

Fake News Framing, Emotion, Argumentation, and Dialogic Social Knowledge Building in Online Discussions: An Exploration Including Natural Language Processing Data

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Abstract: Fake news negatively impacts individuals and society by bringing misinformation and negative emotions into the social knowledge building process, affecting reasoning and argumentation, and leading to misconceptions. Semantic, emotional, and value framing are frequent instruments of fake news dissemination; however, little is known about their effects. In this study, we investigate to what extent fake news framing predicts emotions, argumentation, and social knowledge building in online discussions at a German site. Employing manual content analysis of postings, and automated content analysis of online discussions based on natural language processing, we found significant relationships. Prominently, fake news framing predicted a large amount of variance in two indicators of social knowledge building. Our findings may inform fake news literacy interventions that counteract fake news by making framing transparent to the news consumers.

Introduction

Fake news (Lazer et al., 2018) negatively impacts individuals and society, a major symptom from a psychological perspective being that internet users share misinformation and misconceptions. Such mass communication is accompanied by negative emotions and attitudes, and integrates misconceptions via reasoning and argumentation in the wider dialogic social knowledge building (Trausan-Matu et al., 2021), and in the individual and collective memory (Greifeneder et al., 2020; Pennycook & Rand, 2021). More in detail, fake news effects are grounded in perception and cognitive biases interacting with technological and social phenomena. For instance, humans tend to focus more on negative than on positive information (negativity bias; Park, 2015). Repeated statements appear more credible than information provided only once (illusory truth; Fazio et al., 2015). Information that better fit previous knowledge is easier accepted and cognitively processed (confirmation bias; McGrath, 2017). Some individuals regard their own view of the world as the only valid one, dismissing incongruent information (naïve realism; Cheek, 2020). User profiling leads the recommender systems widely used in social networks to predominantly or exclusively provide users with the information they already accept and believe in (filter bubbles; Pariser, 2016). In combination, all these can sustain the so-called echo chambers, in which like-minded internet users entertain a naïve reality and confirm each other’s biases (Villa et al., 2021).

One of the most frequent techniques used to insidiously convey misinformation is framing. As defined by Entman (1993), “to frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described” (p. 52). Oswald (2019) identifies three categories of framing: semantic framing (associating specific connotations to communication contents, e.g., by using repetitions, striking titles, or lexical inventions), emotional framing (activating emotions in context, i.e., mostly negative emotions like anger), and value framing (appealing to norms and values, e.g., calling for honesty and justice). Often, these semantic connotations, emotions, norms, and values are not necessarily relevant for the overt message, but are covertly inserted in order to manipulate the recipients.

One of the possible interventions against fake news is inoculation (McGuire, 1964) aimed at making manipulation techniques, particularly framing transparent to the news consumers (Basol et al., 2020; Scheibenzuber et al., 2021). However, Oswald’s (2019) classification suggests that different types of framing may have different effects on recipients’ emotions and reasoning, and, more generally, on dialogic social knowledge

building (Trausan-Matu et al., 2021). To enable focused interventions against fake news framing, we need to understand the relationship between fake news framing and dialogic knowledge construction in online environments. Currently, however, this understanding appears limited.

Research questions

Addressing the gap in research identified above, our study addresses the following three *research questions*: To what extent does fake news framing predict (1) emotions, (2) social knowledge building, and (3) argumentation in the online community dialog initiated by the fake news?

Methodology

Our study was built upon a correlative design in an online community setting, with measures based on manual and automated content analysis. The currently available corpus consisted of a sample of 8 articles in German posted in March 2021 on a news site known for frequent dissemination of fake news (Vogel & Jiang, 2019). These articles had initiated a total of 412 comments involving 109 online participants in total.

Manual content analysis was conducted to find occurrences of fake news framing (semantic, emotional, and value framing; Oswald, 2019) in the posted articles, components of argumentation structures (claim, data, warrant, qualifier; Toulmin, 1958), and expressions of negative and positive emotions in the subsequent online discussions. Two of the authors categorized units of content; in case of disagreement, a third coauthor decided which category applied.

Automated content analysis based on natural language processing was employed to assess social knowledge building in the discussions. We used the opensource framework ReaderBench version 0.10.58 (<http://readerbench.com>) (Dascalu et al., 2015) that builds upon dialogism (Trausan-Matu et al., 2021) and social network analysis (SNA; Borgatti et al., 2009), and overcomes inherent limitations of the traditional SNA by identifying the connections between actors by calculating the semantic similarities between their utterances. Thus, this tool performs a so-called cohesion network analysis (CNA; Dascalu et al., 2018) and provides similar indices like SNA, from which we used the CNA outdegree (the frequency with which a discussion participant addresses contents previously addressed by others) and its complement, the CNA indegree (the frequency with which the contents addressed by a participant are subsequently addressed by others) to assess dialogic social knowledge building (Trausan-Matu et al., 2021). For all statistical calculations we used IBM SPSS Statistics version 28.

Findings

In the 8 analyzed postings, *framing* occurred 182 times, from which 109 times as semantic framing (64 repetitions, 19 times use of group-specific terms, 13 times use of extraordinary lettering, 10 hyperbolization, 3 use of lexical inventions), 53 times as emotional framing (from which 1 call for compassion), and 20 times as value framing (6 calls for honesty, 4 calls for justice). Expressions of *negative emotions* were found in more than half of the comments (258 from 412), among which anger (151 occurrences) and anxiety (29) were the most frequent. Whereas *positive emotions* were less frequent (8 occurrences from 412). Elements of *argumentation* were relatively frequent, such that we found 321 claims, 125 conclusions, and 99 qualifiers. However, only 32 comments contained complete argumentation structures. With respect to *social knowledge building*, while the analyzed postings initiated on average $M = 51.5$ comments per posting ($SD = 7.9$) from $M = 30.0$ ($SD = 4.5$) participants, the *CNA indegree* was $M = 48.9$ ($SD = 10.7$) and the *CNA outdegree* $M = 44.6$ ($SD = 7.3$), describing discussions in which the number of references on other's comments was slightly smaller than the total number of comments or participants.

Fake news framing significantly predicted the *emotions expressed in the subsequent online dialog*, such that emotional framing (call for compassion, $\beta = .30, p < .001$) significantly predicted positive emotions. Value framing (call for honesty, $\beta = .37, p = .001$) and semantic framing (hyperbolization, $\beta = .19, p = .02$) positively predicted negative emotions, while emotional framing (call for compassion, $\beta = -.41, p < .001$) and semantic framing (using neologisms, $\beta = -.31, p = .02$; striking titles, $\beta = -.23, p < .02$) negatively predicted the same. Both regressions were significant ($F(412, 7) = 5.19, p < .001$ for positive emotions and $F(412, 7) = 5.66, p < .001$ for negative emotions), however, they explained a small amount of variance ($R^2 = .07$ in both regressions).

Remarkably, fake news framing significantly predicted the *social knowledge building in the subsequent online dialog*. *CNA outdegree* was positively predicted by value framing (call for honesty, $\beta = .72, p < .001$) and semantic framing (hyperbolization, $\beta = .35, p < .001$; use of special terms, $\beta = .11, p = .01$), and negatively predicted by semantic framing (lexical inventions, $\beta = -1.33, p < .001$; striking titles, $\beta = -.72, p < .001$) and value framing (call for justice, $\beta = -.32, p < .001$). This regression was significant ($F(412, 7) = 66.25, p < .001$) and explained a large amount of variance in CNA outdegree ($R^2 = .53$). Furthermore, *CNA indegree* was positively

predicted by value framing (call for honesty, $\beta = .66, p < .001$) and semantic framing (hyperbolization, $\beta = .33, p < .001$), and negatively predicted by semantic framing (lexical inventions, $\beta = -1.25, p < .001$; striking titles, $\beta = -.67, p < .001$) and value framing (call for justice, $\beta = -.28, p < .001$). This regression was significant, too ($F(412, 7) = 47.87, p < .001$) and also explained a large amount of variance in CNA outdegree ($R^2 = .44$).

Finally, we found no significant correlation between fake news framing and the occurrence of *argumentation* elements. However, there was a significant difference in terms of semantic framing of the initial post between the comments with complete argumentation structures and the other comments, such that comments containing complete argumentation structures ($n = 32$) were made on postings with more repetitions ($Mdn = 237.3$) and less defamation ($Mdn = 168.7$) than comments with incomplete or missing argumentation structures ($n = 380$), which were made on postings containing less repetitions ($Mdn = 203.9$) and more defamation ($Mdn = 209.7$). The Mann-Whitney test was significant for both the former ($U = 5096.0, p = .04$) and the latter comparison ($U = 4869.5, p = .05$).

Conclusions

Aiming to explore the relationship between fake news framing (Oswald, 2019) and dialogic social knowledge building (Trausan-Matu et al., 2019) in the online dialog this fake news initiates, we analyzed postings of a news site known in Germany for the dissemination of fake news (Vogel & Jiang, 2019) and online discussions initiated by these postings. In the postings, we identified framing in many instances and in all considered forms (semantic, emotional, and value framing). In the subsequent discussions, we found frequent expressions of negative emotions and very few of positive emotions (Park, 2015), numerous disparate elements of argumentation (mainly claims and conclusions), but very few complete argumentation structures. Social knowledge building was observable but limited to slightly less than one reference to others' utterances per comment and participant (McGrath, 2017). These generic findings suggest that the relatively high number of content repetitions in the initial postings may have generated illusory truth (Fazio et al., 2015), while the nearly 1:1 references on each other's contributions may have perpetuated this illusory truth in an echo chamber (Villa et al., 2021).

In line with our expectations, we found fake news framing to be correlated with the expressions of emotion and argumentation in the subsequent online discussions and, prominently, to predict indicators of dialogic social knowledge building (Trausan-Matu et al., 2019), i.e., CNA outdegree and indegree (Dascalu et al., 2018). This suggests that value framing (calling for honesty) and semantic framing (hyperbolization) may intensify the subversive effects of fake news by eliciting echo chamber discussions. Whereas other methods of semantic framing (lexical inventions, striking titles) and value framing (calling for justice) may have opposite effects, i.e., attenuate echo chamber discussions. Given that these relationships are actually hypotheses that we deduced from the analysis of few postings from a single news site, their generalizability is limited. To overcome this limitation, we plan to analyze more news postings and comments, also from other sites in diverse languages, and using machine learning for the analysis.

Nevertheless, as a consequence for educational practice, the strong relationships we identified here can be used as a starting point for interventions. Based on the inoculation approach defined by McGuire (1964) and applied in some recent fake news studies (e.g., Basol et al., 2020; Scheibenzuber et al., 2021), literacy interventions may aim to counteract fake news effects by making the framing methods transparent to the news consumers. For instance, if calls for honesty and hyperbolization initiate more intensive online discussions on fake news topics, human discussants or bots can post comments that reframe the topic and relativize the meaning of such framing (Rode et al., 2021). On the other hand, if the use of lexical inventions and striking titles attenuate echo chamber discussions, these techniques can be emphasized. Certainly, such interventions need to be validated by further laboratory and field research.

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