Effect of External Factors on User Behaviour towards Influencer Generated Online Misinformation

Cherie Sew
cheriemeiyee.sew@student.unimelb.edu.au
University of Melbourne
Melbourne, VIC, Australia

Jorge Goncalves
jorge.goncalves@unimelb.edu.au
University of Melbourne
Melbourne, VIC, Australia

ABSTRACT

The lack of content verification on online platforms means influencers and those with large followings can sometimes rapidly spread misinformation to their impressionable audience. In this study, we investigate the response of users towards two influencers, Elon Musk and Neil deGrasse Tyson, by empirically examining the effects of external factors such as parasocial relationship bonds with the influencer, perceived source credibility, user political spectrum, and number of critical and supportive comments. We measured participants' likelihood to comment supportively or critically, have a favourable impression, and the likelihood that they will share the information after being exposed to different tweets from both influencers. We found that parasocial relationships and perceived credibility had an independent effect on participants' responses to the tweets. Additionally, we found that participant's political spectrum and sex, as well as the sentiment of comments when it is a critical majority can affect users' reactions to the influencers' content. Based on our findings, we provide design recommendations for online platforms to mitigate the spread of misinformation.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in HCI**.

KEYWORDS

Social Media, Echo Chambers, Parasocial Relationships, Influencers, Misinformation

ACM Reference Format:
Cherie Sew and Jorge Goncalves. 2023. Effect of External Factors on User Behaviour towards Influencer Generated Online Misinformation. In *OzCHI 2023 (OzCHI 2023), December 02–06, 2023, Wellington, New Zealand*. ACM, New York, NY, USA, 13 pages. https://doi.org/10.1145/3638380.3638399

1 INTRODUCTION

The increased prevalence of social media has led to it having a significant influence in people's daily lives. Recent studies have shown that seven-in-ten Americans use some form of social network platform with a marked increase in social media use in younger generations in the past few years [6]. Whiting and Williams [57] note that social media has wedged an important place in modern society due to its uses and self-gratifications, which initially primarily included social interactions and entertainment.

More recently, social media has increasingly become a valid and easy to procure source of information. For instance, social media users can leverage platforms to deliberate over serious topics [43], use them to obtain health information [40], while journalists have quoted content from Twitter in their news articles [12]. However, misinformation also spreads efficiently with social media users sharing content that contains misinformation either intentionally or by mistake, as it can be challenging to discern the reliability of the source [8]. For instance, while well-informed individuals (e.g., scientists) may be able to distinguish between facts and opinions on Twitter due to knowing the sources of information, this may be difficult for the average Twitter user [55].

In addition, previous studies have identified topical influencers as individuals with the capability to socially influence others as they create or share viral content that can reach a large-scale of users [3, 4]. However, there is a lack of content verification for such sources of information across social media platforms. Therefore, there have been increased concerns regarding how influencers can easily share misinformation, knowingly or unknowingly, with their followers. Furthermore, social media has been found to facilitate parasocial relationship bonds between users and influencers [11, 14, 21, 62], which also affects users' perceived credibility of these individuals [35, 44]. Moreover, political homophily can also play a role in how users perceive the topical influencers and their content [15]. These factors can further increase the possibility of followers blindly believing content that an influencer is sharing without much critical thought.

In this study we aim to investigate the response of users towards controversial tweets made by two topical Twitter influencers, Elon Musk and Neil deGrasse Tyson, containing content that falls beyond their expertise. In particular, we empirically test the impact of the presence of external factors such as parasocial relationships with the influencer, perceived source credibility, and user political spectrum on their likelihood to comment supportively or critically, have a favourable impression of the content, and likelihood to share the information. Furthermore, we examine whether user comments can affect other users' reactions towards these tweets.

Our findings indicate that parasocial relationships and perceived credibility affect participants' responses to the influencers' tweets. However, participants' parasocial relationship bond with the influencer was more impactful for Neil deGrasse Tyson's tweets whereas participants' perceived credibility of Elon Musk was more significant. Additionally, there was a positive correlation between parasocial relationships and perceived credibility for both influencers. Comments were found to have a negative effect on users' responses

OzCHI 2023, December 02–06, 2023, Wellington, New Zealand

ACM ISBN 979-8-4007-1707-9/23/12…$15.00
https://doi.org/10.1145/3638380.3638399

towards Elon Musks' tweets when there is a majority of critical comments and the participants' political spectrum as well as sex were taken into account. In particular, females were more likely to comment critically and have a less favourable attitude towards his tweets when comments lean strongly critical. Furthermore, the effects of political spectrum were evident for responses towards both influencers as liberal participants had more negative responses towards Elon Musk while conservative participants viewed Neil deGrasse Tyson more negatively.

Based on our findings, we discuss the impact of parasocial relationships, perceived credibility, political homophily, and user comments on influencers' content. We propose a number of suggestions for the design of online social platforms to minimise the spread of misinformation originating from influencers. These include the addition of expertise labels to aid users in determining the credibility of the influencer on the shared content topic, as well as recommend content from verified topical expertise in order to reduce the 'echo chamber' effect.

2 RELATED WORK

In this section, we summarise the literature that is the most relevant to our work. We start by providing an overview of the literature on topical influencers and their role in propagating information on online platforms. Next, we outline how parasocial relationships with these influencers and their perceived credibility can impact how individuals interpret and internalise the information being provided by the influencers. We then describe how these aspects can lead to homophilic behaviours and the creation of echo chambers on social media. Finally, we report on recent efforts aimed at leveraging comments for moderation purposes when dealing with online misinformation.

2.1 Topical Influencer

Social media users who play a role in topical information diffusion are known as topical influencers [4]. Topical influencers can be further categorised into three groups: opinion leaders with broad support, figures of controversy who provoke debate, and trolls who operate without altruistic purpose except for causing chaos [22]. Interestingly, while all types of topical influencer approaches have been found to lead to increased user interaction, the sentiment users have towards these three groups of topical influencers is quite varied as opinion leaders invoke positive emotions in users whereas users tend to have negative emotions towards trolls [22].

Companies have used topical influencers' social influence for financial driven purposes like viral marketing or brand evaluations. Moreover, topical experts are also essential for online knowledge sharing and learning, which are heavily dependent on collaborations [41]. Previous studies found that topical influencers tend to share their expert knowledge due to a mixture of extrinsic (financial incentive, personal reputation, etc.) and intrinsic (perceived information ownership) motivations [1, 42].

Previous studies have focused on improving recommender systems to identify and analyse topical influencers as they have the ability to reach a wide audience [34, 41]. However, Grabowicz et al. [25] found that users consume content that they topically relate to regardless of personalised recommendations. Their study further confirms that topical posts begin spreading from enthusiasts or topical experts before diffusing to other users who have similar topical interests.

In summary, topical influencers gain their following through their credibility in providing specialised content, which grants them a certain degree of social influence over others. In this study we utilised content from two influencers, Elon Musk and Neil deGrasse Tyson, to investigate users' reactions to their tweets that are not within their expertise.

2.2 Parasocial Relationships and Perceived Source Credibility

Parasocial relationships are defined as the illusion of a social relationship between a media personality and their audience [27]. Prior to the social media era, media personalities would initiate interactions with their audience by simulating an informal, and intimate conversation through mediums like radio or television [5, 27]. The audience has a false sense of immediacy through this encounter and may perceive this interaction as personal, however these qualities are completely one-sided. Previous studies have found that continuous parasocial interactions reduce the uncertainty users have about a persona which increases their confidence in the persona [5, 27, 39].

Although Horton and Wohl [27] initially described parasocial relationships as one-sided, social media has transformed the way media personalities and audiences interact. Previous studies have found that media personalities and influencers' usage of social media platforms to interact with their audience can strengthen parasocial relationships [14, 62]. Bond [11] found that celebrities who retweeted or responded to users on Twitter increased their parasocial relationship bond, in particular with adolescent users. However, viewing the interactions between celebrities and other users on Twitter can also deepen the user's bond of parasocial relationship with the celebrity [21]. Baek et al. [7] explained that users use the same features on social media when interacting with friends or celebrities, which could increase parasocial relationships as the lines between social and parasocial interactions have blurred. Furthermore, parasocial relationships can be further enhanced due to celebrities' self-disclosure on Instagram or Twitter [10].

Additionally, Reinikainen et al. [44] found that positive parasocial relationships and interactions with the influencer may correlate with perceived credibility, a notion that is supported by previous studies [35]. O'Keefe [36] defined perceived source credibility as "judgments made by a perceiver concerning the believability of a communicator". The advent of social media platforms has allowed various user generated content to spread virally and some users have used this to their advantage to become topical influencers. However, their following could be due to homophily, which emphasises the importance of examining users' perceived credibility of these influencers.

The onus of deciding the credibility of social media posts ends up falling to the users due to the absence of intermediary fact checkers [56]. This can be difficult for users as there have been incidences of influencers with certain ideology and financial interests who have used their platform to cast doubt on the public's understanding

on a range of science-based topics, such as climate change and COVID-19 information [52].

Moreover, there is a self-reinforcing effect on the credibility of these topical influencers as audiences perceive them as more trustworthy based on the size of their network [55]. Thus, we aim to examine how participants' parasocial relationship bonds with an influencer, and the perceived credibility of them affects how participants respond to generated misinformation content.

2.3 Homophily and Echo Chambers

The term homophily was first introduced and defined in 1954 by Lazarsfeld and Merton as "a tendency for friendships to form between those who are alike in some designated respect". In recent years, researchers have been able to use social media platforms to observe and study the effects of homophily [15, 28]. While Bisgin et al. [9] question the validity of interest-based homophily in social media connections, some researchers contend that users are actually more likely to form connections with those who do share similar interests [2].

Political homophily on social media has been found to encourage the formation of "echo chambers" within Twitter communities, which have led to an increase of polarisation [18]. In the United States, people tend to have more hostility to others based on partisanship more so than race [29]. A study by Colleoni et al. [15] found that Republican Twitter users display higher levels of homophily if they followed other official Republican accounts. However, they also noted that Democrats tend to have higher levels of homophily in general. Additionally, partisan bias in the United States also played a role on how people perceive scientific communication [28]. Both sides of the political spectrum are susceptible to believing in conspiracy theories, regardless if they are politically naive [37]. Hence, in this study we investigate if participants' political spectrum has an effect on how they perceive information given by topical influencers that are associated with certain political parties.

2.4 Comments as Moderation

Gearhart et al. [23] found that social media users' exposure to comments from those with dissimilar views as themselves on news articles prior to reading the actual article led to perceptual bias on the news article, and its author. However, users who were exposed to the majority's opinion have a propensity to conform socially, especially when they are initially unsure of their own assessment [59, 60]. Furthermore, users' attitude towards Facebook posts has been shown to be affected by other comments despite having knowledge that the posts contained misinformation [16].

Another study by Gierth and Bromme [24] also found that the contents of the comment does matter as comments that question the motivations of the author can affect the readers' perceived integrity of them. Their study also highlighted that the expertise of the commenter affects participants' judgement on credibility. Given the barrage of misinformation users will encounter on social media platforms, we examine whether critical or supportive comments have an effect in dissuading or persuading users' opinions on influencer created content.

3 METHODS

3.1 Experimental Design

This study utilised a within-subjects experimental design via an online survey that contained tweets from two influencers: Elon Musk and Neil deGrasse Tyson. In this section, we justify the choice of influencers that represent the political inclinations in our study. Next, we explain the basis of the topics and tweets chosen. Finally, we clarify the sentiment labelling of the comments as well as provided examples of comments that we considered either "critical" or "positive".

3.1.1 Influencers. We decided to use Elon Musk and Neil deGrasse Tyson as part of our study due to their online social influence, propensity to have controversial takes on Twitter, and perceived political affiliation. As of January 2023, Elon Musk's Twitter account is ranked No. 2 most followed with approximately 126 million followers by Social Blade, the user statistics analytics platform. He is the co-founder and CEO of various companies like OpenAI, Tesla, SpaceX, and he recently officially acquired Twitter. Although he may be considered a topical expert in certain fields of engineering, he has tweeted content that contained verifiable misinformation on other topics. For example, he has claimed that Twitter has a bias for liberals which recent work has disproven [13], and he has also shared conspiracy theories regarding the attack of Paul Pelosi (husband of Nancy Pelosi, the Speaker of the United States House of Representatives) [17].

Social Blade ranked Neil deGrasse Tyson 229th on Twitter with over 14 millions followers. While he has significantly less followers on Twitter compared to Elon Musk, he is an important online influencer due to his standing in the scientific community. As a result of his strong media personality as a science communicator, his followers may conflate his expertise in specific scientific knowledge with other information he shares. Thus, science communicators similar to Neil deGrasse Tyson have the ability to influence and impact public issues from a scientific standpoint. He is also a presenter and host of various television and web-based series related to his topical expertise, astrophysics. Albeit being a renowned science communicator personality, he has incited the wrath of the public for tweets that were perceived as patronising, offensive or inaccurate [46, 48]. Although Neil deGrasse Tyson has claimed to be apolitical, he has stated that he is not a Republican, and he has received backlash from conservative media [20].

3.1.2 Tweets. We used tweets due to the direct social communication it affords users through responding, retweeting, and microblogging. Previous works have found that media personalities use Twitter for personal brand awareness as well as a safe forum for communicating with their fans [49]. Although their interactions with fans may be selective and limited, it can still cultivate a sense of intimacy, which can enhance the sense of parasocial or even social relationships [31, 32].

We selected two tweets from Elon Musk and two tweets from Neil deGrasse Tyson. For each influencer, this included one tweet related to the economy and one tweet related to COVID-19. We chose these topics as they fall beyond the expertise of both influencers. Figure 1 shows the selected economy-related tweets for both influencers,

Figure 1: Selected economy related tweets by Neil deGrasse Tyson and Elon Musk

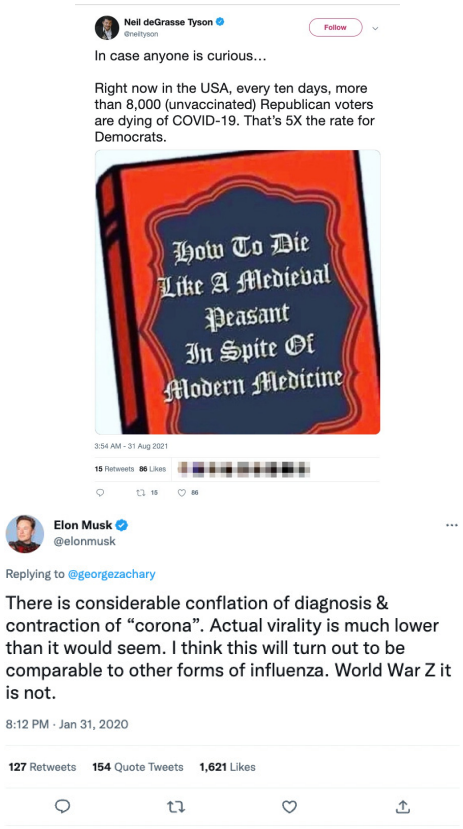

Figure 2: Selected COVID-19 related tweets by Neil deGrasse Tyson and Elon Musk

with statements on how to grow the economy (Neil deGrasse Tyson) and what constitutes the "real economy" (Elon Musk).

Figure 2 shows the COVID-19 related tweets for both influencers. The tweet by Neil deGrasse Tyson contained unverified statistics related to COVID-19 deaths in the United States. He deleted the tweet due to backlash ("FYI: Deleted the Republican-Democrat COVID tweet. Was causing too many unintended Twitter fights.") as some users were questioning his analysis method ("@neiltyson correlation versus causation. There's no meaningful real correlation between those two. You're deriving your figures based off of a bias. I thought better of you than that"). Elon's Musk tweet equates COVID-19 to different forms of influenza. Moreover, it has been widely reported that he has been spreading misinformation with his COVID-19 related tweets [33, 54].

3.1.3 Comments. We used comments and their sentiment to examine the effects they have on participants' reactions towards the tweet as previous works have found that users tend to conform to the majority opinion in online environments [16, 59]. The comments that were shown with each tweet were taken from real replies towards the original tweet by each influencer. The comments were either critical or positive. We considered a comment to be "critical" when they were acerbic or did not show support with the tweet (e.g. "And here I thought you were a scientist, not a political scientist"). Conversely, "positive" comments were comments that showed support towards the tweet (e.g. "100% accurate and we are either the consumer or the producer. You sir are an exemplary form of the producer").

A total of three comments were displayed with each tweet, while the number of critical or positive comments were varied. The composition of critical or positive tweets were as follows: all critical comments, two positive and one critical comments, two critical and one positive comments, or all positive comments. The display pictures and profile names of users were blurred to maintain their privacy and limit bias from the participants. Previous studies have found that people form impressions of trust based on the attractiveness of display photos [19]. Additionally, participants would be able to infer gender from the display name which might cause gender bias on perceived competence and trust [50, 53, 58, 61].

3.2 Procedure

Figure 3 shows the experiment procedure we employed for this study. We measured participants' level of parasocial relationship (PSR) with the influencers as well as their perceived source credibility (PC) before their exposure to the tweets. The purpose of using these measurements was to determine the extent of their effects on participants' opinions on the manipulated tweets. PSR was measured with an eight-item, seven-point likert scale while PC was measured with an eleven-item, seven-point likert scale. We adapted both measurements from Reinikainen et al.'s [44] research on parasocial relationships, perceived credibility, and comments as moderation in influencer marketing.

To avoid order effects, half of the participants were shown the PSR and PC measurements for Elon Musk followed by the measurements for Neil deGrasse Tyson, while the other half were shown the inverse order. The questions items for the measurements are shown in Table 1. The averages of these measurements were computed for data analysis.

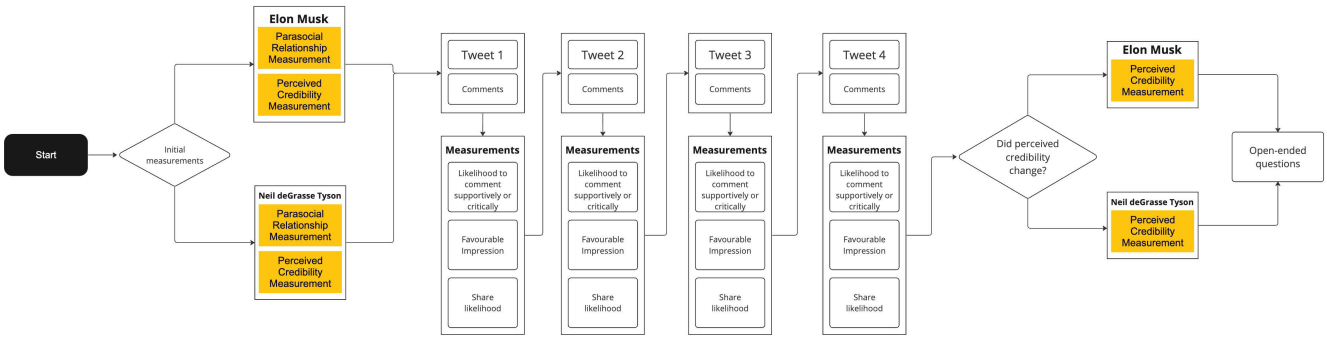

Figure 3: Flowchart of experiment procedure

Table 1: Parasocial Relationship and Perceived Credibility measurements [44].

Parasocial Relationship Measurement
I look forward to reading the tweets by the influencer.
If the influencer posted on a different social media platform, I would read their posts.
When I reply to his tweets, I feel as if I am part of his group.
I think the influencer is like an old friend.
I would like to meet the influencer in person.
If there was a story about the influencer in a newspaper or magazine, I would read it.
The influencer makes me feel comfortable, as if I am with friends.
When the influencer shows me how they feel about a topic, it helps me make up my own mind about the topic.
Perceived Credibility Measurement
I feel the influencer is honest.
I consider the influencer to be trustworthy.
I feel the influencer is truthful.
I consider the influencer to be sincere.
I feel the influencer knows a lot about the topics they talk about.
I feel the influencer is competent to make assertions about the topics they talk about.
I consider the influencer sufficiently experienced to make assertions about the topics they talk about.
I consider the influencer an expert on the topics they talk about.
The influencer and I have a lot in common.
The influencer and I are very alike.
I can easily identify with the influencer.

After participants completed the PSR and PC measurements for both influencers, they were shown the selected four tweets, one tweet at a time. The sequence of the tweets was counterbalanced to avoid any ordering effects.

Participants were also required to answer five question items after being shown each tweet. These questions were previously used in the literature [16]. These questions aimed to determine the likelihood of participants commenting on the tweet supportively or critically, their impression towards the tweet, and the likelihood of sharing the tweet. Likelihood of sharing was composed from three items that were averaged as previous research found that certain signals are more effective than others for extracting a person's true intention [45]. The questions were measured using a seven-point likert scale (-3 = Strongly Disagree and 3 = Strongly Agree) with the exception of the likelihood of leaving either a critical or supportive comment in response to the tweet, which was measured using a binary scale (Mostly Critical/Mostly Supportive).

PCs for both influencers were measured again after exposure to all four tweets using the same scale employed in the initial measurement. Finally, participants were asked to answer the following open-ended text questions: "Have your answers changed after viewing the tweets? Why or why not?".

The online survey also contained two Instructional Manipulation Checks (IMC), before and after the presentation of the tweets, to ensure that participants were paying attention and reading the questions [38]: "Which one is an animal?" and "Please enter 'Hello :)' in the box below". We did not remove any participants from our data based on the IMCs as all of them provided the correct answer.

3.3 Data Collection and Participants

We conducted a pilot study with five people to determine the average time taken to complete the full survey to inform our participant compensation scheme as well as to identify any issues in the survey. After the pilot study, we utilised Prolific to recruit participants. As Elon Musk and Neil deGrasse Tyson are based in the United States and our study is based on their Twitter activity, we pre-screened for participants with United States nationality, and those who use Twitter at least once a week.

Due to Prolific's inability to distribute the survey evenly based on political spectrum, we deployed two separate surveys. The surveys had identical questions, however, one survey pre-screened for participants who identified as liberal, while the other survey pre-screened for participants who identified as conservative. The pre-screening criteria were also added to the surveys to provide additional validation as recommended by Prolific.

Both surveys were successfully completed by a total of 96 participants, with a balanced sample of sex and political spectrum. Participants who completed the survey were compensated for their time, based on going rates within the Prolific platform. They were also shown a Plain Language Statement at the beginning of the survey that described the purpose of this research, and were required to provide their consent prior to starting the survey.

4 RESULTS

We operationalised an opinion towards a tweet as three dependent variables: likelihood to comment supportively or critically, favourable impression, and share likelihood. For this study, we investigated five factors to discern their impact on the dependent variables:

- Parasocial Relationship (PSR): Averaged from a 8-item scale
- Perceived Credibility (PC): Averaged from a 11-item scale
- Political Spectrum: Conservative (**C**) and liberal (**L**)
- Sex: Male (**M**) and female (**F**)
- Comments Leaning: Strongly Critical (**SC** - all critical comments), Mildly Critical (**MC** - two critical and one positive comments), Mildly Positive (**MP** - two positive and one critical comments) and Strongly Positive (**SP** - all positive comments).

We used the R package lme4 to perform generalised linear mixed-effects model (GLMM) analysis on the relationship between the mentioned factors and likelihood to comment supportively or critically. We also conducted fit linear mixed-effects model (LMER) analysis on favourable impression and likelihood to share. The data for both topical influencers were modelled separately for clarity. Individual differences in the models were considered by specifying participants' prolific ID (user_id) as a random effect. The models were tested for multicollinearity to ensure that all six models were valid. Our predictors report a variance inflation factor below the often-used threshold of 5 to detect multicollinearity [26].

We also performed a Wilcoxon Signed-Rank test to analyse participants' averaged perceived credibility scores before and after exposure to the manipulated tweets. The purpose of this test was to observe potential significant differences in perceived credibility of the topical influencers after the experiment was completed. Finally, we employed a general inductive approach to conduct qualitative analysis of participants' response to the open-ended questions [51], which allowed us to derive themes that complement the quantitative results.

Table 2 and Table 3 include all the dependent variables that are statistically significant predictors for Elon Musk and Neil deGrasse Tyson respectively.

Table 2: Effect of statistically significant predictors on comments likelihood, favourable impression, and share likelihood for Elon Musk's tweets

Elon Musk		
Predictor	Coefficient	P-value
Likelihood to Comment Supportively or Critically		
Perceived Credibility	0.759	0.008
Spectrum (L)	-3.041	<0.001
Comments leaning (SC): Sex (F)	-2.234	0.035
Favourable Impression		
Perceived Credibility	0.265	0.01
Spectrum (L)	-1.476	<0.001
Parasocial Relationship: Perceived Credibility	-0.087	0.045
Comments leaning (SC): Sex (F)	-0.987	0.029
Share Likelihood		
Spectrum (L)	-1.190	0.004
Comments leaning (SC): Spectrum (C)	-0.732	0.029
Perceived Crebility: Spectrum (C): Sex (M)	0.555	0.009

Table 3: Effect of statistically significant predictors on comments likelihood, favourable impression, and share likelihood for Neil deGrasse Tyson's tweets

Neil deGrasse Tyson		
Predictor	Coefficient	P-value
Likelihood to Comment Supportively or Critically		
PSR	0.465	0.001
Comments (MC): Spectrum (C): Sex (F)	-5.124	0.001
Comments (MP): Spectrum (C): Sex (F)	-2.389	0.042
Comments (SC): Spectrum (C): Sex (F)	-3.670	0.003
Comments leaning (SP): Spectrum (C): Sex (F)	-2.901	0.024
Comments leaning (MP): Spectrum (C): Sex (M)	-3.545	0.008
Comments leaning (SC): Spectrum (C): Sex (M)	-3.461	0.006
Comments leaning (SP): Spectrum (C): Sex (M)	-2.326	0.049
Favourable Impression		
Parasocial Relationship	0.559	<0.001
Comments leaning (MC): Spectrum (C): Sex (F)	-2.598	<0.001
Comments leaning (MP): Spectrum (C): Sex (F)	-2.201	<0.001
Comments leaning (SC): Spectrum (C): Sex (F)	-2.338	<0.001
Comments leaning (SP): Spectrum (C): Sex (F)	-1.729	0.019
Comments leaning (MP): Spectrum (C): Sex (M)	-2.838	<0.001
Comments leaning (SC): Spectrum (C): Sex (M)	-2.324	<0.001
Comments leaning (SP): Spectrum (C): Sex (M)	-1.535	0.012
Comments leaning (SC): Spectrum (L): Sex (M)	-1.298	0.048
Share Likelihood		
Parasocial Relationship	0.424	0.015
Comments leaning (MP)	-0.579	0.050
Comments leaning (SC)	-0.775	0.009

4.1 Likelihood to Comment Supportively or Critically

4.1.1 Elon Musk. Likelihood to comment supportively or critically on Elon Musk's tweets was found to be dependent on participants' perceived credibility of him, participants' political spectrum, as well as other interactions. Figure 4 (left) shows that participants were more likely to comment in a supportive manner when they have a higher perceived credibility (PC) of him. Political spectrum also had a main effect as participants who identified as liberals were statistically less likely to comment supportively, which can be observed in Figure 4 (right).

Furthermore, Table 2 displays a statistically significant interaction effect between comments leaning and sex. Female participants were found to comment more critically when the comments shown with the tweet were strongly critical.

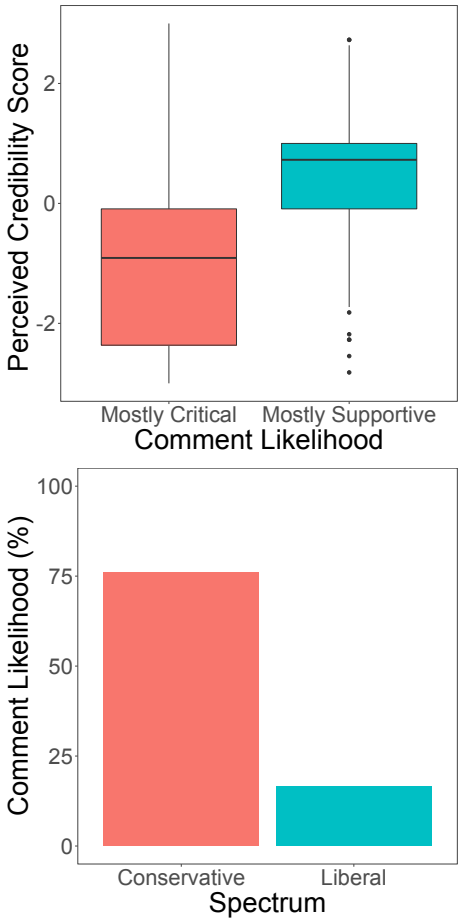

Figure 4: Top: Participants with higher PC were more likely to comment supportively on Elon's tweets. Bottom: Conservative participants were more likely to comment positively on his tweets

4.1.2 Neil deGrasse Tyson. Our results indicate that parasocial relationships (PSR) between the participant and Neil deGrasse Tyson is a main effect for likelihood to comment supportively, as observed in Figure 5. Participants were observed to more likely leave supportive comments when they have a stronger parasocial relationship with him. Additionally, Table 3 shows that there were negative effects for the three-way interactions of comments leaning, political spectrum, and sex, with particularly conservatives being more likely to comment critically.

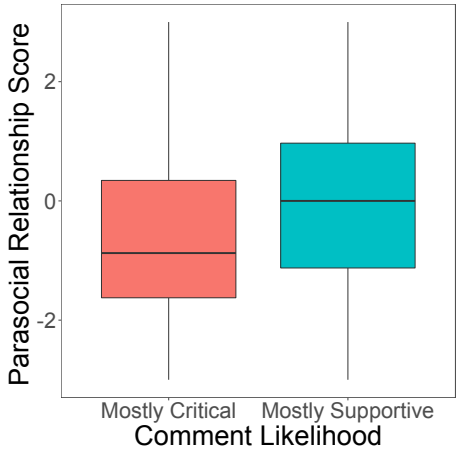

Figure 5: Impact of parasocial relationship score on likelihood to comment supportively or critically on Neil deGrasse Tyson's tweets

4.2 Favourable Impression

4.2.1 Elon Musk. Figure 6 (left) shows that participants' perceived credibility of Elon Musk is a positive main effect for having a favourable impression of his tweets. Moreover, Figure 6 (right) shows that there is a correlation between participants' parasocial relationship and perceived credibility of Elon Musk. Another main (negative) effect is participants' political spectrum, as Figure 7 (left) indicates liberals are less likely to have a favourable impression of his tweets. Lastly, Figure 7 (right) denotes a negative statistical effect for favourable impression on a tweet when the participants are female and they were exposed to comments leaning strongly critical.

4.2.2 Neil deGrasse Tyson. Participants' parasocial relationship with Neil deGrasse Tyson was found to have a positive main effect on favourable impressions towards his tweets. Furthermore, attitudes towards his tweets were less favourable for conservative males and females (Figure 8).

4.3 Share Likelihood

4.3.1 Elon Musk. Participants' political spectrum was found to be a statistically significant main effect for likelihood to share Elon Musk's tweets. This can be observed in Figure 9 (left) which shows that liberal participants were less likely to share his tweets. Additionally, the interaction of political spectrum with comments leaning was noted to have a statistical negative effect when the participant is conservative and the comments leaned strongly critical, as observed in Figure 9 (right). However, participants who are

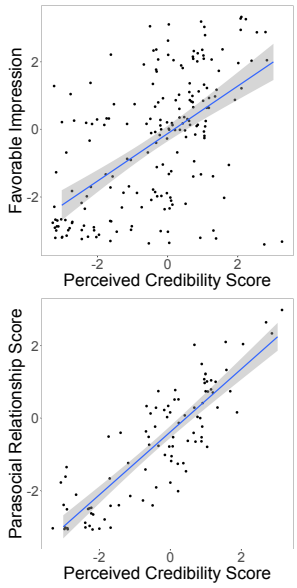

Figure 6: Top: Participants with higher PC have a more favourable impression of Elon's tweets. Bottom: Participants' PC of Elon Musk was correlated to their PRS bond with him.

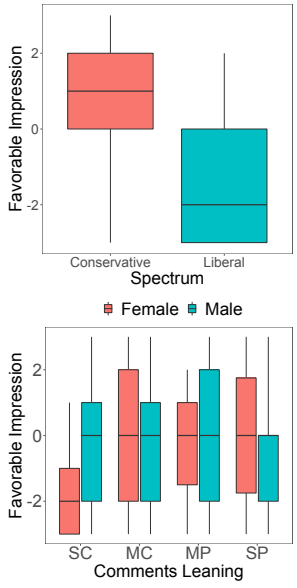

Figure 7: Top: Conservative participants were more likely to have a favourable impression of Elon's tweets. Bottom: Female participants had a less favourable impression of his tweets when the comment sentiment was strongly critical.

conservative and male with a higher perceived credibility of Elon Musk are more likely to share his tweets, as observed in Figure 10 (left).

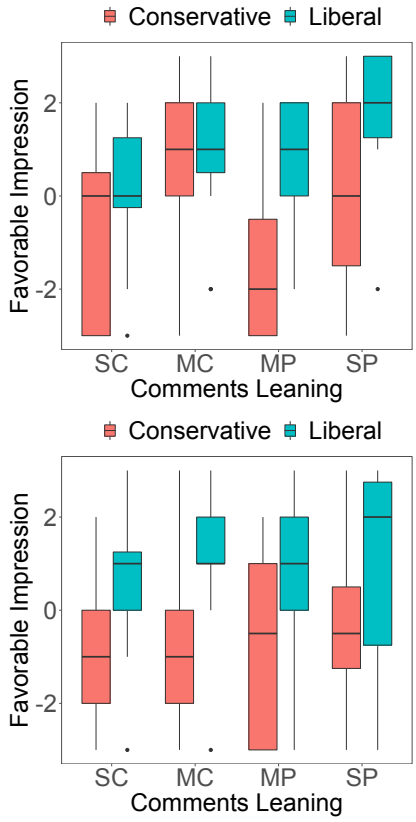

Figure 8: Both conservative male (left) and female (right) participants had an unfavourable impression of Neil deGrasse Tyson's tweets.

4.3.2 Neil deGrasse Tyson. Participants' parasocial relationship with Neil deGrasse Tyson was observed to also have a positive main effect on their likelihood to share his tweets, as shown in Figure 11 (right).

4.4 Influencer's Perceived Credibility

We observed a statistically significant difference between perceived credibility before and after participants were exposed to the tweets for both influencers. There was decrease in perceived credibility for Elon Musk ($Z = -4.047, p \leqslant 0.001$) and Neil deGrasse Tyson ($Z = -4.222, p \leqslant 0.001$) respectively.

4.5 Qualitative Findings

An open-ended question ("Have your answers changed after viewing the tweets? Why or why not?") was asked after the second perceived credibility measurement for both topical influencers to gain insights on participants' thoughts and opinions. We followed an inductive thematic analysis of participants' responses [51], which were complementary to the quantitative results. The qualitative results were grouped into the following themes: participants' parasocial relationship with the influencers, increased or strengthened

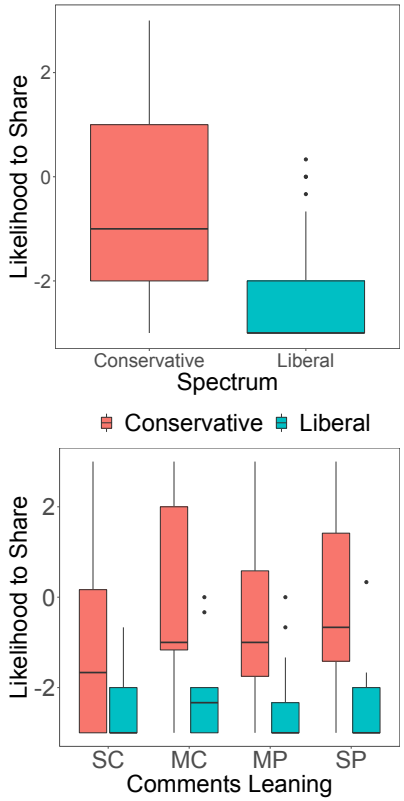

Figure 9: Left: Conservative participants were more likely to share Elon's tweets. Right: Conservative participants were less likely to share when comment sentiment was strongly critical.

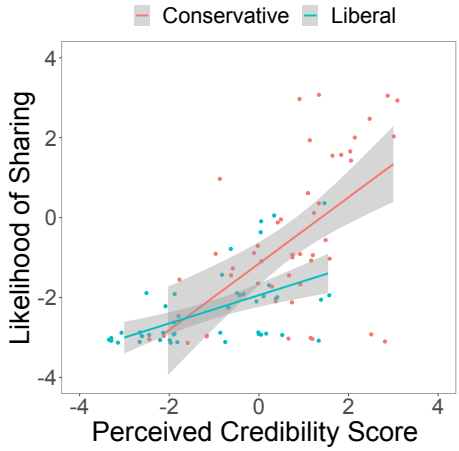

Figure 10: Males' Perceived Credibility of Elon Musk with political spectrum.

perceived credibility of the influencers, and uncertainty of influencers' topical expertise.

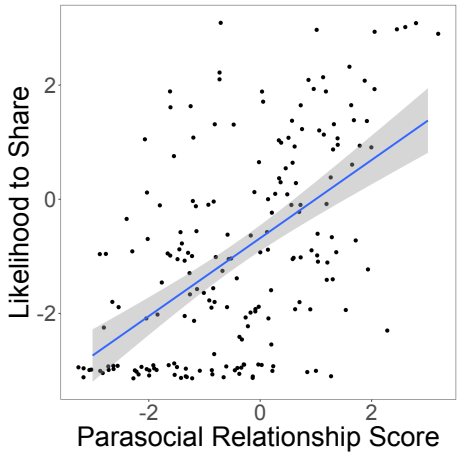

Figure 11: Participants with higher PRS score more likely to share Neil deGrasse Tyson's tweets

4.5.1 Parasocial Relationship with the Influencers. We investigated the effects of parasocial relationships on participants' opinions of topical influencers' tweets that were personal beliefs or outright misinformation. Several participants' responses reflect their parasocial relationship with the topical influencers due to providing answers that seem to indicate they personally knew these topical influencers.

> "No, I think that Elon says what he thinks and isn't compromised by the elite to follow their propaganda." (P9, EM)
>
> "No because I know about his personality already" (P62, EM)
>
> "Not really. His tweets reflect the person I believe him to be." (P73, NDT)
>
> "No, not really. If anything it just confirms what I already thought of him. He's a good person with good intentions towards the people." (P70, NDT)

However, it was important to note that there were participants who felt the manipulated tweets were insufficient to sway their current perception of him.

> "There's too much of an impression built up already outside of the tweets to change it." (P46, NDT)
>
> "No. Not enough info in tweets to change my mind" (P34, EM)

4.5.2 Extant/Increased Perceived Credibility. We found that some participants' perceived credibility of the topical influencers increased. Several participants discussed their change of perceived credibility due to viewing the topical influencers as intelligent.

> "I feel like after seeing the tweets that he is more knowledgeable in his field of expertise and what he talks about" (P7, EM)
>
> "A couple of my responses may have changed, I sometimes forget just how smart he is." (P5, EM)

Participants were also motivated to trust the topical influencers due to being able to relate to the influencers' point of view.

> "Yes, we have a lot of the same philosophies." (P13, EM)
>
> "Not really, I just find that I agree with his point of view on most things."(P24, EM)
>
> "I guess, maybe because those particular viewpoints of him i agree with" (P91, NDT)

Furthermore, some participants described that their perceived credibility of the influencers did not change as they had an extant trust of the influencers.

> "No because when he tweets it usually evidence behind it" (P58, NDT)
>
> "No, my answer stay the same because Tyson has a science degree in physic" (P11, NDT)
>
> "No because he kept the same consistent cadence" (P37, EM)

4.5.3 Uncertainty of Influencers' Topical Expertise. Our results showed that some participants experienced a negative change of perceived credibility of the topical influencers. However, it is unknown if participants were critical due to the manipulation of comments shown or previous knowledge related to the topic of the tweets.

> "It changed because he seemed to make statements without any proof" (P7, NDT)
>
> "A little. Because it seems he doesn't really know everything about everything he talks about." (P95, NDT)
>
> "If those are real tweets I realised he spreads more misinfo than i thought he did" (P91, EM)

Several participants expressed their belief that the topical influencers should not be posting about topics beyond their expertise.

> "My answers changed after viewing the tweets. Because he is a manipulative person. He gives opinions on issues he doesn't have expertise on." (P56, EM)
>
> "I think there's certain topics he should avoid talking about" (P53, EM)
>
> "Maybe a bit; I forgot how stupid he is and he should stay in his lane of astronomy and not talk about other things" (P81, NDT)

One participant indicated that they were uncertain whether the tweets were factual or opinions, presumably because they were unsure of the topical influencer's areas of expertise.

> "Yes a little because I'm not sure if he's just telling opinions or facts." (P28, NDT)

5 DISCUSSION

The rise of social media has enabled influencers to easily connect with their audience. While these influencers may have gained credibility due to their expertise in certain topics, this perceived credibility can become an issue when it is extended to topics beyond their expertise. In this study we aimed to investigate the effects of several external factors on participants' responses to an influencers' tweets that contain content that falls outside their specific domain of expertise. In addition, we examined whether comments could influence participants' behaviour towards the topical influencers' tweets as a form of moderation.

5.1 Impact of Sentiment towards Topical Influencers

Our findings revealed that both parasocial relationships and perceived credibility play a significant role in participants' opinions of the tweets used. However, participants' parasocial relationship bond with the influencer was an impactful factor for Neil deGrasse Tyson's tweets for commenting positively, having a favourable attitude, and sharing. Regarding Elon Musk, participants' perceived credibility of him was a significant predictor for commenting supportively and having a favourable attitude towards his tweets. The results also indicate a correlation between participants' perceived credibility and parasocial relationship with the topical influencers. This finding is inline with previous work that has shown that building parasocial relationships with influencers will inherently also lead to an increase in trust [35].

Furthermore, our qualitative findings provide additional insights on the impact of parasocial relationships and perceived credibility. Although some participants were aware of the tweets being misinformation, there were still several participants who expressed trust towards the topical influencers while displaying signs of a possible parasocial relationship bond. Additionally, a subset of participants were unsure if the tweets fell under the influencers' domain of expertise. For Neil deGrasse Tyson, it is possible that people conflate his expertise in astrophysics with health (i.e., COVID-19 related tweets), as both these topics are related to science. Similarly, given that Elon Musk is a well-known businessman, some might have equated that with having expertise in more general economic affairs. This finding supports previous work that examined the difficulty users encounter when determining the credibility of content on social media as there is a lack of features or intermediary parties to verify the validity of the content [56].

5.2 Conformity and the Effects of Political Homophily

We found that the sentiment composition of the comments affected participants' behaviour towards a tweet. In particular, we observed that it negatively affects participant's likelihood to share Neil deGrasse Tyson's tweet if the comments leaned strongly critical. This provides support to previous works that studied the effects of majority opinion on conformity behaviour [16, 59].

Interestingly, we found that the sentiment composition of the comments was statistically significant when it is combined with political spectrum and sex for behaviour towards Neil deGrasse Tyson's tweets. However, we note that conservative participants of either sex indicated they would not comment positively or have a favourable attitude towards his tweets. In contrast, participants who are male and liberal only had a less favourable attitude of Neil deGrasse Tyson's tweets when faced with a majority of critical comments.

Previous research in the US found that people perceive information from sources that aligns with their political beliefs more

favourably, and both sides of the political spectrum are susceptible to believing misinformation [15, 37]. Our work supports those findings given that liberal participants leaned negatively towards Elon Musk who has publicly denounced the Democratic party, while conservative participants had a negative opinion of Neil deGrasse Tyson who supports issues that have been deemed to align more with the Democratic party. Therefore, social media platforms should consider how information that has been politicised are being shown to users as this could potentially limit the "echo chamber" effect [15, 18].

5.3 Implications for the Design of Online Platforms

Based on the findings discussed, we provide further evidence to previous literature that suggest that platforms with social interactions should utilise user comments in order to moderate the spread of misinformation by considering how they are displayed under content posted by influencers or other users [16, 59].

Additionally, we propose that platforms include an additional verification message of topical influencers' expertise. This combines the approach of fact-checking labels, and providing credentials in knowledge-based social networks like Quora. Influencers with a significant following can have their topical expertise verified, which could support efforts to reduce misinformation within different topics as well. For example, providing a warning message under an influencer's Twitter handle that they are not a verified expert in the topic of the tweet. Moreover, related tweets could be displayed to provide users with additional perspectives from verified experts. Further research should be conducted to study if displaying related tweets from verified experts can limit the "echo chamber" effect on users.

5.4 Limitations and Future Work

This study had several limitations. Our study focused on two male influencers that are considered experts in specific topics. Previous work has shown that sex of both the social media user and the influencer can result in biases regarding the acceptability of the presented information [30]. Future work could include a more diverse set of influencers to investigate whether these gender biases persist in the presence of other external factors, such as the ones explored in this paper. Furthermore, investigating a wider array of topics of expertise and types of misinformation would provide a more nuanced understanding of people's reaction to the content.

Additionally, this study specifically investigated United States based participants using influencers that are nationally well-known. Previous research found that amongst 17 countries surveyed, the United States was the most politically and ethnically divided as perceived by the public [47]. Thus, this divisiveness could have an effect on participants' attitude that may be unique to participants based in the United States. Future research could include influencers as well as participants from a broader spectrum of countries to examine the similarities and differences in participants' behaviour towards influencers and influencer-generated content as compared to this study.

Finally, participants were exposed to tweets that they may have previously seen which could have caused them to have pre-existing bias towards them. Future studies could utilise a first-hand observation approach to study participants' opinions on the influencer's latest content as this could potentially minimise pre-existing bias.

6 CONCLUSION

Recent literature has studied the social influence that topical experts have on social media [3, 4] as well as the parasocial relationship bonds people create with famous personalities on social media [11, 14, 21, 62], and the perceived credibility of them [35, 44]. However, there is a lack of understanding of how users perceive content from topical influencers that is not within their expertise, especially content that contains misguided opinions or misinformation, which we address in our work. Therefore, the aim of this study was to study participants' opinions and beliefs towards a topical influencer's tweets that is unrelated to their area of expertise in conjunction with the external effects of parasocial relationships, perceived credibility, sex, and political spectrum. Additionally, we manipulated the number of positive and critical comments that are presented alongside a tweet to investigate the effects of majority opinion on participants' beliefs and opinions.

Our findings indicate that although parasocial relationships and perceived credibility are independently important depending on the topical influencer, there is a correlation between these two variables for participants' opinions on both topical influencers. Additionally, we discussed the effects of parasocial relationship and perceived credibility combined with participants' political spectrum and sex.

Moreover, we investigated the role of political spectrum in affecting participants' opinions of the topical influencers used in this study, who have been associated with either political party in the United States. Our results provide further support to the growing body of work in the area of political homophily and information diffusion [15, 28]. Furthermore, we found varying degrees of effect of the composition of comment sentiment in participants' own opinions when also considering their political affiliation.

Our work provides empirical evidence of the effects of a multitude of different external factors on social media users' perceptions and opinions of content generated by online influencers. We encourage social media platforms to consider topic expertise labels and displaying related tweets from verified topical experts to reduce the spread of misinformation.

REFERENCES

[1] M.S. Ackerman and L. Palen. 1996. The Zephyr help instance: Promoting ongoing activity in a CSCW system. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. 268–275.

[2] L.M. Aiello, A. Barrat, R. Schifanella, C. Cattuto, B. Markines, and F. Menczer. 2012. Friendship prediction and homophily in social media. *ACM Transactions on the Web (TWEB* 6, 2 (2012), 1–33.

[3] Z. Alp and S. Öğüdücü. 2016. Influential user detection on Twitter: Analyzing effect of focus rate. In *2016 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM.* https://doi.org/10.1109/asonam.2016.7752407

[4] Z. Alp and S. Öğüdücü. 2018. Identifying topical influencers on twitter based on user behavior and network topology. *Knowledge-Based Systems* 141 (2018), 211–221. https://doi.org/10.1016/j.knosys.2017.11.021

[5] P.J. Auter. 1992. Psychometric: TV that talks back: An experimental validation of a parasocial interaction scale. *Journal of Broadcasting & Electronic Media* 36, Spring (1992), 173–81.

[6] B. Auxier and M. Anderson. 2021. Social media use in 2021. *Pew Research Center* 1 (2021), 1–4.

[7] Y.M. Baek, Y. Bae, and H. Jang. 2013. Social and parasocial relationships on social network sites and their differential relationships with users' psychological well-being. *Cyberpsychology, Behavior, and Social Networking* 16, 7 (2013), 512–517.

[8] M. Barthel, A. Mitchell, and J. Holcomb. 2016. *Many Americans Believe Fake News Is Sowing Confusion.* Pew Research Center's Journalism Project.

[9] H. Bisgin, N. Agarwal, and X. Xu. 2012. A study of homophily on social media. *World Wide Web* 15, 2 (2012), 213–232.

[10] M.G. Blight, E.K. Ruppel, and K.V. Schoenbauer. 2017. Sense of Community on Twitter and Instagram: Exploring the Roles of Motives and Parasocial Relationships. In *Cyberpsychology, Behavior, and Social Networking*. 314–319.

[11] B.J. Bond. 2016. Following your "friend": Social media and the strength of adolescents' parasocial relationships with media personae. *Cyberpsychology, Behavior, and Social Networking* 19, 11 (2016), 656–660.

[12] M. Broersma and T. Graham. 2013. Twitter as a news source. *Journalism Practice* 7, 4 (2013), 446–464. https://doi.org/10.1080/17512786.2013.802481

[13] W. Chen, D. Pacheco, K. Yang, and F. Menczer. 2021. Neutral bots probe political bias on social media. *Nature Communications* 12, 1 (2021). https://doi.org/10.1038/s41467-021-25738-6

[14] S. Chung and H. Cho. 2017. Fostering parasocial relationships with celebrities on social media: Implications for celebrity endorsement. *Psychology & Marketing* 34, 4 (2017), 481–495.

[15] E. Colleoni, A. Rozza, and A. Arvidsson. 2014. Echo chamber or public sphere? Predicting political orientation and measuring political homophily in Twitter using big data. *Journal of communication* 64, 2 (2014), 317–332.

[16] J. Colliander. 2019. This is fake news": Investigating the role of conformity to other users' views when commenting on and spreading disinformation in social media. *Computers in Human Behavior* (2019), 202–215.

[17] O. Darcy and D. O'Sullivan. 2022. Elon Musk, Twitter's new owner, tweets conspiracy theory about attack on Paul Pelosi | CNN business. https://edition.cnn.com/2022/10/30/business/musk-tweet-pelosi-conspiracy/index.html Retrieved November 2, 2022.

[18] S. Du and S. Gregory. [n. d.]. The echo chamber effect in Twitter: does community polarization increase? In *International workshop on complex networks and their applications*. Springer, Cham, 373–378.

[19] E. Ert, A. Fleischer, and N. Magen. 2016. Trust and reputation in the sharing economy: The role of personal photos in Airbnb. *Tourism Management* 55 (2016), 62–73. https://doi.org/10.1016/j.tourman.2016.01.013

[20] M. Fleischer. 2014. Opinion: Why are conservatives afraid of Neil deGrasse Tyson? Los Angeles Times. https://www.latimes.com/nation/la-ol-neil-degrasse-tyson-cosmos-20140729-story.html Retrieved November 2, 2022.

[21] E.L. Frederick, H.L. Choong, G. Clavio, and P. Walsh. 2012. Why we follow: An examination of parasocial interaction and fan motivations for following athlete archetypes on Twitter. *International Journal of Sport Communication* 5, 4 (2012), 481–502.

[22] L. Gao, Y. Wu, X. Xiong, and J. Tang. 2019. Discriminating Topical Influencers Based on the User Relative Emotion. *IEEE Access* 7 (2019), 100120–100130. https://doi.org/10.1109/access.2019.2929548

[23] S. Gearhart, A. Moe, and B. Zhang. 2020. Hostile media bias on social media: Testing the effect of user comments on perceptions of news bias and credibility. *Human behavior and emerging technologies* 2, 2 (2020), 140–148.

[24] L. Gierth and R. Bromme. 2020. Attacking science on social media: How user comments affect perceived trustworthiness and credibility. *Public Understanding of Science* 29, 2 (2020), 230–247.

[25] P. Grabowicz, N. Ganguly, and K. Gummadi. 2016. Distinguishing between Topical and Non-topical Information Diffusion Mechanisms in Social Media. *Proceedings of the International AAAI Conference on Web and Social Media* 10, 1 (2016), 151–160.

[26] J. Hair, W. Black, B. Babin, and R. Anderson. 2010. *Multivariate data analysis* (7th ed.). Pearson, Upper Saddle River, NJ.

[27] D. Horton and R.R. Wohl. 1956. Mass Communication and Para-Social Interaction: Observations on Intimacy at a Distance. *Psychiatry* 19 (1956), 215–29.

[28] S. Iyengar and D.S. Massey. 2019. Scientific communication in a post-truth society. *Proceedings of the National Academy of Sciences* 116, 16 (2019), 7656–7661.

[29] S. Iyengar and S.J. Westwood. 2015. Fear and loathing across party lines: New evidence on group polarization. *American journal of political science* 59, 3 (2015), 690–707.

[30] J.A. Kang, G.T. Hubbard, and S. Hong. 2019. Gender and credibility in branded storytelling. *Gender in Management: An International Journal* (2019).

[31] J. Kassing and J. Sanderson. 2010. Fan–Athlete Interaction and Twitter Tweeting Through the Giro: A Case Study. *International Journal of Sport Communication* 3, 1 (2010), 113–128. https://doi.org/10.1123/ijsc.3.1.113

[32] J. Kim and H. Song. 2016. Celebrity's self-disclosure on Twitter and parasocial relationships: A mediating role of social presence. *Computers In Human Behavior* 62 (2016), 570–577. https://doi.org/10.1016/j.chb.2016.03.083

[33] M. Koren. 2020. The Cult of Elon Is Cracking. *The Atlantic* (2020). https://www.theatlantic.com/science/archive/2020/05/elon-musk-coronavirus-pandemic-tweets/611887/. Retrieved 13 June 2022.

[34] P. Lahoti, G. Francisci Morales, and A. Gionis. [n. d.]. Finding topical experts in Twitter via query-dependent personalized PageRank. In *Proceedings of the 2017 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining 2017* (2017-07). 155–162.

[35] J. Munnukka, D. Maity, H. Reinikainen, and V. Luoma-aho. 2019. Thanks for watching". The effectiveness of YouTube vlog endorsements. *Computers In Human Behavior* 93 (2019), 226–234. https://doi.org/10.1016/j.chb.2018.12.014

[36] D.J. O'Keefe. 1990. *Persuasion: Theory and Research.* Sage, Newbury Park, CA.

[37] J.E. Oliver and T.J. Wood. 2014. Conspiracy theories and the paranoid style (s) of mass opinion. *American Journal of Political Science* 58, 4 (2014), 952–966.

[38] D.M. Oppenheimer, T. Meyvis, and N. Davidenko. 2009. Instructional manipulation checks: Detecting satisficing to increase statistical power. *Journal of Experimental Social Psychology* 45, 4 (2009), 867–872.

[39] E.M. Perse and R. Rubin. 1989. Attribution in Social and Parasocial Relationships. *Communication Research* 16, February (1989), 59–77.

[40] Y. Pershad, P. Hangge, H. Albadawi, and R. Oklu. 2018. Social Medicine: Twitter in Healthcare. *Journal of Clinical Medicine* 7, 6 (2018), 121. https://doi.org/10.3390/jcm7060121

[41] T.B. Procaci, B.P. Nunes, T. Nurmikko-Fuller, and S.W. Siqueira. 2016. Finding topical experts in question & answer communities. In *2016 IEEE 16th international conference on advanced learning technologies (ICALT*. IEEE, 407–411.

[42] D. Raban and F. Harper. 2008. Motivations for answering questions online. *New media and innovative technologies* 73 (2008).

[43] J. Rasmussen. 2015. Should each of us take over the role as watcher?' Attitudes on Twitter towards the 2014 Norwegian terror alert. *Journal of Multicultural Discourses* 10, 2 (2015), 197–213. https://doi.org/10.1080/17447143.2015.1042882

[44] H. Reinikainen, J. Munnukka, D. Maity, and V. Luoma-aho. 2020. You really are a great big sister' – parasocial relationships, credibility, and the moderating role of audience comments in influencer marketing. *Journal of Marketing Management* 36, 3-4 (2020), 279–298.

[45] A.E. Schlosser, T.B. White, and S.M. Lloyd. 2006. Converting website visitors into buyers: how web site investment increases consumer trusting beliefs and online purchase intentions. *Journal of marketing* 70, 2 (2006), 133–148.

[46] D. Schwartz. [n. d.]. It's time to launch Neil deGrasse Tyson into Deep Space. https://www.vice.com/en/article/5dmkgz/neil-degrasse-tysons-tweets-are-so-bad-and-he-needs-to-go-away Retrieved November 2, 2022.

[47] Laura Silver, Janell Fetterolf, and Aidan Connaughton. 2021. Diversity and Division in Advanced Economies. https://www.pewresearch.org/global/2021/10/13/diversity-and-division-in-advanced-economies/

[48] H. Silverman. [n. d.]. Neil deGrasse Tyson apologizes for his tweets about shooting deaths. https://edition.cnn.com/2019/08/05/us/neil-degrasse-tyson-gun-death-tweets-trnd/index.html Retrieved November 2, 2022.

[49] G.S. Stever and K. Lawson. 2013. Twitter as a way for celebrities to communicate with fans: Implications for the study of parasocial interaction. *North American journal of psychology* 15, 2 (2013).

[50] J. Terrell, A. Kofink, J. Middleton, C. Rainear, E. Murphy-Hill, C. Parnin, and J. Stallings. 2017. Gender differences and bias in open source: Pull request acceptance of women versus men. *PeerJ Computer Science* 3 (2017), 111.

[51] D.R. Thomas. 2006. A general inductive approach for analyzing qualitative evaluation data. *American journal of evaluation* 27, 2 (2006), 237–246.

[52] K.M.D.I. Treen, H.T. Williams, and S.J. O'Neill. 2020. Online misinformation about climate change. *Wiley Interdisciplinary Reviews: Climate Change* 11, 5 (2020), 665.

[53] J. Uscinski and L. Goren. 2010. What's in a Name? Coverage of Senator Hillary Clinton during the 2008 Democratic Primary. *Political Research Quarterly* 64, 4 (2010), 884–896. https://doi.org/10.1177/1065912910382302

[54] J. Walsh. 2021. Elon Musk's False Covid Predictions: A Timeline. https://www.forbes.com/sites/joewalsh/2021/03/13/elon-musks-false-covid-predictions-a-timeline/?sh=253ae1175b6d. Retrieved 13 June 2022.

[55] P. Weingart and L. Guenther. 2016. Science communication and the issue of trust. *Journal of Science communication* 15, 5 (2016), 01.

[56] D. Westerman, P.R. Spence, and B. Heide. 2014. Social media as information source: Recency of updates and credibility of information. *Journal of computer-mediated communication* 19, 2 (2014), 171–183.

[57] A. Whiting and D. Williams. 2013. Why people use social media: a uses and gratifications approach. *Qualitative Market Research: An International Journal* (2013).

[58] S. Wijenayake, N. Berkel, V. Kostakos, and J. Goncalves. 2019. Measuring the Effects of Gender on Online Social Conformity. *Proceedings Of The ACM On Human-Computer Interaction* 3, CSCW (2019), 1–24. https://doi.org/10.1145/3359247

[59] S. Wijenayake, D. Hettiachchi, S. Hosio, V. Kostakos, and J. Goncalves. 2020. Effect of Conformity on Perceived Trustworthiness of News in Social Media. *IEEE Internet Computing* 25, 1 (2020), 12–19. https://doi.org/10.1109/mic.2020.3032410

[60] Senuri Wijenayake, Jolan Hu, Vassilis Kostakos, and Jorge Goncalves. 2021. Quantifying the Effects of Age-Related Stereotypes on Online Social Conformity. In *Human-Computer Interaction – INTERACT 2021*, Carmelo Ardito, Rosa Lanzilotti, Alessio Malizia, Helen Petrie, Antonio Piccinno, Giuseppe Desolda, and Kori Inkpen (Eds.). Springer International Publishing, Cham, 451–475.

[61] Senuri Wijenayake, Niels van Berkel, Vassilis Kostakos, and Jorge Goncalves. 2020. Quantifying the Effect of Social Presence on Online Social Conformity. *Proc. ACM Hum.-Comput. Interact.* 4, CSCW1, Article 55 (2020), 22 pages. https://doi.org/10.1145/3392863

[62] T. Wulf, F.M. Schneider, and J. Queck. 2021. Exploring viewers' experiences of parasocial interactions with videogame streamers on twitch. *Cyberpsychology, Behavior, and Social Networking* 24, 10 (2021), 648–653.