

Scroll-Time and Echo-Chambers: Effect of Mass Media on Ingroup Bias and Polarization

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Abstract

Information disseminated through mass-media has been known to significantly influence behaviors such as voting (Iyengar & Kinder, 1987), brand preferences (Tversky & Kahneman, 1981), and public opinion (McCombs & Shaw, 1972). More specifically, the way information is framed and presented in mass media (for instance through “breaking news” and “sensational headlines”) can reinforce existing beliefs and contribute to political and ideological polarization, with partisan media creating “echo chambers” that deepen biases (Hobolt et al., 2024). The current study leverages these insights to investigate the effects of the echo chambered media and the time available for information consumption in an intergroup context across three experiments. Going by the minimal group paradigm, Experiment 1 employed a randomized, untimed presentation (non-echo-chamber) of news about an ingroup and an outgroup, while Experiment 2 used a blocked, untimed design (echo-chamber), and Experiment 3 a blocked, timed design (echo-chamber, doomscroll). All experiments involved two news sources with varying reliability (low and high) disseminating valanced (positive/negative) intergroup news headlines, and the participants were asked about the degree to which they believed the specific news items. Results showed that the manner of news presentation and timing moderated ingroup favoritism, with higher propensity to believe positive ingroup than positive outgroup news and vice-versa for the negative news, with the most significant bias emerging in Experiment 2 and negative news bias in Experiment 3. These findings shed light on how patterns of media consumption may influence intergroup perceptions and lead to polarization in society.

Keywords: ingroup bias; minimal group paradigm; media believability; polarization

Introduction

Humans navigate their social environments, often by categorizing other individuals as either members of their social ingroup or of an outgroup (Sumner, 1906; Allport, 1954; Rosch, 1978; Fiske & Taylor, 1991). Such a distinction between ingroup and outgroup members forms the basis for an *ingroup bias*, i.e., a tendency to favor those perceived as

part of one's group over those who are not (Tajfel & Turner 1978; Brewer, 1991; Kurzban et al., 2001; Bigler & Liben, 2007). The ingroup bias is a robust effect that manifests across a spectrum of behaviors, from preferential treatment and cooperation for ingroup to prejudice and discrimination against outgroups (Hewstone et al., 2001; Brewer, 2012; Balliet et al., 2014; Everett et al., 2015).

The said ingroup bias can manifest in both explicit and implicit forms (Amodio & Mendoza, 2010). For instance, it has been identified as a primary driver of social discrimination across various social categories, including gender, caste, nationality, and ethnicity (Greenwald & Pettigrew, 2014). Examples of this bias include making morally favorable decisions toward ingroup members (Cadsby et al., 2016) and exhibiting greater prosocial behavior toward the ingroup than the outgroup (Fiedler et al., 2018). On the other hand, ingroup bias can also appear as prejudice or negative evaluations and emotional responses directed at outgroup members (Amodio, 2014), potentially escalating to physical violence (Sherif et al., 1961; see Dunham, 2008, for a comprehensive review). Moreover, these manifestations of ingroup bias are not only limited to overt behavior but are also associated with distinct neural mechanisms (Molenberghs, 2013; Saarienen et al., 2021).

In recent years, the pervasive influence of mass media has emerged as a critical factor shaping intergroup dynamics and consequent social behavior. Media broadcasts, consumed across digital platforms such as news websites and social media outlets, have been shown to shape public perceptions and inform various social behaviors (Harwood & Joyce, 2012; Harris et al., 2007; Baretto, 2012, Seate & Mastro, 2017). Interestingly, these media narratives not only reflect societal attitudes but actively shape them through mechanisms such as framing and agenda-setting (Scheufele & Tewksbury 2007; Kubin & Sikorski, 2023), often magnifying polarization between groups. Indeed, studies have demonstrated the profound role of media in influencing public opinion and behaviors (Iyengar & Kinder; 1987;

McCombs & Shaw, 1972; for more recent works, see Happer & Philo, 2013; Huang et al., 2021; Liao, 2023). Further, in the contemporary context, the influence of mass media on social behaviors has grown significantly, being amplified by the proliferation of partisan content, often creating echo chambers wherein individuals predominantly consume information that aligns with their existing beliefs. Such selective exposure reinforces biases, fosters ingroup favoritism, and exacerbates intergroup divisions, raising critical questions about the role of media in intergroup dynamics (Evans & Fu, 2018; Sandu & Nistor, 2020; Alatawi et al., 2021; Ranalli & Malcom, 2023; Steiglechner et al., 2023).

Media reliability significantly shapes public opinion and social choices, as individuals are more likely to trust and internalize narratives from credible sources (Huang et al., 2021; Han et al., 2022). Partisan media, for example, often portray ingroups positively and outgroups negatively, reinforcing polarization. The extent to which media framing influences bias depends on factors such as source credibility, content presentation, and audience predispositions (Ariyanto et al., 2007; Knobloch-Westerwick, 2020; Hartmann & Tanis, 2013).

Additionally, the depth of deliberation plays a crucial role in information processing. Extended deliberation promotes critical thinking and nuanced evaluations, whereas minimal deliberation often leads to heuristic-driven judgments shaped by preexisting biases (Bago et al., 2020). The valence of information—whether positive or negative—also affects cognitive processing, with negative stimuli demanding greater cognitive resources and eliciting stronger emotional responses, a phenomenon known as "negativity bias" (Baumeister et al., 2001; Vaish et al., 2008; Norris, 2021). The interaction between deliberation time and information valence has important implications for understanding how media content influences public attitudes, particularly in shaping intergroup relations and social polarization (Valkenburg & Peter, 2013; Cho et al., 2023).

The current study examined how media exposure influences ingroup bias, moderated by news source reliability and deliberation time, using the minimal group paradigm (Tajfel, 1970). Participants were arbitrarily assigned to groups before being exposed to controlled information. Prior research has shown that even in the absence of meaningful group distinctions, individuals display strong ingroup preferences, underscoring the deep-rooted nature of group biases (Tajfel, 1970; Platow et al., 1990; Otten & Wentura, 1999; Otten & Moskowitz, 2000; Ashburn et al., 2001; Dunham et al., 2011; Dunham, 2018). This study specifically investigated whether the reliability of the news source (low vs. high), the time spent deliberating (timed vs. untimed), and the valence of information (positive vs. negative) would shape ingroup bias, even within a minimal group setting.

The study employed a 2x2x2 within-subjects design to systematically examine the interplay between three key factors: (1) source reliability (high vs. low), (2) the valence of intergroup media content (positive vs. negative), and (3)

group membership (ingroup vs. outgroup). Participants were presented with news headlines attributed to either a high reliable or low reliable news source, with each headline framed as either favorable (positive) or unfavorable (negative) toward their ingroup or outgroup. This design allowed us to explore not only the main effects but also interactions between these factors, providing a nuanced understanding of media believability and ingroup favoritism.

More specifically, the current study tested two hypotheses: (1) presenting both ingroup and outgroup news (positive and negative) in a mixed-randomized manner would reduce ingroup bias compared to news focused solely on one group (i.e., blocked presentation), reflecting the effects of echo-chambered feeds; and (2) the time spent reading news articles would influence behavioral differences in ingroup bias. To test these hypotheses, we conducted three experiments. In Experiment 1, participants were exposed to intergroup news in a non-echo chambered design, with ingroup and outgroup news presented randomly for participants to judge as true or false, without time constraints. In Experiment 2, participants viewed intergroup news in a blocked design, akin to echo-chambered feeds, again without time constraints. In Experiment 3, participants judged intergroup news in a blocked design with a time limit, simulating the doomscrolling behavior seen on echo-chambered social media. We anticipated a reduction in ingroup bias in Experiment 1 due to the non-echo chambered design, while expecting higher levels of ingroup bias in Experiments 2 and 3 due to the echo-chambered media presentation.

Experiment 1

Methods

Participants Twenty-one participants took part in Exp 1. Three participants were excluded due to failure to learn news-source reliability. All participants (3 females, mean age = 26 ± 3.08, all right-handed with normal or corrected-to-normal vision) were recruited from the university. A written consent form approved by the Institute Ethics Committee was completed by all participants prior to running the experiment. All participants were duly compensated for taking part in the experiment.

Stimuli The experiment was set up in two phases. In Phase 1, 96 news headlines, 48 correct and 48 incorrect, were used for the news-source familiarization and establishment of source reliabilities. These headlines were created from general knowledge articles and paraphrased as news headlines. The incorrect news headlines were created by replacing factually correct information with incorrect one. Two news sources, ABC News and XYZ News, counterbalanced for low (providing 25% correct news) and high (providing 75% correct news) reliability, disseminated news for both Phase 1 and Phase 2 of the experiment.

The Phase 2 involved (i) minimal intergroup categorization (RUPRAA and JAWAAI, Hindi non-words denoting two communities, counterbalanced for ingroup and outgroup) and (ii) intergroup valenced news judgment task. 72 news

headlines (36 positive, 36 negative) were selected from a pool of 270 (150 positive, 120 negative) news items to be used in Phase 2. These 270 valanced news headlines were created using news articles from the internet. The experiment was run on a PC using PsychoPy software (version 2023.1.2) and displayed on a 24-inch monitor with a refresh rate of 100 Hz and a resolution of 1920x1080.

Procedure As mentioned earlier, in Phase 1, participants learned the reliability of the news sources (ABC News and XYZ News) and in Phase 2, participants judged intergroup valanced news headlines coming from the two learned news sources, having different reliabilities.

Prior to running the experiment, pilot (n = 11) of Phase 1 was carried out to test whether participants were able to learn and discriminate between the low and high credible news sources. Of the total 96 news headlines in Phase 1, 66.67% news were used as a learning block (24 correct and 8 incorrect for the higher reliable news source) with feedback provided after every news headline judgment. The rest 33.34% were used as a testing block (12 correct and 4 incorrect for the higher reliable news source). The pilot data confirmed participants' learning of the two distinct news sources and associated reliability, and we proceeded to use the same for the main experiment.

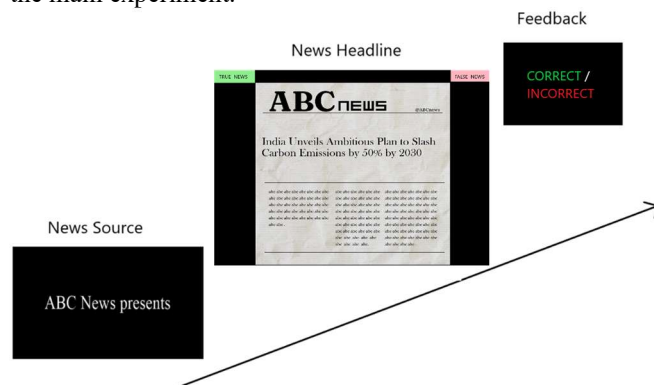


Figure 1: Example task in Phase 1. The trial started with an on-screen display of news source, followed by the news headline. Feedback was provided in learning block of phase 1, but not in testing block. Phase 2 had same task structure (without feedback).

Also, the set of 270 news headlines (150 positive, 120 negative) created using news articles available on the internet were rated for valence by 30 participants, and 36 most positive and 36 most negative news headlines were selected to be used in Phase 2 of the experiment. These 72 news headlines were then balanced for ingroup and outgroup news (36 ingroup news, 18 positive and 18 negative). The experiment was conducted in the following steps:

- a) Participants arriving for the experiment first completed Phase 1 and got familiarized with ABC News and XYZ News as low and high reliable news sources, counterbalanced. Participants judged a news headline as TRUE or FALSE and received feedback in the learning block (64 news items)

about their judgment. Following this, participants judged the remaining news headlines (32) coming from ABC and XYZ News without feedback.

- b) After participants had judged all the 96 news headlines, a screen appeared that prompted participants to choose the news source that they felt was more reliable in a two-alternate forced choice fashion. Also, in the same screen, participants were asked to rate the perceived reliability of the two news sources between 0-100% using sliders.
- c) Next, Phase 2 started with allocating participants to either JAWAAI or RUPRAA group. The allocation was such that odd-numbered participants belonged to JAWAAI community and even-numbered participants belonged to RUPRAA community.
- d) After minimal intergroup categorization, participants were instructed for the Phase 2 task wherein they judged the intergroup news headlines (positive as well as negative) as TRUE or FALSE coming from low and high reliable news sources (ABC and XYZ News as learned in Phase 1).
- e) Phase 2 news judgment task had two blocks, each block had 36 news items to be judged as TRUE or FALSE news. The experiment started with a reminder page that displayed participant's ingroup and outgroup and the low and high reliable news sources, and the reminder page appeared again after the end of first block during the break.

For the news judgment in the source familiarization task (Phase 1), the headlines, correct or incorrect, came from ABC News and XYZ News in a randomized design. There was no time limit, and participants completed Phase 1 in their own time. For Phase 2, the intergroup news presentation was randomized across the two blocks and untimed, and participants judged these positive and negative intergroup headlines in their own time. As we will see going further, Phase 1 was same across Experiments 1-3, with presentation design and stimuli timing of Phase 2 being manipulated across the three experiments.

Statistical Analyses Data from participants who failed to learn the low and high reliable news sources were excluded from the analysis. Consequently, less than 2% of the data was excluded and analysis was performed on the remaining trials. The study utilized a 2x2x2 factorial design, with source reliability (REL: low and high), news valence (VAL: positive and negative), and group membership (GRP: ingroup and outgroup) as the three factors. An ANOVA was performed in R with percentage of news believability as the dependent variable, including all main effects and interactions among the three factors. Tukey's HSD test was applied as a post hoc analysis, and the valence-group interaction was of primary interest for the study. Specifically, the authors were interested in differences between positive ingroup news judgment vs positive outgroup news judgment and negative ingroup news judgment vs negative outgroup news judgment.

Results

A three-way ANOVA was conducted to examine the effects of news reliability (REL), news valence (VAL), and group membership (GRP) on the dependent variable (percentage of news believability). Significant main effects were found for reliability, $F(1,136) = 50.91, p < 0.001$ and valence, $F(1,136) = 45.41, p < 0.001$. The main effect of group was not statistically significant, $F(1,136) = 0.40, p = 0.527$. No significant interactions were observed between reliability and valence, $F(1,136) = 3.33, p = 0.070$, reliability and group, $F(1,136) = 0.23, p = 0.635$, or valence and group, $F(1,136) = 2.77, p = 0.098$. Similarly, the three-way interaction among reliability, valence, and group was not also significant, $F(1,136) = 0.006, p = 0.937$.

Post hoc analysis using Tukey’s HSD test revealed that though participants favored ingroup news (see Table 1 for post-hoc comparisons for VAL*GRP interaction) with lower percentage of believability for negative ingroup news compared to negative outgroup news ($p_{\text{adjusted}} = 0.36$) and higher percentage of believability for positive ingroup news compared to positive outgroup news ($p_{\text{adjusted}} = 0.88$), these differences were not significant. Figure 2 reports the VAL*GRP interaction including all possible comparisons.

Table 1: Post-hoc comparison for Valence x Group interaction for experiment 1

Comparison across	mean difference	p_{adjusted}
POS:IG - NEG:IG	0.3271	0.00000
NEG:OG - NEG:IG	0.0895	0.36772
POS:OG - NEG:IG	0.2870	0.00000
NEG:OG - POS:IG	-0.2376	0.00017
POS:OG - POS:IG	-0.0401	0.88542
POS:OG - NEG:OG	0.1975	0.00259

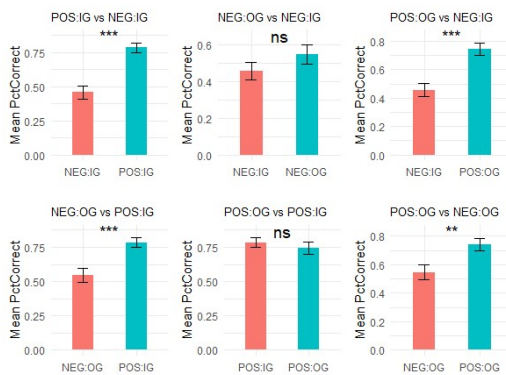


Figure 2: Experiment 1 results. Error bars represent standard errors of the mean.

Discussion

As expected, when participants judged valenced intergroup news presented randomly across the two blocks, they displayed a non-significant bias for their own group. This random news presentation along with deliberation time

seems to have helped participants mentalize and get a broader perspective about the minimal groups and their relations (Rahal et al, 2020; Nasie, 2023; Schmidtke & Kuperman, 2024), and this in turn reduced the inherent group bias (Caluwaerts et al, 2023). Note that participants were assigned to minimal groups as per Tajfel (1970) and the participants had no prior information about the two groups. As we would see going further, Social Identity Theory entails ingroup favoritism despite minimal grouping conditions, and the non-significant bias we observe in Exp 1 could thus be attributed to non-echo chambered news presentation in public media (Kubin & Sikorski, 2021, 2024; Balietti et al, 2021).

Experiments 2 & 3

Experiments 2 and 3 utilized the same method as that of Experiment 1, with changes in the manipulation of the news presentation order and news judgment timing in phase 2 while phase 1 remained the same. Both experiment 2 and 3 had 37 participants. All three experiments in the study employed unique sets of participants to avoid familiarization of the experimental task and demand characteristics.

Experiment 2

For experiment 2, participants (10 female, mean age = 21.72 ± 3.74 , 35 right-handed, all normal or corrected-to-normal vision) again learned about the reliability of the two news sources ABC News and XYZ News in phase 1. Following source familiarization, participants proceeded with phase 2 of the experiment where the intergroup news were presented in blocked design, with all ingroup news presented in one block and all outgroup news presented in the other. The order of the ingroup/outgroup block was randomized across participants. Data from participants who failed to learn the high and low credible news sources in phase 1 was not included for the analysis, resulting in exclusion of less than 5% of the data.

Results

A three-way ANOVA yielded the main effects of news source reliability ($F(1,288) = 108.04, p < 0.001$) and news valence ($F(1,288) = 80.02, p < 0.001$). A strong interaction effect of news valence and group membership was also obtained ($F(1,288) = 24.00, p < 0.001$). A Tukey’s HSD test to further elucidate the VAL*GRP interaction showed that participants significantly favored ingroup news (see Table 2 for post-hoc comparisons for VAL*GRP interaction) with lower percentage of believability for negative ingroup news compared to negative outgroup news ($p_{\text{adjusted}} = 0.0023$) and higher percentage of believability for positive ingroup news compared to positive outgroup news ($p_{\text{adjusted}} = 0.0049$). Figure 3 reports bar plots of all possible VAL*GRP comparisons.

Table 2: Post-hoc comparison for Valence x Group interaction for experiment 2

Comparison across	mean difference	p_{adjusted}
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POS:IG - NEG:IG	0.3382	0.00000
NEG:OG - NEG:IG	0.1124	0.00234
POS:OG - NEG:IG	0.2381	0.00000
NEG:OG - POS:IG	-0.2258	0.00000
POS:OG - POS:IG	-0.10009	0.00492
POS:OG - NEG:OG	0.1257	0.02332

Discussion

As expected, blocked news presentations seem to have magnified the ingroup bias that showed only trends in experiment 1. Here, the experiment tried replicating how echo-chambered mass media broadcasts may drive polarization by restricting a broader perspective about societal working and providing only belief-conforming news (Vicario et al, 2016; Barbera, 2020; Cinelli et al, 2021; Jiang et al, 2021). The participants tended to believe ingroup positive news and rejected ingroup negative news much more readily, balancing higher self/group esteem and cognitive dissonance experienced through positive ingroup news and negative ingroup news, respectively. However, the participants were much more skeptical in case of outgroup positive news but more affirming of outgroup negative news. In essence, the findings are in line with our expectations, that giving an echo-chamberesque news presentation in public media drives polarization and increases ingroup biases.

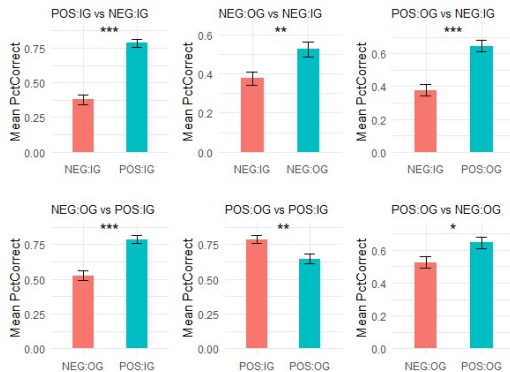


Figure 3: Experiment 2 results. Error bars represent standard errors of the mean.

Experiment 3

Experiments 3 utilized the same design as the previous experiment with only the time component being added to the latter. Here, participants (13 female, mean age = 22.86 ± 2.98 , 35 right-handed, all normal or corrected-to-normal vision) after source familiarization task (phase 1) proceeded to phase 2 where the intergroup news was presented in blocked-design just like experiment 2. The headlines were displayed on the screen for 6 seconds, after which they disappeared, and TRUE/FALSE News buttons appeared, requiring participants to make a choice within 2 seconds. Again, the order of the ingroup/outgroup block was randomized across participants, and data from participants who failed to learn the high and low credible news sources in phase 1 was not included for the analysis, resulting in exclusion of less than 5% of the data.

Results

A 2x2x2 ANOVA revealed significant main effects for news source reliability ($F(1,288) = 54.72, p < 0.001$) and news valence ($F(1,288) = 109.08, p < 0.001$), along with a strong interaction effect between news valence and grouping condition ($F(1,288) = 18.80, p < 0.001$). A post-hoc analysis using Tukey's HSD test conducted to further explore the VAL*GRP interaction revealed that participants again preferred ingroup news (see Table 3 for post-hoc comparisons for VAL*GRP interaction) with significantly lower percentage of believability for negative ingroup news compared to negative outgroup news ($p_{\text{adjusted}} = 0.0003$) but non-significant higher percentage of believability for positive ingroup news compared to positive outgroup news ($p_{\text{adjusted}} = 0.164$). Figure 4 reports bar plots of all possible VAL*GRP comparisons.

Table 3: Post-hoc comparison for Valence x Group interaction for experiment 3

Comparison across	mean difference	p_adjusted
POS:IG - NEG:IG	0.4270	0.00000
NEG:OG - NEG:IG	0.1658	0.00036
POS:OG - NEG:IG	0.3423	0.00000
NEG:OG - POS:IG	-0.2612	0.00000
POS:OG - POS:IG	-0.0847	0.16426
POS:OG - NEG:OG	0.1764	0.00012

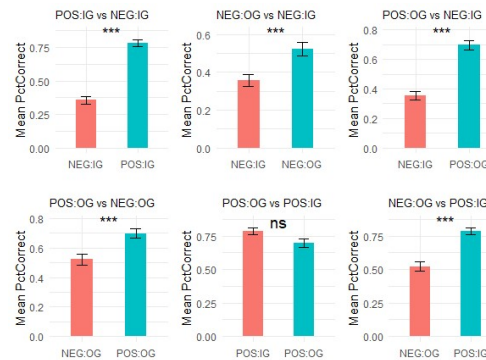


Figure 4: Experiment 3 results. Error bars represent standard errors of the mean.

Discussion

As in experiment 2, blocked news presentation drove news judgment bias in favor of ingroup more than that observed in experiment 1. Interestingly, the speeded manner of the judgment prominently drove negative news bias but attenuated the positive news bias for the intergroup headlines. A similar effect of low deliberation time has been reported in literature as a source of faulty news judgment (Lewandowsky et al, 2017; Pennycook & Rand, 2019; Bago et al, 2020), and an additional positivity bias (Austin & Dong, 1994) could be attributed to the observed results in experiment 3. Specifically, the speeded nature of the task may have facilitated higher believability for positive news for both the

ingroup and the outgroup but made participants wary of negative ingroup news and the eventual lower believability of the same as compared to negative outgroup news.

General Discussion

Previous studies using the minimal group paradigm shows that even arbitrary group categorization induces strong ingroup bias. This study investigated individuals' willingness to believe intergroup news within a minimal group setting. Across three experiments, we manipulated news source reliability (reliable/unreliable), news valence (positive/negative), group membership (ingroup/outgroup), evaluation time (timed/untimed), and presentation format (blocked/echo-chamber vs. mixed/non-echo-chamber).

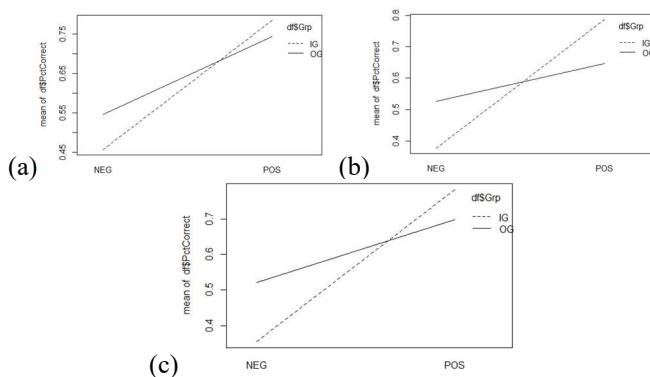


Figure 5: Interaction (VAL*GRP) plot for (a) Exp 1, (b) Exp 2, (c) Exp 3.

The authors expected that given the tendency for ingroup favouritism, individuals will be more likely to believe positive news about their ingroup as compared to positive news about an outgroup; and less ingroup negative news as compared to outgroup negative news. Also, the authors hypothesized that the manner of presentation and time available for the individuals would interact with the participants' willingness to believe the presented news items.

Consistent with the authors' expectations, participants were found to favor their ingroup, depicting higher willingness to believe positive news about the ingroup compared to the positive news about the outgroup. Also, the participants showed a lower inclination to believe ingroup negative than outgroup negative news. This pattern, though varying in magnitude, was observed across all three experiments and Figure 5 demonstrates this result through the VAL*GRP interaction plot.

More specifically, in experiment 1, where randomized ingroup and outgroup news was presented without time limits, the observed ingroup bias was negligible, showing only slight trends. However, in Experiment 2, with a blocked design and no time constraints, revealed significant ingroup bias for both positive and negative news. Finally, in Experiment 3, again with blocked design but time-limited judgments, showed strong ingroup bias for negative news but only a trend for positive news.

The findings of the current study align with previous research highlighting the role of partisan media consumption and confirmation bias as key contributors to increasing societal polarization (Levy, 2021; Kubin & Sikorski, 2021; Guess et al, 2021; Weismueller et al, 2024). Studies have shown that media diversity plays a significant role in the formation of echo chambers, with pro-attitudinal media exacerbating polarization (Mutz & Martin, 2001; Dubois & Blank, 2018; for a review, see Kubin & Sikorski, 2021). More recently, Lefebvre et al. (2024) and Steinfeld et al. (2024) demonstrated that exposure to diverse viewpoints significantly reduces polarization, influencing intergroup attitudes and fostering broader perspectives.

Our experiments contribute additional evidence to existing findings on media influence and intergroup bias. In Experiment 1, where news was presented in a randomized, non-echo chamber format, ingroup bias was minimal. This result suggests that exposure to diverse viewpoints mitigates polarized attitudes and fosters a more balanced perspective on intergroup relations (Mutz, 2002; Huckfeldt et al, 2004; Saveski et al, 2022). In contrast, Experiment 2 employed a blocked design analogous to echo-chambered media, which led to pronounced ingroup bias, highlighting how isolated, pro-attitudinal content can amplify polarization in the absence of diverse perspectives.

Experiment 3 simulated a "doomscrolling" scenario, reflecting the time-pressured and polarized media consumption typical of social media platforms. Under these conditions, ingroup bias was particularly pronounced for negative news. This finding aligns with insights from evolutionary psychology, which suggest that threats are prioritized over rewards, resulting in a stronger negativity bias (Cacioppo & Gardner, 1999; Baumeister, 2001; Allen & Badcock, 2003; Norris, 2021). Across all three experiments, the heightened ingroup bias for negative news compared to positive news consistently underscores the disproportionate impact of threat-related information on social judgment.

Overall, these results emphasize the critical role of diverse media exposure in reducing polarization and mitigating ingroup bias. They also highlight the dangers of echo-chambered content and time constraints, which amplify polarized attitudes and negativity bias. Addressing these challenges in media presentation could be pivotal in fostering healthier intergroup dynamics.

Conclusion

In summary, we see how presentation design and presentation time moderates ingroup biases in news judgement tasks across the three experiments. The echo chambered vs non-echo-chambered presentation significantly dictates ingroup biases regarding media believability, and the reduced deliberation of news feeds facilitated by social media platforms adds a unique dynamic to intergroup behavior. The study can guide social media policies on regulating content, reducing echo chambers, and promoting broader intergroup perspectives in our increasingly interconnected socio-cultural world, ultimately helping to mitigate intergroup biases.

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References

- Alatawi, F., Cheng, L., Tahir, A., Karami, M., Jiang, B., Black, T., & Liu, H. (2021). A survey on echo chambers on social media: Description, detection and mitigation. arXiv preprint arXiv:2112.05084.
- Allport, G. W. (1954). *The nature of prejudice*. Reading/Addison-Wesley.
- Ariyanto, A., Hornsey, M. J., & Gallois, C. (2007). Group allegiances and perceptions of media bias: Taking into account both the perceiver and the source. *Group Processes & Intergroup Relations*, 10(2), 266-279.
- Ashburn-Nardo, L., Voils, C. I., & Monteith, M. J. (2001). Implicit associations as the seeds of intergroup bias: How easily do they take root?. *Journal of personality and social psychology*, 81(5), 789.
- Bago, B., Rand, D. G., & Pennycook, G. (2020). Fake news, fast and slow: Deliberation reduces belief in false (but not true) news headlines. *Journal of experimental psychology: general*, 149(8), 1608.
- Balliet, D., Wu, J., & De Dreu, C. K. (2014). Ingroup favoritism in cooperation: a meta-analysis. *Psychological bulletin*, 140(6), 1556.
- Barberá, P. (2020). Social media, echo chambers, and political polarization. *Social media and democracy: The state of the field, prospects for reform*, 34-55.
- Barreto, M. A., Manzano, S., & Segura, G. (2012). The impact of media stereotypes on opinions and attitudes towards Latinos. *National Hispanic Media Coalition, Latino Decisions*.
- Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of general psychology*, 5(4), 323-370.
- Bigler, R. S., & Liben, L. S. (2007). Developmental intergroup theory: Explaining and reducing children's social stereotyping and prejudice. *Current directions in psychological science*, 16(3), 162-166.
- Brewer, M. B. (1991). The social self: On being the same and different at the same time. *Personality and social psychology bulletin*, 17(5), 475-482.
- Brewer, M. B. (2012). Optimal distinctiveness theory: Its history and development. *Handbook of theories of social psychology*, 2, 81-98.
- Caluwaerts, D., Bernaerts, K., Kesberg, R., Smets, L., & Spruyt, B. (2023). Deliberation and polarization: a multi-disciplinary review. *Frontiers in Political Science*, 5, 1127372.
- Cho, M. J., Reeves, B., Ram, N., & Robinson, T. N. (2023). Balancing media selections over time: Emotional valence, informational content, and time intervals of use. *Heliyon*, 9(12).
- Cinelli, M., De Francisci Morales, G., Galeazzi, A., Quattrocchi, W., & Starnini, M. (2021). The echo chamber effect on social media. *Proceedings of the National...*
- Del Vicario, M., Vivaldo, G., Bessi, A., Zollo, F., Scala, A., Caldarelli, G., & Quattrocchi, W. (2016). Echo chambers: Emotional contagion and group polarization on facebook. *Scientific reports*, 6(1), 37825.
- Dunham, Y., Baron, A. S., & Carey, S. (2011). Consequences of "minimal" group affiliations in children. *Child development*, 82(3), 793-811.
- Enikolopov, R., Petrova, M., & Zhuravskaya, E. (2011). Media and political persuasion: Evidence from Russia. *American economic review*, 101(7), 3253-3285.
- Everett, J. A., Faber, N. S., & Crockett, M. (2015). Preferences and beliefs in ingroup favoritism. *Frontiers in behavioral neuroscience*, 9, 126656.
- Evans, T., & Fu, F. (2018). Opinion formation on dynamic networks: identifying conditions for the emergence of partisan echo chambers. *Royal Society open science*, 5(10), 181122.
- Fiske, S. T. (1991). *Social cognition*.
- Happer, C., & Philo, G. (2013). The role of the media in the construction of public belief and social change. *Journal of social and political psychology*, 1(1), 321-336.
- Han, R., Xu, J., & Pan, D. (2022). How media exposure, media trust, and media bias perception influence public evaluation of COVID-19 pandemic in international metropolises. *International Journal of Environmental Research and Public Health*, 19(7), 3942.
- Harris, R., Cady, E., & Barlett, C. (2007). Cognition and media. *Handbook of applied cognition*, 659-682.
- Hartmann, T., & Tanis, M. (2013). Examining the hostile media effect as an intergroup phenomenon: The role of ingroup identification and status. *Journal of Communication*, 63(3), 535-555.
- Harwood, J., & Joyce, N. (2012). Intergroup contact and communication. In *The handbook of intergroup communication* (pp. 167-180). Routledge.
- Hewstone, M., Rubin, M., & Willis, H. (2002). Intergroup bias. *Annual review of psychology*, 53(1), 575-604.
- Hobolt, S. B., Lawall, K., & Tilley, J. (2024). The polarizing effect of partisan echo chambers. *American Political Science Review*, 118(3), 1464-1479.
- Huang, J., Cook, G. G., & Xie, Y. (2021). Large-scale quantitative evidence of media impact on public opinion toward China. *Humanities and Social Sciences Communications*, 8(1), 1-8.
- Jiang, J., Ren, X., & Ferrara, E. (2021). Social media polarization and echo chambers in the context of COVID-19: Case study. *JMIRx med*, 2(3), e29570.
- Knobloch-Westerwick, S., Mothes, C., & Polavin, N. (2020). Confirmation bias, ingroup bias, and negativity bias in selective exposure to political information. *Communication research*, 47(1), 104-124.
- Kubin, E., & SIKORSKI, C. V. (2023). *The Complex Relationship Between Media and Political Polarization*:

- Understanding How the Media Can Affectively (De) Polarize Citizens. *International Journal of Communication*, 17.
- Kubin, E., & Von Sikorski, C. (2021). The role of (social) media in political polarization: a systematic review. *Annals of the International Communication Association*, 45(3), 188-206.
- Kubin, E., & von Sikorski, C. (2024). The polarizing content warning: how the media can reduce affective polarization. *Human Communication Research*, hqae006.
- Kurzban, R., Tooby, J., & Cosmides, L. (2001). Can race be erased? Coalitional computation and social categorization. *Proceedings of the National Academy of Sciences*, 98(26), 15387-15392.
- Liao, C. H. (2023). Exploring the Influence of Public Perception of Mass Media Usage and Attitudes towards Mass Media News on Altruistic Behavior. *Behavioral Sciences*, 13(8), 621.
- McCombs, M. E., & Shaw, D. L. (1993). The evolution of agenda-setting research: Twenty-five years in the marketplace of ideas. *Journal of communication*, 43(2), 58-67.
- Nasie, M. (2023). Sociopsychological principles for intercultural interventions to reduce intergroup bias in school. *Intercultural Education*, 34(6), 612-630.
- Norris, C. J. (2021). The negativity bias, revisited: Evidence from neuroscience measures and an individual differences approach. *Social neuroscience*, 16(1), 68-82.
- Otten, S., & Moskowitz, G. B. (2000). Evidence for implicit evaluative in-group bias: Affect-biased spontaneous trait inference in a minimal group paradigm. *Journal of Experimental Social Psychology*, 36(1), 77-89.
- Otten, S., & Wentura, D. (1999). About the impact of automaticity in the Minimal Group Paradigm: Evidence from affective priming tasks. *European Journal of Social Psychology*, 29(8), 1049-1071.
- Pennycook, G., & Rand, D. G. (2019). Fighting misinformation on social media using crowdsourced judgments of news source quality. *Proceedings of the National Academy of Sciences*, 116(7), 2171-2180.
- Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon and Schuster.
- Van Boven, L., Kamada, T., & De Dreu, C. K. (2018). Intergroup contact and ingroup bias. *Journal of Social Issues*, 74(3), 641-659.
- Vasilenko, A., & Ribeiro, M. (2020). Political polarization in a fragmented media environment: An empirical examination. *Journal of Politics and Technology*, 14(2), 103-121.
- Zollo, F., Bessi, A., Del Vicario, M., Scala, A., Caldarelli, G., & Quattrociocchi, W. (2015). Debunking in a world of echoes: Early detection of fake news and political bias. *Information Sciences*, 346, 1-16.