Stronger Than Yesterday: Investigating Peoples' Experiences of View Strengthening on Social Media

Beall, Sabrina City, University of London, UK | Beall.Sabrina@gmail.com

Makri, Stephann City, University of London, UK | Stephann@city.ac.uk

McKay, Dana RMIT, Australia | Dana.McKay@rmit.edu.au

ABSTRACT

Polarization of views (known as ideological polarization) is one of the greatest societal challenges of our time, potentially sewing distrust and hate among individuals and communities and threatening to undermine the fabric of democracy. Divisive issues such as abortion and gun control are ever-present and can drive issue polarization, and even affective polarization—a disdain for 'the other side,' which can further divide society. Social media has been flagged as a breeding ground for polarized views, with private groups and personalized algorithms facilitating self-creation of echo chambers that may lead to polarization. While there is prior research on the technological influences on view strengthening, scant Human-centered research exists and most of it has focused on view change in general, rather than view *strengthening* specifically. To investigate peoples' experiences of view strengthening on social media, we interviewed 10 people who recently strengthened their views on important topics. While some took steps to avoid creating echo chambers (e.g., by seeking out opposing views), others intentionally created them to allow their views to strengthen without interference. These findings have important implications for designing social media platforms that support careful and conscious view strengthening while mitigating against the risk of information manipulation.

KEYWORDS

Human-Information Interaction, echo chambers, personalization, view strengthening, polarization

INTRODUCTION

Polarization is a complex phenomenon and can be political (divergence of political attitudes away from the center), ideological (what we think about an issue) or affective (how we feel about people on the other side of the debate) (Kubin and von Sikorski, 2021). Recent years have seen a sharp increase in polarization of all forms (Iyengar, et al., 2019), a change often been blamed on the internet or social media. While there is strong evidence that broadcast TV reduced polarization (Campante and Hojman, 2013) and that mobile internet has increased it (Melnikov, 2021), studies on social media have been mixed (Ferguson, 2021, Lee, et al., 2022). Polarization, particularly affective polarization, has deleterious effects on society: dehumanizing 'the other side' does not allow for the productive discussions necessary for a healthy democracy (Helberger, 2011) and can result in political divisions that outweigh considerations of honesty or decency. Understanding polarization is thus a highly socially important goal. While much work has pointed to the role of technology in polarization, we lack an understanding of the human perspective of how people move toward stronger, and thus potentially more polarized views.

While there is significant work understanding the causes and impacts of polarization, little work has focused on the role of human information interaction (HII) in this process. Research examining the role of HII in view change has noted that view strengthening is one possible outcome (Buchanan, et al., 2022, McKay, et al., 2022), but has not focused on view strengthening (and thus possible polarization) specifically. Understanding the human experience of digital information in view strengthening is key to understanding how we might design information and interfaces to reduce or mitigate polarization, and it is this issue this paper examines. We report on semi-structured interviews with 10 participants who had recently experienced a strengthening of their views on an issue of importance to them, to examine the under-explored question 'what is the nature of HII-facilitated view change?' Participants described a variety of factors as contributing to their view strengthening, including emotionally captivating images or video, deliberate avoidance of disagreeable information, and algorithmic support for highly personalized feeds.

The rest of this paper is structured as follows: first, we examine the literature on polarization, focusing on the role of social media to frame our research question. Next, we describe our data collection and analysis method, including ethical considerations. We then present our findings, before discussing them in the context of prior work and using them to propose design recommendations. Finally, we present conclusions and suggest avenues for future research.

BACKGROUND

Concerns about increased polarization characterize our era. Brexit (Hobolt, et al., 2021); the Trump presidency (Iyengar, et al., 2019) and, more recently, the COVID pandemic (Stoetzer, et al., 2023) have seen deepening differences in ideological position. These divisions in turn that make it hard to have the productive conversations and find the necessary consensus to live in a functioning society (Helberger, 2011). More worrisome than the ideological split, though, is an increase in affective polarization, where it is not just the views held by 'the other side' that are held

in disdain, but the people who hold them. This reflects the nature of polarization, where people 'deny the existence of degrees' by (over)simplifying an issue to 'true' or 'false' (Badia, 2019, p.309). In the case of affective polarization, people consider those who do not share their black-and-white views as objectionable. This can create a sense of group identity that influences their willingness to accept information (Haider & Sundin, 2022) and can push individuals to more extreme views in the direction of their prior-held views, known as 'group polarization' (Sunstein, 2019).

The internet in general and social media specifically have been blamed for a rise in affective polarization (Ferguson, 2021, Iyengar, et al., 2019, Kubin and von Sikorski, 2021, Lee, et al., 2022, Munn, 2020, Rathje, et al., 2021). There is some evidence to support this: while broadcast television increased consensus and reduced polarization (Campante and Hojman, 2013), the introduction of mobile internet, allowing people to readily access a huge array of information (and misinformation) from their pocket, appears to have increased it (Melnikov, 2021). While it is easy to blame social media, with its highly personalized feeds, results of studies of social media use are mixed: some show an increase in polarization (Lee, et al., 2022), others show no change (Ferguson, 2021). No study has shown a decrease though.

So why might the internet in general and social media specifically promote polarization? One leading theory is the notion of 'selective exposure' (Kelly, 2009, Valentino, et al., 2009). The internet allows people to find others with interests similar to their own and engage more strongly with information they agree with (Bruns, 2019), even if that information is highly biased (Bakir and McStay, 2018). One common way of discussing this phenomenon is through the notion of an echo chamber (Sunstein, 2018): people prefer to surround themselves with people and ideas they agree with and algorithms support this approach, either because they are designed to (Pariser, 2011), or because people 'curate' or train them to provide the kind of information they prefer to see and keep other information out (Lee, et al., 2022).

This theory is appealing and easy to support, with studies showing little engagement with news from a different political polarity (Bakshy, et al., 2015, Flaxman, et al., 2016, Weeks, et al., 2016) and people avoiding conversations on social media with those with whom they disagree (Seargeant and Tagg, 2019). Conversely, though, it has been argued and demonstrated that people are unable to entirely insulate themselves from disagreeable views (Bruns, 2019, McKay, et al., 2022), and that in fact, regular exposure to views from the other side actually increases polarization(Bail, et al., 2018). Furthermore, views from the other side are more likely to be shared on social media and generate stronger emotional reactions than the views people agree with (Rathje, et al., 2021). One attempt to explain increased polarization in this context is the notion of the 'backfire effect', where exposure to views other than one's own serves specifically to entrench views (Nyhan and Reifler, 2010). Another hypothesis is the notion of 'sorting': that while traditionally we have shared some views and disagreed on others with most people, digital media is influencing us to have fewer cross-cutting opinions, creating ideological in-groups and out groups. The mechanism by which this is thought to occur is that, in being exposed to several views other than our own online, we become irritated, and influenced to shift our weakly-held views to align more closely with people with whom we share strongly held views (Törnberg, 2022). This theory fits with recent studies of debunking misinformation, which have shown debunking is most effective when it comes from those like us (Lewandowsky, et al., 2012). At this stage, though, sorting theory is conceptual; it has not been empirically validated.

Understanding how polarization (particularly affective polarization) occurs is a key challenge of our time, as we try to decrease social division and preserve democratic values. It is perhaps surprising, then, that little work has examined the human experience of becoming polarized. Which do people experience as more important in influencing their own? Shared views or opposing views? What kind of information plays a role in this process? Is social media an important factor? In this paper, we begin to address these questions from the perspective of understanding the role of social media on view strengthening, recognizing that, at an individual level, polarization is a specific form of view change: strengthening one's views.

While there is an extensive literature on view change in psychology (Petty, et al., 2003, Wood, 2000), it has not examined strengthening views specifically, nor has it focused on the information that contributes to view change. A recent study on the human experience of information in view change observed some instances of view strengthening, where people thought their views had become stronger over time, but also did not investigate view strengthening specifically. That study demonstrated that view change is often seeded by a passive information encounter on social media, and that many of these encounters are with emotionally impactful images or video (Mckay, et al., 2020). After this initial encounter, follow-up information seeking supports the view change. We cannot say, though, whether these patterns are true of view strengthening. This paper begins to address this gap.

METHOD
To understand peoples' experiences of view strengthening on social media, we conducted semi-structured interviews with 10 social media users, lasting 45-60 minutes. We now explain and justify our participant recruitment, interview and data analysis approach and associated limitations and ethical considerations.

Ten participants were recruited through the primary researcher's networks, social media and snowball sampling; we looked specifically for people who had experienced view strengthening as a result of information interaction on social media. This sample size is not unusual for studies of human information interaction, especially where the experience under investigation may be hard to pinpoint, see for example (Makri, et al., 2014, Marshall and Bly, 2005). Of our participants, six identified as women, three as men, and one as non-binary. All participants lived in Europe, the UK or the US; all were 18-35. Prior to participating in the study, participants completed a screening survey where they briefly overviewed the view that had been strengthened. This was to avoid discussing views that either the participants or the researcher would find upsetting to discuss. No participants were excluded from the study on this basis.

We conducted semi-structured interviews by Zoom with all participants. Online interviews allowed for geographically diverse participation and allowed participants to screenshare information that supported their view strengthening. In the interviews, we asked participants about information-related aspects of their view strengthening, including: what information they found on social media that had strengthened their views, what they did, thought, and felt when they found the it, how the information strengthened their views, and the effect this view strengthening had on their subsequent beliefs or behaviours. While these topics were covered with all interviewees, the interview style was discursive and curiosity-driven, to elicit as much detail as possible from participants about their experiences. To avoid shaming participants for their views, we took an empathy-first approach to interviewing, much like that described in (McKay et al. 2020), which focuses on view change generally rather than view strengthening specifically.

Interviews were transcribed automatically into Dovetail, which was used to support an inductive, reflexive thematic analysis (Clarke and Braun, 2021). Transcripts were supplemented by screenshots from the screen recordings; when an interviewee referred to a specific social media post/image/video, we pasted a screenshot of it in the relevant transcript section. This facilitated easier and more in-depth analysis and reporting. Initial codes were formed, then iteratively refined and grouped into themes. For example, this segment from P1's transcript was initially coded as '*importance of other people*' and '*importance of empathizing with others*' for strengthening views: *"You see that this TikTok resonated with other real people...that further supports that there are real people affected by this...because this had one million likes at one point..."* These codes were then organized into the overarching theme of '*Empathy is the main driver for view strengthening*.' Data collection and analysis was iterative; we analyzed each interview before conducting the next to alert us to interesting emerging findings.

The study was approved by our university ethics committee. Given the sensitive nature of many of the views, participants were reminded they could pause or stop the interview at any time; the interviewer retained the same right. Participant debriefs were conducted immediately after each interview to ensure participants were not discomfited by the experience. No participant expressed negative emotions during the debrief, and many explicitly described having the opportunity to reflect on their experiences as positive. While our findings may be misappropriated to manipulate people into strengthening their views these risks are already at play on social media (e.g., the Facebook emotions study (Kramer, et al., 2014)), this research does not pose additional risks, and may offer opportunities to mitigate them.

Our study has two main limitations. The first is lack of participant diversity: nearly all were the researchers' social contacts, and all were college educated and aged 20-35. While our findings may not be generalizable beyond this group, previous research has demonstrated that education level and age do not increase the likelihood of being in an echo chamber (Dubois & Blank, 2018). The second limitation is recall bias. This study relied heavily on participant recall, which may be unreliable. To mitigate against this, we focused on specific, concrete examples, and told participants it was fine if they couldn't remember specific aspects of view strengthening.

FINDINGS

In this section we present our findings. We first explain how it takes only a single information encounter to incite view strengthening, then address the role of algorithms in those encounters. Next, we examine the role of emotional content, and discuss information verification practices in view strengthening, before moving on to the role of previously known information. Finally, we discuss avoiding and engaging with opposing views, before summarizing.

It Only Takes One Encounter: Passively Encountered Information Catalyzes View Strengthening

While previous studies of the role of HII in view change found a one-off information encounter is not enough to change views outright (McKay et al., 2020), we found a single passive information encounter (Erdelez & Makri, 2020) was responsible for view strengthening in nearly every case. This is, perhaps, because view strengthening is even more incremental than outright change. These information encounters were often on social media feeds, highlighting the importance of passive encounters on social media for strengthening views. As an example, P3 strengthened his view on the severity of climate change by passively encountering, on social media and elsewhere, information about 'Fridays for Future' - a school-aged student strike where youth skipped Friday classes to advocate for climate change action. Being exposed to this information from several channels contributed to P3's greater climate awareness and the strengthening of his view on the issue. P3 stated *"it was everywhere. It was in the news, it was in newspapers, social*

media, in conversations. That was definitely a driver to get deeper into the topic." P3 explained *"the strengthening probably wouldn't have taken place without the topic being discussed and without having the awareness."*

For P9, an infographic (Figure 1) encountered on TikTok sparked her awareness of food regulation differences by country, leading her to be more conscious about the food she eats in the US. She stated *"I actually never questioned it before I saw the TikTok or the side-by-side comparisons."* Had it not been for this single serendipitous information encounter, P9 may not have felt the shock that led her to educate herself more about food ingredients.

Figure 1: Infographic in a TikTok video illustrating a side-by-side comparison of ingredients comparable 'Quaker' oatmeal cereal in the US (left) and UK (right)

It is notable that almost all view strengthening was facilitated by information that was passively acquired, as passive acquisition requires relatively little effort as compared with active seeking. This can be considered both a blessing, as it allowed participants' view strengthening journeys to progress naturally in response to incidental information exposure, and a curse, as once started, these journeys often continued despite the lack of intent to progress them.

Who's in Control? User vs. Algorithmic Agency in View Strengthening

While most participants perceived they had full control over their view strengthening, the strong role personalized algorithms played in curating and promoting content in their social media feeds highlighted a blurred boundary between user and algorithmic agency in view strengthening. For example, after P9 encountered the TikTok video comparing food ingredients in the US and UK (Figure 1), she actively searched for information on what ingredients were used in the US but banned elsewhere, and how to avoid them. She found an abundance of information that compared food ingredients in similar products across different countries, leading her to believe that people were becoming more aware of this issue. However, she still questioned the algorithm's role: "the *algorithm has definitely picked it up on Instagram and TikTok...this infographic wasn't the only one I've seen. I would say people are taking a stronger stance on it. But I could just be influenced by the fact my algorithm has picked it up."*

In contrast to P9's experience was P5, who was attempting to transition from vegetarianism to veganism. He explicitly sought out and followed certain types of content to 'create a bubble' of information by following organizations such as Greenpeace, who posted information he related to veganism, such as climate change news. He argued that this could be a positive way of allowing his views on vegetarianism to strengthen: *"I realized that, if you want to be vegetarian or vegan, you kind of have to create your own bubble and find your own websites, social media platforms, friends, and realms...which makes it, on one hand, easier for you to stay vegetarian or vegan and on the other hand it gets you more information. You then realize this is a good thing to do, because if you don't, you are always confronted with the opinions of others that contradict yours."* (P5).

This highlights a blurred line between whether peoples' views are strengthened autonomously, or due to algorithmic curation of their social feeds – where content is personalized partly based on previous information consumed. This blurred line may make it difficult for people to detect when their views are being unduly influenced by personalized content. Furthermore, it highlights the risk of passively encountered information reenforcing a particular viewpoint and potentially influencing peoples' views as a result, such as by strengthening them.

I Feel for you: Empathy is a Key Driver for View Strengthening

Empathy with the personal experiences of others was a key driver for HII-facilitated view strengthening. These experiences were often reflected in comments made or videos posted on social media by people who want to share their them. While no participants discussed examples where their view strengthening process had been manipulated by *misinformation* evoking empathy, the persuasive power of empathy-evoking information was considerable, and this had a strong impact on view strengthening. Understanding the personal experiences of others was crucial for many

view strengthening journeys. For example, P2 expressed how others' personal stories made her feel stronger in her pro-choice view, to the point she would advocate for and discuss it (despite originally being neutral and avoiding discussion on the topic). She stated that articles featuring the personal abortion stories of women *"would strengthen my view...for me, the personal stuff is really what makes me more active."* Similarly, P4 stressed that *"hearing from all the sex-trafficking survivors…that really strengthened my viewpoint…it's just so impactful."* As most informational catalysts for view strengthening were passively encountered (e.g., on personalized social media feeds) this highlights a compound risk of manipulation through empathy-evoking content. Participants did, however, demonstrate awareness of some risks of information manipulation on social media through empathy evocation, such as the risk of impersonation. For example, when viewing personal experience posts on social media, P8 said she would routinely view the profiles of those sharing personal experience posts to ensure they were really the person they claimed to be--and sometimes she found that they were not: *"I would always check who the posts are from...I would try to make sure they are not from some random individual...I ran into a bit of a problem there."*

Even the perception that others empathized with a post could strengthen viewpoints. For example, P1 based her perception of others' viewpoints on the amount of likes and comments on a particular TikTok video (Figure 2) which humanized women who have abortions. She stated *"you see that this TikTok resonated with other real people...that further supports that there are real people affected by this...because this had one million likes at one point, one million people who supported it. I know that the numbers don't always matter, but at the same time...in the comments you're going to see people who probably relate to it."* While, on one hand, this illustrates that engagement measures such as likes and comments can be useful in supporting view strengthening, on the other it highlights the risk of placing disproportionate weight on the views of a subset of the population, which may make a view appear to have greater support than it really does. This can potentially bias view strengthening.
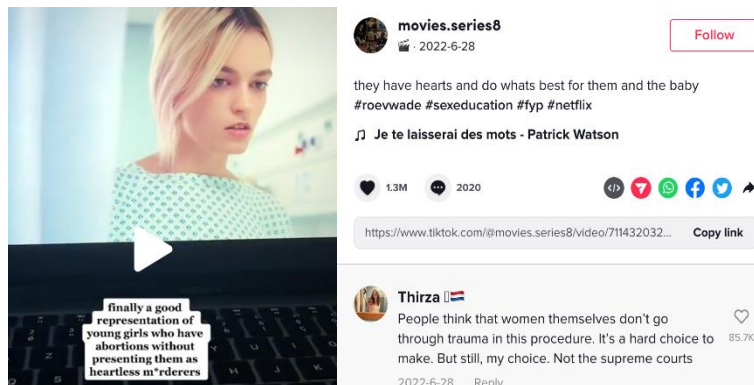
Figure 2: TikTok video humanizing women who have abortions (left) and example comments on it (right)

Built on (Potentially) Shaky Ground: View Strengthening Based on Unverified Sources

None of the participants described examples of view strengthening that seemed to be based on demonstrably false, or misleading information. However, some did describe trusting information that displayed only surface-level credibility indicators (e.g., cited sources, trusted author, source or brand names) and, crucially, participants rarely verified this information (e.g., by looking up the cited sources, or the author/source/brand). This highlights a possible risk of people placing misplaced trust in information that looks credible on the surface, but is actually false or misleading, and strengthening their views based on this 'bad information.' For example, P6 considers herself pro-choice (supports the right to abortion). She passively encountered an infographic on Instagram shortly after the overturn of Roe v. Wade (a US Supreme Court case making the right to abortion law, which was overturned in June 2022). P6 felt comfortable trusting the infographic as it cited the source of its data. P6 stated *"it has a source, NPR 2022, on the first slide. So, I know that it's factual. It basically debunks some commonly held misconceptions of abortions…but it also strengthened my view."* P6 demonstrated an awareness of the importance of not grounding her views in unreliable information, stating "*I never want to be hypocritical or ignorant about my views. So, I did my best to search for pieces of information with sources."* However, notably, she did not actually visit the source to verify its credibility, or its contents, and the source itself was not clickable to facilitate this. Although NPR is generally considered trustworthy, content may creators to falsely cite a credible source to gain trust and people may therefore strengthen their views based on misinformation. On one hand, participants demonstrated an awareness of the importance of credibility on social media. On the other, they rarely verified information found on it, instead often taking trustworthiness at face value.

Shaped by What I've Seen Before: Interpreting Information in Light of Prior Information Consumed

In line with prior work, previous information participants had consumed shaped the way they interpreted future information (Badia, 2019, p.309) and this often encouraged them to continue strengthening their views in a direction they had already started to travel in (Sunstein, 2019). For example, P10 had already began to question the common

but incorrect view that PCOS (Polycystic Ovary Syndrome) only affects women's reproductive systems, by actively seeking PCOS information. She later came across an infographic on PCOS (Figure 3), which claimed to compare the myths and facts about the condition. She stated she *"liked it a lot because it did address what I thought I knew...what I was told...that PCOS just affects your reproductive system."* This helped strengthen her pre-existing view that the symptoms of PCOS are not all ovary-specific. Notably, however, although P10 said she appreciated information that cited its sources, she discussed an example where she had trusted information that did not cite its sources but mirrored her existing knowledge and beliefs, without verifying it. This may reflect confirmation bias, as she may have allowed her previous knowledge to convince her that this information was factual. It also likely reflects selectively choosing what information should influence one's viewpoint based on information previously consumed (see later discussion on selective exposure). On the one hand, selective choice in light of prior information allows for regular reflection on one's views, which may prevent the risk of manipulation. On the other, it might *lead to* manipulation by reinforcing views grounded in false or misleading information. While we cannot assume P10 was manipulated through confirmation bias, this example highlights the risk of over-relying on existing beliefs when interpreting new information.

Figure 3: Infographic on Polycystic Ovary Syndrome highlighting myths vs. facts

Interpreting new information in light of previous information did not always nudge views in an existing direction, according to a pre-established trajectory. Sometimes apparent contradictions or inconsistencies between the pre-existing view and new information spurred participants to question their beliefs and, on occasion, change their views and then embark on a new, gradual view strengthening journey. For example, P5 was very aware of, and felt guilty about, inconsistencies between his current view on veganism and a documentary he had watched - 'Seaspiracy,' which spotlighted animal welfare issues in factory farms. He stated *"the reasons for me being vegetarian always made me a bit ashamed because they're the same reasons why you should be vegan. I'm trying to save animals and I'm trying to save the climate...I am still eating, for example, cheese or eggs...Most of these things still contribute to factory farming."* This resulted in him attempting to transition from a vegetarian to a vegan lifestyle (based on a strengthening of his views on the importance of minimizing consumption of factory-farmed products).

P2 also expressed discomfort with the way she finds news: *"I'm never really happy how I gather information. 'Cause my main source is Instagram and I just think it's so bad, so I try to make it better."* Despite her discomfort, P2 continued to utilize Instagram, particularly linked articles posted on Instagram stories, including from news sources, as her main way of consuming abortion-related news. To alleviate this discomfort, she deliberately diversified the news media accounts she followed on Instagram, to expose herself to a wider range of sources and opinions.

P5 stated he deliberately watched difficult media to shape his views in response to it, thereby confronting his cognitive dissonance. Non-deliberate information consumption (e.g., passive, incidental encounters) also built on prior information engagement. For example, when P5 happened to watch a cooking show that (presumably accidentally) ran a *"cute"* lamb video during an ad break and a demo of how to cook a lamb steak shortly after it, he felt shocked and disgusted at the juxtaposition. However, he recognized that he likely would not have had the same reaction years ago, when he was not yet vegetarian. This demonstrates that P5's views, and associated view strengthening, were shaped by his prior information consumption. On one hand, this has the potential to guide people along a journey of gradual opinion discovery, perhaps strengthening their views along the way. On the other, if the prior information they build on is incorrect or unreliable, they may end up led the garden path rather than guided

Choosing not to Hear: Selective information Avoidance Influencing View Strengthening
Some participants practiced topic-based selective information avoidance, where they avoided engaging with information about issues that had become emotionally distressing for them, such as animal welfare, abortion or gun control. Certain participants, such as P2, selectively avoided information to *inhibit view strengthening*: they did not wish to become further polarized. P2 selectively avoided all abortion-related information due to her overwhelm from

the abundance of abortion-related information she encountered, particularly in her social media feeds. She was conscious that, given the emotive impact this issue had on her, any information about Roe v. Wade, regardless of stance, was going to anger her and strengthen her view: *"It was just basically everything I heard about it. It didn't matter what medium, it didn't matter what opinion, which side of the story. I just got really angry, and it strengthened my opinion."* P2 therefore temporarily selectively avoided *all* abortion-related information to try to prevent the emotional impact this issue was having on her from strengthening her pre-existing view further.

In contrast, some participants wanted to *continue strengthening their view*, and made a deliberate decision to selectively avoid opposing views to do so. In stark contrast to P2, P1 avoided information that *opposed* abortion, expressing her fatigue with hearing views from the 'other side.' She therefore only intentionally consumed pro-choice information that she agreed with. This allowed her to continue strengthening her view without having to consider opposing viewpoints, besides when (unavoidably) exposed to information incidentally. P5's attempt to curate his feed was also an attempt to avoid information he did not wish to engage with; he stated: *'you then realize [curation] is a good thing to do, because if you don't, you are always confronted with the opinions of others that contradict yours.*

None of the participants who practiced selective avoidance was entirely successful in completely shutting out opposing view; all reported, for example, passive, incidental exposure to the opposing view through social media feeds. This supports the argument that it is impossible to entirely insulate oneself from information on a particular topic (Bruns, 2019, Fletcher and Nielsen, 2017) and therefore highlights that echo chambers are more permeable than they are traditionally considered to be.

Other Views Welcome? Opposing Views Strengthened Pre-Existing Views
While some participants selectively avoided opposing views, others sought them out. This was often because participants were aware of the concept of an echo chamber and did not wish to become trapped in one. Take P7, for example: *"you surround yourself with groups you agree with and in doing that, you create an echo chamber for yourself. So, you're not getting conflicting views anymore. I can even see that with myself...you're only getting people that agree with you and then you start to resent the people that disagree with you. I'm aware that this is a thing, so I try not to let it happen to me too much."*

While we did not observe the 'backfire effect' described in (Nyhan and Reifler, 2010), engagement with opposing views did not necessarily result in questioning or reflection, even where participants claimed this was their motivation for seeking these opposing views out. We did, however, see some instances where engaging with opposing views increased disdain for 'the other side'- a symptom of affective polarization. For example, P1 posted on Reddit to gain clarity on certain pro-life arguments on abortion, even though she was pro-choice. She did this not to reconsider her pro-choice view, but to understand the opposing logic and how to counter it. This strengthened her pre-existing view: *"I posted because I couldn't really wrap my head around some of the arguments that I wanted to discuss...It was valuable too, because some doctors would respond... and I was like, 'you know, the DNA argument, do we consider something that has DNA as existing?' They responded 'well, if I had a big vat of DNA in a soup, would you consider it murder to kill that?'"* This can be considered an example of finding out enough about the opposing view to convince themselves their pre-existing view was correct. It does not demonstrate a 'backfire effect,' but a confirmation effect - it strengthened P1's view by confirming rather than challenging it.

P7 expressed that opposing information, if rooted in fact, could encourage him to change his viewpoint. He stated *"when I find new information on something that I believe and the new information disproves it, I tend to gravitate towards the newer information, because that's just how science works, right? Your viewpoint changes based on new information."* While he stated he trusted science and would alter his views in light of new facts, when he encountered opposing views, his view strengthening accelerated. When asked about the important factors in his view strengthening, he mentioned apathy amongst those who were against gun control in the US had played a key role.

For P2, reading the opinions of those against her own viewpoint directly led to strengthening her own view. *"I'd read one article about people who are 'Pro-Life' and even that will strengthen me. I just see the bullshit they're talking about. It's basically just like, I cannot take you seriously.*

Some participants tried to avoid entering echo chambers by staying aware of when they were about to enter one. This was to 'keep in' alternative views and avoid a scarcity of viewpoint diversity influencing the strengthening of their views (by leaving them unchallenged). For example, P7 was aware that self-creating an echo chamber would shut out opposing views and could result in affective polarization, so tried to avoid it by actively seeking out opposing viewpoints. He stated *"you surround yourself with groups you agree with and in doing that, you create an echo chamber for yourself. So, you're not getting conflicting views anymore. I can even see that with myself...you're only getting people that agree with you and then you start to resent the people that disagree with you. I'm aware that this is a thing, so I try not to let it happen to me too much."*

Summary of Findings

Information from social media played a fundamental role in view strengthening. Usually, it was passively encountered rather than actively sought and often only a single piece of information was needed to drive view strengthening. Of particular concern is that, while some discussed curating algorithms, they may have less agency in influencing their personalized feeds than they think. Most informational catalysts were videos and this media type often grabbed peoples' emotions; empathy was the main driver for view strengthening. While several participants claimed to value source credibility, especially on social media, few invested efforts to verify content and platforms did not make sources easily scrutable. Peoples' views were shaped by information they had seen before, often encouraging them to continue on a pre-established view strengthening trajectory. Sometimes, however, contradictions or inconsistencies with prior information prompted them to question their existing views. Whether participants intentionally sought out opposing views or selectively avoided them, view strengthening still occurred as a result. Furthermore, they did not always selectively avoid opposing information to allow their views to strengthen; sometimes they did so to pause strengthening (e.g., when faced with too much emotionally distressing information). We now discuss the implications of these findings and propose design suggestions aimed at reducing the effect of polarization through social media.

DISCUSSION

In this section, we discuss our findings in the context of previous work. We first provide an overview of the polarity of information that strengthened views relative to participants own views. Next, we discuss the key role of information encountering, and the importance of algorithms, before broadening to discuss the role of social media in polarization. Finally, we examine the role of algorithms and the agency people may (or may not) have to influence what information they are exposed to. Based on this discussion, we then make design recommendations for social media platforms.

Selective Exposure, or Opposing Views? It's Complicated

Our findings paint a complex picture of the role of information on social media in view strengthening. We noted some behaviors that align with notions of selective exposure: our participants stated they wished to avoid information they disagreed with, and some of them even used the language of echo chambers and filter bubbles; for example, P5 described deliberately 'creating a bubble' and P7 wanted to avoid 'creating an echo chamber'. This selective exposure was used by some participants to strengthen their views, as in the case of P5 and P2, but not by all; P1 wanted to *avoid* strengthening her views and practiced deliberate selective exposure to achieve this aim. Moreover, while participants described sometimes wanting to entirely avoid information reflecting opposing views, none of them were completely successful in this attempt, supporting previous work (Dubois and Blank, 2018).

Alongside those who inadvertently engaged with opposing views, and in contrast to selective exposure theory, we also found some participants consciously chose to engage with opposing views. They did this to avoid falling into an echo chamber, in pursuit of factuality, and to deliberately keep an open mind. While these are laudable aims, our study found consuming information reflecting opposing views clearly *strengthened* pre-existing views. It might be tempting to dismiss this as the backfire effect, particularly when P2 describes the views of others as 'bullshit'. However, most of our participants described carefully considered approaches that seem far removed from accidental backfire.

In contrast to those who wanted to open their minds, some people engaged with information they disagreed with to *strengthen* their own views, by formulating counterarguments. This replicates findings of previous studies (McKay, et al., 2022, Weeks, et al., 2016), and supports the presence of confirmation bias. Our finding that peoples' views were strengthened when they encountered information that echoed information they had previously consumed also supports the presence of confirmation bias.

Overall, participants engaged with and deliberately avoided information that both reflected and opposed their pre-existing views, for various reasons. Some wanted to strengthen their views. Others wanted to involve their views intensifying, which they saw as negative. Regardless of participants' intentions, though, both selective exposure and exposure to opposing views *did* result in view strengthening. This paints a complex picture of view strengthening that demonstrates a variety of information contexts in which it can occur and highlights the complexity of issue and affective polarization, and may support the partisan sorting hypothesis, though more work is needed (Törnberg, 2022).

Importance of Information Encountering

A consistent feature of view strengthening was the pivotal role of information encountering (Erdelez & Makri, 2020). Rather than deliberately and actively engaging only with information they agreed with (and potentially becoming more polarized as a result), all participants strengthened their views as a result of *passively* encountering information in their feeds. This aligns with a previous study's findings on HII-facilitated view change, which demonstrated it is often seeded by a serendipitous encounter (McKay et al., 2020). In contrast to that previous study, though, and of deep concern in an era of widespread polarization is our finding that a *single* information encounter was responsible for view strengthening in nearly every case. In the previous study, multiple encounters played a role. Another difference between the view strengthening in our study, and the view change in that previous study is the limited verification our participants undertook. This contrasts sharply with the extensive follow-up information-seeking conducted in that

study and may be explained by view change being 'higher stakes' than the incremental strengthening of a pre-existing view and therefore being perceived to require more supporting information.

Role of Emotion

Another common pattern of HII-facilitated view strengthening was the considerable emotional impact information encountered had on participants; all the view strengthening examples in our study reflected strong empathy. This strong emotional impact aligns with previous studies of view change generally (Petty, et al., 2003, Wood, 2000), which often have an affective component, and with studies of HII-facilitated view change specifically, which is often a result of an encounter with images or video that have a strong emotional impact (McKay et al., 2020).

Prior work on polarization also highlights emotion as playing an important role (Iyengar, et al., 2019, Lee, et al., 2022), and studies of how best to debunk misinformation show that appealing to emotion alongside fact can be helpful. Interestingly, negative emotion is also one of the drivers of sharing content on social media (Rathje, et al., 2021) (particularly negative emotion toward those who do not share one's views) and that videos juxtaposing one's views with those from another video are a particularly common and effective form of partisan communication on short video social media platforms, such as TikTok (Serrano, et al., 2020). Recent studies of news have shown an increasing preference for emotional content over fact based content in news, too, increasing the use of social media as a news source (Vosoughi, et al., 2018). It is clear that emotion is important, but the nature of its impacts present an interesting challenge: we now know that serendipitous encounters with information that provokes a strong or empathetic emotional reaction might change someone's view *or* strengthen it. Understanding how we might predict the influence of a particular piece of information on someone's view remains a key challenge for future work.

Role of Algorithms

Knowing that strong emotional resonance drives engagement on social media leads to a discussion of the respective roles of people and algorithms. We know that engagement drives social media algorithms (e.g. (Munn, 2020; Boeker and Urman, 2022). Indeed, Facebook has been accused of making algorithmic design decisions that exploit emotions such as anger and fear to drive further engagement, creating hate as a byproduct (Munn, 2020).Our study replicates previous findings that exposure to opposing views facilitated view strengthening (Bail, et al., 2018, Lee, et al., 2022), confirming that social media may be a driver of polarization, albeit indirectly and not in the way previously thought. Another way social media algorithms may drive emotion is by presenting increasingly extreme content, as occur when going down YouTube recommendation 'rabbit holes' (Ledwich and Zaitsev, 2020). More polarized information is likely to increase the strength of emotional responses, whether positive or negative, increasing engagement and affecting polarization in complex ways.

So how did participants describe the relationship tween themselves and their social media algorithms? Some described deliberately curating their feeds to strengthen their views on certain topics, such as P5 who 'created a bubble' to support his transition to veganism. In contrast, others described their algorithms making decisions for them, such as to present similar information to that they had already consumed. While generally our participants expressed a high level of agency, it is unclear from our findings how much agency they actually had to manage their feeds. A recent study of interactions between people and when curating personalized TikTok feeds demonstrated that people found the algorithm surprisingly effective in selecting information to show them (Lee, et al., 2022). An examination of TikTok usage, though, shows that while there is some attempt to curate algorithms (as seen in our study and other work on view change), most of the control of the feed is ceded to the algorithm (Kang and Lou, 2022). While our participants attempted to exercise control and, for the most part thought they were in control, it is likely that, at least some of the time, they were overestimating their own autonomy.

Does Social Media Polarize?

Our participants described passive encounters with information that has a strong emotional impact as being a primary driver of view strengthening. While at first glance, this could happen with information in any situation, we see from the studies described above, that social media platforms specifically may be making view strengthening more likely. People are more likely to share social media posts showcasing the opposing views that sometimes drive polarization (Rathje, et al., 2021), meaning the feed of any given user is more likely contain information of this kind than other kinds of information. The same study found that agreeable information was a high driver of likes; another signal of engagement. Engagement, in turn, drives the algorithms that construct feeds, potentially creating a vicious cycle. Passive consumption of information in feeds is key form of interaction with social media platforms (Kang and Lou, 2022, Lee, et al., 2022, McKay, et al., 2022), so how feeds are constructed is important.

Our participants demonstrated a desire to have input into the content of their feeds, both in terms of topic, and polarity of that content - a finding also echoed in other studies (Kang and Lou, 2022, Lee, et al., 2022, McKay, et al., 2022, Seargeant and Tagg, 2019). What we did not see, however, was an attempt to curate feeds based on the emotional strength of the content. It is thus up to social media designers to make this decision, and it seems likely that strongly emotional content is preferred, as it drives engagement.

Taking emotions and algorithms together, it seems possible that social media could drive polarization and we can see that, for our participants at least, interactions with social media did strengthen their views. However, these same features (the nature of the feed and highly emotional content) also drive view *change (Mckay, et al., 2020)*. Therefore, the case for social media driving polarization only, as an inevitable outcome of view strengthening, is weak; it is likely that social media can polarize in certain, but not all situations. A future research challenge involves better understanding the situations in which polarization through engagement with social media can occur.

Design Recommendations

As we clearly found that information on social media strongly influenced view strengthening, the risk of polarization remains. Although how best to reduce the risk of polarization on social media is a question for further empirical research, we present three design recommendations that represent possible first steps. These recommendations focus on reducing the risk of *affective* polarization, on controversial issues.

Firstly, given the high emotional valence of information that prompts both view change and view strengthening, it is possible to adjust algorithms to promote more factual, and less emotional information on controversial topics. Previous studies have demonstrated that a feed of fact-checked information reduces polarization, while personal anecdotes increase it (Kubin and von Sikorski, 2021). As social media platforms can adjust what is presented based on its likely emotional impact (Kramer, et al., 2014), these approaches typically used to generate further engagement (Munn, 2020) can also be used to reduce the risk of polarization.

Secondly, social media platforms could encourage empathy-building, with people on all sides of controversial issues. While a social media user may not agree with another's viewpoint or the ideology behind it, revealing commonalities with those with whom we disagree may reduce the sorting effect and thus the risks of dehumanizing the other side. Dehumanizing is a common feature of affective polarization (Hobolt, et al., 2021, Iyengar, et al., 2019, Lee, et al., 2022, Rathje, et al., 2021). Conversely, showing information presented by someone relatable is one of the more effective ways of combatting misinformation (Lewandowsky, et al., 2012). Our participants highlighted the importance of empathy. Therefore, feeds could leverage this willingness to empathise to support social cohesion.

Finally, social media platforms could reflect the emotional valence of a feed and allow their users to curate their feeds for emotion, alongside topic and polarity, to reduce affective polarization. This would allow users to 'turn down' the emotion-provoking content in their feed when, for example, they notice their views are strengthening regardless of whether they consume agreeable or disagreeable information. Indeed, many of our participants said they did not wish to have their views strengthened and the only way to avoid this at present is by avoid certain topics entirely. Reducing emotionally impactful content could support people in staying informed, without necessarily becoming emotionally invested. How best to implement these recommendations remains an important question for future work.

CONCLUSION

Viewpoint strengthening is an important phenomenon that deserves to be acknowledged from the point of view of those experiencing it to better understand its causes and impacts. To understand the human experience of view strengthening, we conducted 10 semi-structured interviews with people who had recently strengthened their views based on information they found on social media. The findings provide new insights into the ways views are strengthened by digital information and emphasizes the crucial role of passively encountered information. The findings also highlight just how influential information that evokes empathy is; this type of information led to the strongest and most impactful view strengthening experiences.

While participants described both selectively avoiding and consciously engaging with information they disagreed with, the key role of passive encounters highlights the importance of algorithmic feeds on social media. Participants described both attempting to curate these feeds and being surprised by how the feeds responded to their information engagement. Both seeking out *and* deliberately avoiding information reflecting opposing views strengthened views though - so a diverse feed is no guarantee of reduced polarization.

We contribute novel insights into the role of social media in a specific type of view change (view strengthening). We now know the importance of emotional content and algorithms, and the complexity of engagement with opposing views. Based on these insights, our study offers several avenues for future work. These include investigating the role of *sought* information in view strengthening (social media is driven by passive engagement), the long-term effects of algorithm curation, and how best to tone down emotional content on feeds while still promoting engagement and support people in weakening their views, should they wish to do so. Understanding view strengthening from a Human-Information Interaction perspective can reveal new insights that, in the longer-term, may shed new light on how best to tackle the dangerous societal problems of polarization.

ACKNOWLEDGEMENTS

REFERENCES

Badia, A. (2019). The Information Manifold: Why Computers Can't Solve Algorithmic Bias and Fake News. MIT Press.

Bail, C. A., Argyle, L. P., Brown, T. W., Bumpus, J. P., Chen, H., Hunzaker, M. B. F., Lee, J., Mann, M., Merhout, F. and Volfovsky, A., 2018. Exposure to opposing views on social media can increase political polarization. *Proceedings of the National Academy of Sciences*, 115(37), 9216-9221.

Bakir, V. and McStay, A., 2018. Fake News and The Economy of Emotions. *Digital Journalism*, 6(2), 154-175.

Bakshy, E., Messing, S. and Adamic, L. A., 2015. Exposure to ideologically diverse news and opinion on Facebook. *Science*, 348(6239), 1130-1132.

Boeker, M. and Urman, A., 2022. An Empirical Investigation of Personalization Factors on TikTok. In *Proceedings of the Proceedings of the ACM Web Conference 2022*, 2298–2309.

Bruns, A., 2019. Filter bubble. *Internet Policy Review*, 8(4).

Bruns, A., 2019. It's not the technology, stupid: How the 'Echo Chamber' and 'Filter Bubble' metaphors have failed us. In *Proceedings of the International Association for Media and Communication Research*.

Buchanan, G., Kelly, R., Makri, S. and McKay, D., 2022. Reading Between the Lies: A Classification Scheme of Types of Reply to Misinformation in Public Discussion Threads. In *Proceedings of the ACM SIGIR Conference on Human Information Interaction and Retrieval*, 243–253.

Campante, F. R. and Hojman, D. A., 2013. Media and polarization: Evidence from the introduction of broadcast TV in the United States. *Journal of Public Economics*, 100, 79-92.

Clarke, V. and Braun, V., 2021. *Thematic analysis: a practical guide*. Sage Publications.

Dubois, E. and Blank, G., 2018. The echo chamber is overstated: the moderating effect of political interest and diverse media. *Information, Communication & Society*, 21(5), 729-745.

Erdelez, S. and Makri, S. 2020. Information encountering re-encountered: A conceptual re-examination of serendipity in the context of information acquisition. *Journal of Documentation*, 76(3), 731-751.

Ferguson, C. J., 2021. Does the Internet Make the World Worse? Depression, Aggression and Polarization in the Social Media Age. *Bulletin of Science, Technology & Society*, 41(4), 116-135.

Flaxman, S., Goel, S. and Rao, J. M., 2016. Filter Bubbles, Echo Chambers, and Online News Consumption. *Public Opinion Quarterly*, 80(S1), 298-320.

Fletcher, R. and Nielsen, R. K., 2017. Are people incidentally exposed to news on social media? A comparative analysis. *New Media & Society*, 20(7), 2450-2468.

Haider, J. and Sundin, O. (2022). Paradoxes of Media and Information Literacy: The Crisis of Information. Taylor & Francis.

Helberger, N., 2011. Diversity by Design. *Journal of Information Policy*, 1, 441-469.

Hobolt, S. B., Leeper, T. J. and Tilley, J., 2021. Divided by the Vote: Affective Polarization in the Wake of the Brexit Referendum. *British Journal of Political Science*, 51(4), 1476-1493.

Iyengar, S., Lelkes, Y., Levendusky, M., Malhotra, N. and Westwood, S. J., 2019. The Origins and Consequences of Affective Polarization in the United States. *Annual Review of Political Science*, 22(1), 129-146.

Kang, H. and Lou, C., 2022. AI agency vs. human agency: understanding human–AI interactions on TikTok and their implications for user engagement. *Journal of Computer-Mediated Communication*, 27(5).

Kelly, G. R., 2009. Echo chambers online?: Politically motivated selective exposure among Internet news users. *Journal of Computer-Mediated Communication*, 14(2), 265-285.

Kramer, A. D. I., Guillory, J. E. and Hancock, J. T., 2014. Experimental evidence of massive-scale emotional contagion through social networks. *Proceedings of the National Academy of Sciences*, 111(24), 8788-8790.

Kubin, E. and 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.

Ledwich, M. and Zaitsev, A., 2020. Algorithmic extremism: Examining YouTube's rabbit hole of radicalization. *First Monday*, 25(3).

Lee, A. Y., Mieczkowski, H., Ellison, N. B. and Hancock, J. T., 2022. The Algorithmic Crystal: Conceptualizing the Self through Algorithmic Personalization on TikTok. *Proc. ACM Hum.-Comput. Interact.*, 6(CSCW2), Article 543.

Lee, S., Rojas, H. and Yamamoto, M., 2022. Social Media, Messaging Apps, and Affective Polarization in the United States and Japan. *Mass Communication and Society*, 25(5), 673-697.

Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N. and Cook, J., 2012. Misinformation and Its Correction: Continued Influence and Successful Debiasing. *Psychological Science in the Public Interest*, 13(3), 106-131.

Makri, S., Blandford, A., Woods, M., Sharples, S. and Maxwell, D., 2014. "Making my own luck": Serendipity strategies and how to support them in digital information environments. *Journal of the Association for Information Science and Technology*, 65(11), 2179-2194.

Marshall, C. C. and Bly, S., 2005. Turning the page on navigation. In *Proceedings of the ACM/IEEE Joint Conference on Digital Libraries 2005*, 225-234.

Mckay, D., Makri, S., Gutierrez-Lopez, M., MacFarlane, A., Missaoui, S., Porlezza, C. and Cooper, G., 2020. We are the Change that we Seek: Information Interactions During a Change of Viewpoint. In *Proceedings of the 2020 ACM SIGIR Conference on Human Information Interaction and Retrieval*, 173–182.

McKay, D., Owyong, K., Makri, S. and Lopez, M. G., 2022. Turn and Face the Strange: Investigating Filter Bubble Bursting Information Interactions. In *Proceedings of the ACM SIGIR Conference on Human Information Interaction and Retrieval*, 233–242.

Melnikov, N., 2021. Mobile internet and political polarization. *Available at SSRN 3937760*.

Munn, L., 2020. Angry by design: toxic communication and technical architectures. *Humanities and Social Sciences Communications*, 7(1), 53.

Nyhan, B. and Reifler, J., 2010. When Corrections Fail: The Persistence of Political Misperceptions. *Political Behavior*, 32(2), 303-330.

Pariser, E., 2011. *The filter bubble: What the Internet is hiding from you*. Penguin UK.

Petty, E., S.C., W. and Tormala, Z., 2003. Persuasion and Attitude Change, *Handbook of Psychology* Wiley 353-382

Rathje, S., Van Bavel, J. J. and van der Linden, S., 2021. Out-group animosity drives engagement on social media. *Proceedings of the National Academy of Sciences*, 118(26), e2024292118.

Seargeant, P. and Tagg, C., 2019. Social media and the future of open debate: A user-oriented approach to Facebook's filter bubble conundrum. *Discourse, Context & Media*, 27(41-48.

Serrano, J. C. M., Papakyriakopoulos, O. and Hegelich, S., 2020. Dancing to the Partisan Beat: A First Analysis of Political Communication on TikTok. In *Proceedings of the 12th ACM Conference on Web Science*, 257–266.

Stoetzer, L. F., Munzert, S., Lowe, W., Çalı, B., Gohdes, A. R., Helbling, M., Maxwell, R. and Traunmüller, R., 2023. Affective partisan polarization and moral dilemmas during the COVID-19 pandemic. *Political Science Research and Methods*, 11(2), 429-436.

Sunstein, C., 2018. *#Republic: Divided Democracy in an Age of Social Media*. Princeton University Press.

Sunstein, C.R. (2019). How change happens. MIT Press.

Törnberg, P., 2022. How digital media drive affective polarization through partisan sorting. *Proceedings of the National Academy of Sciences*, 119(42), e2207159119.

Valentino, N. A., Banks, A. J., Hutchings, V. L. and Davis, A. K., 2009. Selective Exposure in the Internet Age: The Interaction between Anxiety and Information Utility. *Political Psychology*, 30(4), 591-613.

Vosoughi, S., Roy, D. and Aral, S., 2018. The spread of true and false news online. *Science*, 359(6380), 1146-1151.

Weeks, B. E., Ksiazek, T. B. and Holbert, R. L., 2016. Partisan Enclaves or Shared Media Experiences? A Network Approach to Understanding Citizens' Political News Environments. *Journal of Broadcasting & Electronic Media*, 60(2), 248-268.

Wood, W., 2000. Attitude Change: Persuasion and Social Influence. *Annual Review of Psychology*, 51(1), 539-570.