that believing and sharing news content were two unrelated outcomes in our model, with sharing intentions being independent from the perceived truthiness of the news. As a result of the disconnect between belief and sharing, interventions intending to increase awareness to fake news may result in a decrease in overall belief but may not necessarily result in a decrease of sharing intent (Bor et al., 2020).

5.1 Methodological Innovations

The current study brought three main innovations, (i) the multiforms design method, which allowed to have a more efficient data collection; (ii) the interactivity/responsiveness, which resulted in higher data integrity; and (iii) distinguishing between fake and true news in the processes of human detection and sharing.

5.2 Limitations

The sample used in this study Was made of Portuguese participants, and the materials were specific to the Portuguese socio-political-mediatic context. Thus, it is still an open question whether these results can be generalized beyond this scope. Moreover, in this study, we relied on CrowdTangle autonomous search and on independent fact checkers to categorize the materials, but the final selection of items was not pre-tested. That means that we cannot exclude that our own biases might have influenced the final cut of items to be included in the study. Pre-testing materials is a way to ensure that researchers' own biases are not carried over to the selected stimuli, and that the final selected items are working as expected for the study questions and design. Another issue comes from the eventual backlash of opting to present the news posts in a naturalistic way (unmodified in all aspects except on the publisher's identification). Whereas this choice gives the materials ecological validity, we cannot deny that there was added noise from confound variables unaccounted for in the model (e.g., the images' emotional strength or number of likes). There is also a consideration to be made regarding the use of the multiform planned missings design — because in most of the variables 40% of the data was generated synthetically using the multiple imputation method. However, computing the model on the original data (prior imputations) yielded very similar results. Lastly, as we used cross-sectional data collection, we cannot rule out that the causal processes that are proposed in our approach are actually responsible for the data-pattern. The issue of reversed causation can only be ruled out for the effects of prior beliefs (as they were assessed before the news presentation), but not for the other effects. Moreover, there might be third variables unaccounted so far, which can produce spurious correlations.

5.3 Future Directions

Despite the large body of research that was produced on this topic, social science has not yet unveiled a coherent and understandable model of the psychological processes that make us fall– or not – for fake news, and share them. Such a model could help researchers, computer scientists and policy makers to pinpoint the differences in these processes, depending on the news accuracy. This work is the result of an effort made to address that issue, but it does not solve the problem. We consider our research, however, as a first step to put the promising Bayesian approach to an empirical test by deriving predictable and testable hypotheses from it and by attaining interpretable – though partially unexpected - results.

We believe that future research could improve upon the shortages of the present study, and that the presented model can be augmented and refined. We can foresee a future model benefiting from the crossing of big data extracted from social media with survey responses; specially, if we are interested in understanding sharing behaviour and fake news spreading as an informational anomaly rooted in human psychology. The question that seems to follow our results is why some

individuals share fake news, regardless of perceived accuracy, perceived credibility and emotionality. We call for research that intersects the effects of different cognitive dispositions with motivational reasons to address this issue.

5.4 Concluding remarks

The current work examined the role of prior beliefs, epistemic emotions, and perceived credibility to understand predictors of news sharing and believing. To our knowledge, that is the first time that these particular processes have been conceptualized through the lens of the Bayesian framework that we adopted. By providing an intuitive and empirically testable model we expect to contribute to the improvement of the discussion around the psychological key drivers of fake news spreading, which can be useful to those working on detection or prevention of fake news, be they human or automatic.

Data Accessibility. Stimuli and collected data can be found at this project's page at the Open Science Framework website:

https://osf.io/5et7q/?view_only=3996f2d1f9f5458ca184cdfeadcbe653 (anonymized link)

Funding Sources. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

Allen, J., Howland, B., Mobius, M., Rothschild, D., & Watts, D. J. (2020). Evaluating the fake news problem at the scale of the information ecosystem. *Science Advances*, *6*(14), eaay3539. https://doi.org/10.1126/sciadv.aay3539

Baldi, P., & Itti, L. (2010). Of bits and wows: A Bayesian theory of surprise with applications to attention. *Neural Networks*, *23*(5), 649–666. https://doi.org/10.1016/j.neunet.2009.12.007

Bor, A., Osmundsen, M., Rasmussen, S. H. R., Bechmann, A., & Petersen, M. B. (2020). *'Fact-checking' videos reduce belief in but not the sharing of 'fake news' on Twitter*. PsyArXiv. https://doi.org/10.31234/osf.io/a7huq

Bovet, A., & Makse, H. A. (2019). Influence of fake news in Twitter during the 2016 US presidential election. *Nature Communications*, *10*(1), 7. https://doi.org/10.1038/s41467-018-07761-2

Brashier, N. M., Eliseev, E. D., & Marsh, E. J. (2020). An initial accuracy focus prevents illusory truth. *Cognition*, *194*, 104054. https://doi.org/10.1016/j.cognition.2019.104054

Brummette, J., DiStaso, M., Vafeiadis, M., & Messner, M. (2018). Read All About It: The Politicization of "Fake News" on Twitter. *Journalism & Mass Communication Quarterly*, *95*(2), 497–517. https://doi.org/10.1177/1077699018769906

Buchanan, T., & Benson, V. (2019). Spreading Disinformation on Facebook: Do Trust in Message Source, Risk Propensity, or Personality Affect the Organic Reach of "Fake News"? *Social Media + Society*, *5*(4), 2056305119888654. https://doi.org/10.1177/2056305119888654

Chang, R., & Little, T. D. (2018). Innovations for Evaluation Research: Multiform Protocols, Visual Analog Scaling, and the Retrospective Pretest–Posttest Design. *Evaluation & the Health Professions*, *41*(2), 246–269. https://doi.org/10.1177/0163278718759396

Chapter9 Rubin's Rules. (n.d.). bookdown.org. Retrieved November 15, 2022, from https://bookdown.org/mwheymans/bookmi/rubins-rules.html

Dahlgren, P. (2018). Media, Knowledge and Trust: The Deepening Epistemic Crisis of Democracy. *Javnost - The Public*, *25*(1–2), 20–27. https://doi.org/10.1080/13183222.2018.1418819

Deutskens, E., de Ruyter, K., Wetzels, M., & Oosterveld, P. (2004). Response Rate and Response Quality of Internet-Based Surveys: An Experimental Study. *Marketing Letters*, *15*(1), 21–36. https://doi.org/10.1023/B:MARK.0000021968.86465.00

Druckman, J. N. (2019). The evidence for motivated reasoning in climate change preference formation. *Nature Climate Change*, *9*, 9.

Ekman, P., Levenson, R. W., & Friesen, W. V. (1983). Autonomic nervous system activity distinguishes among emotions. *Science (New York, N.Y.)*, *221*(4616), 1208–1210. https://doi.org/10.1126/science.6612338

Estimating Statistics and Imputing Missing Values. (n.d.). https://www.ibm.com/docs/en/spss-statistics/27.0.0?topic=analysis-estimating-statistics-imputing-missing-values

Fake news. (n.d.). Retrieved 8 April 2021, from https://dictionary.cambridge.org/dictionary/english/fake-news

Fletcher, R., & Park, S. (2017). The Impact of Trust in the News Media on Online News Consumption and Participation. *Digital Journalism*, *5*(10), 1281–1299. https://doi.org/10.1080/21670811.2017.1279979

Friggeri, A., Adamic, L., Eckles, D., & Cheng, J. (2014, May). Rumor cascades. In *proceedings of the international AAAI conference on web and social media* (Vol. 8, No. 1, pp. 101-110).

Frijda, N. H. E. (2000). *Emotions and Beliefs: How Feelings Influence Thoughts*. Cambridge University Press.

Gleason, P. M., & Harris, J. E. (2019). The Bayesian Approach to Decision Making and Analysis in Nutrition Research and Practice. *Journal of the Academy of Nutrition and Dietetics*, *119*(12), 1993–2003. https://doi.org/10.1016/j.jand.2019.07.009

Griffiths, P. E. (2008). *What Emotions Really Are: The Problem of Psychological Categories*. University of Chicago Press.

Guess, A., Nagler, J., & Tucker, J. (2019). Less than you think: Prevalence and predictors of fake news dissemination on Facebook. *Science Advances*, *5*(1), eaau4586. https://doi.org/10.1126/sciadv.aau4586

Hotez, P. J. (2020). Combating antiscience: Are we preparing for the 2020s? *PLoS Biology*, *18*(3). https://doi.org/10.1371/journal.pbio.3000683

Itti, L., & Baldi, P. (2009). Bayesian surprise attracts human attention. *Vision Research*, *49*(10), 1295–1306. https://doi.org/10.1016/j.visres.2008.09.007

Juul, J. L., & Ugander, J. (2021). Comparing information diffusion mechanisms by matching on cascade size. *Proceedings of the National Academy of Sciences, 118(46)*, e2100786118.

Karlsen, R., & Aalberg, T. (2021). Social Media and Trust in News: An Experimental Study of the Effect of Facebook on News Story Credibility. *Digital Journalism*, 1-17.

Kim, A., & Dennis, A. (2018, January 3). *Says Who?: How News Presentation Format Influences Perceived Believability and the Engagement Level of Social Media Users*. https://doi.org/10.24251/HICSS.2018.497

Kramer, A. D. I., Guillory, J. E., & Hancock, J. T. (2014). Experimental evidence of massive-scale emotional contagion through social networks. *Proceedings of the National Academy of Sciences*, *111*(24), 8788–8790. https://doi.org/10.1073/pnas.1320040111

Kumkale, G. T., Albarracín, D., & Seignourel, P. J. (2010). The Effects of Source Credibility in the Presence or Absence of Prior Attitudes: Implications for the Design of Persuasive Communication Campaigns. *Journal of Applied Social Psychology*, *40*(6), 1325–1356. https://doi.org/10.1111/j.1559-1816.2010.00620.x

Kuru, O., Pasek, J., & Traugott, M. W. (2017). Motivated Reasoning in the Perceived Credibility of Public Opinion Polls. *Public Opinion Quarterly*, *81*(2), 422–446. https://doi.org/10.1093/poq/nfx018

Lazer, D. M. J., Baum, M. A., Benkler, Y., Berinsky, A. J., Greenhill, K. M., Menczer, F., Metzger, M. J., Nyhan, B., Pennycook, G., Rothschild, D., Schudson, M., Sloman, S. A., Sunstein, C. R., Thorson, E. A., Watts, D. J., & Zittrain, J. L. (2018). The science of fake news. *Science*, *359*(6380), 1094–1096. https://doi.org/10.1126/science.aao2998

Lee, M. D., & Vanpaemel, W. (2018). Determining informative priors for cognitive models. *Psychonomic Bulletin & Review*, *25*(1), 114–127. https://doi.org/10.3758/s13423-017-1238-3

Leron, U., & Hazzan, O. (2009). Intuitive vs analytical thinking: Four perspectives. *Educational Studies in Mathematics*, *71*(3), 263–278. https://doi.org/10.1007/s10649-008-9175-8

Levine, T. R. (2014). Truth-Default Theory (TDT): A Theory of Human Deception and Deception Detection. *Journal of Language and Social Psychology*, *33*(4), 378–392. https://doi.org/10.1177/0261927X14535916

Lipsitz, S., Parzen, M., & Zhao, L. P. (2002). A Degrees-Of-Freedom approximation in Multiple imputation. *Journal of Statistical Computation and Simulation*, *72*(4), 309–318. https://doi.org/10.1080/00949650212848

Luo, M., Hancock, J. T., & Markowitz, D. M. (2020). Credibility Perceptions and Detection Accuracy of Fake News Headlines on Social Media: Effects of Truth-Bias and Endorsement Cues. *Communication Research*, 0093650220921321. https://doi.org/10.1177/0093650220921321

Lutz, B., Adam, M. T. P., Feuerriegel, S., Pröllochs, N., & Neumann, D. (2020). Affective Information Processing of Fake News: Evidence from NeuroIS. In F. D. Davis, R.

Riedl, J. vom Brocke, P.-M. Léger, A. Randolph, & T. Fischer (Eds.), *Information Systems and Neuroscience* (pp. 121–128). Springer International Publishing. https://doi.org/10.1007/978-3-030-28144-1_13

Mandel, D. R. (2014). The psychology of Bayesian reasoning. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.01144

Martel, C., Pennycook, G., & Rand, D. G. (2020). Reliance on emotion promotes belief in fake news. *Cognitive Research: Principles and Implications*, *5*(1), 47. https://doi.org/10.1186/s41235-020-00252-3

Mellers, B., Fincher, K., Drummond, C., & Bigony, M. (2013). Chapter 1 - Surprise: A belief or an emotion? In V. S. C. Pammi & N. Srinivasan (Eds.), *Progress in Brain Research* (Vol. 202, pp. 3–19). Elsevier. https://doi.org/10.1016/B978-0-444-62604-2.00001-0

Metzger, M. J., & Flanagin, A. J. (2013). Credibility and trust of information in online environments: The use of cognitive heuristics. *Journal of Pragmatics*, *59*, 210–220. https://doi.org/10.1016/j.pragma.2013.07.012

Metzger, M. J., Flanagin, A. J., & Medders, R. B. (2010). Social and Heuristic Approaches to Credibility Evaluation Online. *Journal of Communication*, *60*(3), 413–439. https://doi.org/10.1111/j.1460-2466.2010.01488.x

Nunes, A., Limpo, T., Lima, C. F., & Castro, S. L. (2018). Short Scales for the Assessment of Personality Traits: Development and Validation of the Portuguese Ten-Item Personality Inventory (TIPI). *Frontiers in Psychology*, *9*. https://doi.org/10.3389/fpsyg.2018.00461

Pekrun, R., and Stephens, E. J. (2012). "Academic emotions," in APA educational psychology handbook, Vol. 2, eds K. R. Harris, S. Graham, T. Urdan, S. Graham, J. M. Royer, and M. Zeidner (Washington, DC: American Psychological Association), 3–31.

Pennycook, G., Cannon, T. D., & Rand, D. G. (2018). Prior exposure increases perceived accuracy of fake news. *Journal of Experimental Psychology. General*, *147*(12), 1865–1880. https://doi.org/10.1037/xge0000465

Pennycook, G., Epstein, Z., Mosleh, M., Arechar, A. A., Eckles, D., & Rand, D. G. (2021). Shifting attention to accuracy can reduce misinformation online. *Nature*, 1–6. https://doi.org/10.1038/s41586-021-03344-2

Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G., & Rand, D. G. (2020). Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. *Psychological Science*, *31*(7), 770–780. https://doi.org/10.1177/0956797620939054

Pennycook, G., & Rand, D. G. (2019). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, *188*, 39–50. https://doi.org/10.1016/j.cognition.2018.06.011

Pennycook, G., & Rand, D. G. (2020). Who falls for fake news? The roles of bullshit receptivity, overclaiming, familiarity, and analytic thinking. *Journal of Personality*, *88*(2), 185–200. https://doi.org/10.1111/jopy.12476

Pennycook, G., & Rand, D. G. (2021). The Psychology of Fake News. *Trends in Cognitive Sciences*. https://doi.org/10.1016/j.tics.2021.02.007

Pereira, A., Bavel, J. J. V., & Harris, E. A. (2018). *Identity concerns drive belief: The impact of partisan identity on the belief and dissemination of true and false news*. PsyArXiv. https://doi.org/10.31234/osf.io/7vc5d

Petersen, M. B., Osmundsen, M., & Arceneaux, K. (2018). *The "Need for Chaos" and Motivations to Share Hostile Political Rumors*. PsyArXiv. https://doi.org/10.31234/osf.io/6m4ts

Petty, R., & Cacioppo, J. (1986). The Elaboration Likelihood Model of Persuasion. *Advances in Hydroscience*, *19*, 124–205.

Ridderinkhof, K. R. (2017). Emotion in Action: A Predictive Processing Perspective and Theoretical Synthesis. *Emotion Review*, *9*(4), 319–325. https://doi.org/10.1177/1754073916661765

Rosseel, Y. (n.d.). *lavaan: An R package for structural equation modeling and more Version 0.5-12 (BETA)*. 37.

Rubin, D. B. (1976). Inference and missing data. *Biometrika*, *63*(3), 581–592. https://doi.org/10.1093/biomet/63.3.581

Scherer, K. R., Schorr, A., & Johnstone, T. (2001). *Appraisal Processes in Emotion: Theory, Methods, Research*. Oxford University Press.

Silvia, P. J. (2001). Interest and Interests: The Psychology of Constructive Capriciousness. *Review of General Psychology*, *5*(3), 270–290. https://doi.org/10.1037/1089-2680.5.3.270

Silvia, P. J. (2008). Interest—The Curious Emotion. *Current Directions in Psychological Science*, *17*(1), 57–60. https://doi.org/10.1111/j.1467-8721.2008.00548.x

Silvia, P. J., Kwapil, T. R., Walsh, M. A., & Myin-Germeys, I. (2014). Planned Missing Data Designs in Experience Sampling Research: Monte Carlo Simulations of Efficient Designs for Assessing Within-Person Constructs. *Behavior Research Methods*, *46*(1), 41–54. https://doi.org/10.3758/s13428-013-0353-y

Sindermann, C., Cooper, A., & Montag, C. (2020). A short review on susceptibility to falling for fake political news. *Current Opinion in Psychology*, *36*, 44–48. https://doi.org/10.1016/j.copsyc.2020.03.014

Stefanone, M. A., Vollmer, M., & Covert, J. M. (2019). In News We Trust? Examining Credibility and Sharing Behaviors of Fake News. *Proceedings of the 10th International Conference on Social Media and Society*, 136–147. https://doi.org/10.1145/3328529.3328554

Srinivasan, M., & Barclay, F. P. (2017). Media credibility: A triangulation test. *Journal of Content, Community & Communication*, *6*(3).

Sterne, J. A. C., White, I. R., Carlin, J. B., Spratt, M., Royston, P., Kenward, M. G., Wood, A. M., & Carpenter, J. R. (2009). Multiple imputation for missing data in epidemiological and clinical research: Potential and pitfalls. *BMJ*, *338*, b2393. https://doi.org/10.1136/bmj.b2393

Trevors, G. J., Muis, K. R., Pekrun, R., Sinatra, G. M., & Muijselaar, M. M. L. (2017). Exploring the relations between epistemic beliefs, emotions, and learning from texts. *Contemporary Educational Psychology*, *48*, 116–132. https://doi.org/10.1016/j.cedpsych.2016.10.001

Tsang, S. J. (2020). Motivated Fake News Perception: The Impact of News Sources and Policy Support on Audiences' Assessment of News Fakeness. *Journalism & Mass Communication Quarterly*, 107769902095212. https://doi.org/10.1177/1077699020952129

Van Bavel, J. J., & Pereira, A. (2018). The Partisan Brain: An Identity-Based Model of Political Belief. *Trends in Cognitive Sciences*, *22*(3), 213–224. https://doi.org/10.1016/j.tics.2018.01.004

Visentin, M., Pizzi, G., & Pichierri, M. (2019). Fake News, Real Problems for Brands: The Impact of Content Truthfulness and Source Credibility on consumers' Behavioral Intentions toward the Advertised Brands. *Journal of Interactive Marketing*, *45*, 99–112. https://doi.org/10.1016/j.intmar.2018.09.001

Vogl, E., Pekrun, R., Murayama, K., Loderer, K., & Schubert, S. (2019). Surprise, Curiosity, and Confusion Promote Knowledge Exploration: Evidence for Robust Effects of Epistemic Emotions. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.02474

Vosoughi, S., Roy, D., & Aral, S. (2018). The spread of true and false news online. *Science*, *359*(6380), 1146–1151. https://doi.org/10.1126/science.aap9559

Waisbord, S. (2018). The elective affinity between post-truth communication and populist politics. *Communication Research and Practice*, *4*(1), 17–34. https://doi.org/10.1080/22041451.2018.1428928

Wardle, C., & Derakhshan, H. (2017). *INFORMATION DISORDER: Toward an interdisciplinary framework for research and policy making Information Disorder Toward an interdisciplinary framework for research and policymaking*.

Wardle, C., & Derakhshan, H. (2018). *Thinking about 'information disorder': Formats of misinformation, disinformation, and mal-information*. 12.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of personality and social psychology*, *54*(6), 1063.

Young, E. (2016). A new understanding: What makes people trust and rely on news. *American Press Institute. Accessed December*, *18*, 2018.

Zarocostas, J. (2020). How to fight an infodemic. *The Lancet*, *395*(10225), 676. https://doi.org/10.1016/S0140-6736(20)30461-X

Credit Author Statement

Angela Rijo: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing – Original Draft, Writing – Review & Editing, Visualization. **Sven Waldzus**: Methodology, Software, Validation, Formal analysis, Data curation, Writing – Original Draft, Writing – Review & Editing, Supervision.