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Algorithms vs. Human Nature: A Tale of Selective Exposure

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Algorithms vs. Human Nature: A Tale of Selective Exposure

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Psychology

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Abstract

The public's turn towards news websites and social media for news consumption has sparked anxiety over echo chambers, avoidance of opinion-challenging content, and potentially fragmentation and polarization among sociopolitical groups. Algorithms have specifically been blamed for increasing the ease of filtering out counter-attitudinal online content and potentially exacerbating selective exposure tendencies. However, longstanding classic psychological research has demonstrated the ubiquitous phenomenon of cognitive dissonance and selective exposure far before the internet became the primary tool for news consumption. Research investigating how algorithms directly influence online approach and avoidance behavior is unfortunately scarce. This dissertation work aimed to analyze the impact of an algorithm system during online information consumption on selective exposure behavior. Participants were randomly assigned to one of three conditions: a neutral condition where presented articles are balanced in attitudinal valence; an algorithm condition where presented articles update to match previous selection behavior; and a motivated condition where participants are encouraged to explore dissimilar viewpoints. Overall, a-priori hypotheses were *not* supported, and condition had virtually no effect on dependent variables, including selective exposure tendency. However, results provide an in-depth look into perceptual and behavioral processes of highly polarized individuals during the information-seeking process.

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Algorithms vs. Human Nature: A Tale of Selective Exposure

I have a distinct memory of sitting on the cold tile floor of my maternal grandmother's sunroom, casually overhearing a cable news network correspondent while playing a lonely game of Monopoly by myself. The vocal inflection of a news anchor carries a lot of nostalgia for me now as an adult. It seems as though they are all trained to talk in an identical manner when authoritatively describing the night's breaking news. The days of listening to these familiar voices appear to be long gone – at least, that is, for my generation.

Roughly eighteen years have passed since this memory, and the landscape of information-seeking, news consumption, and sociopolitical discussion has completely shifted. With this shift comes new benefits and, of course, new concerns. Rather than tuning in to the nightly televised news, Americans between the ages of eighteen and twenty-nine are significantly more likely to seek out news from social networking sites (SNS) such as Facebook and Twitter. Although television remains the most popular source for older adults over the age of sixty-five, over 80% of American adults in general prefer to use a digital device, such as a smartphone or computer, to access their news (Shearer, 2021). For many like me, that familiar news anchor voice is but a relic of an older time.

The new online approach to news and information consumption certainly has its advantages. Users no longer must sit down and commit to one or two large cable news networks at a time – instead, they can “pull” information from a large variety of online news sources (Furey, 2016; Knobloch-Westerwick & Kleinman, 2012). This “pulling” often takes only a brief amount of time, which makes information gathering a faster, more focused, and more accessible process. Additionally, online search engines and SNS allow for personalization, which narrows down the amount of information that presented to users and increases the relevance of such

presented information (Beam & Kosicki, 2014). This narrowing may prevent a sense of being “overloaded” by too many source choices. Regarding discussions and information sharing, the internet grants the ability to discuss, argue about, write about, and share information to *any* user (Anderson et al., 2013; Coe et al., 2014). Instead of journalists and news corporations having the ability to gatekeep what information is discussed and disseminated, the power is now in the hands of the public. Optimistically, this open access should bring more diversity in voices and sources to the online sphere.

Despite the internet’s advantages, most of the public’s attention has been directed to its darker side. When it comes to news consumption, there has been a primary focus on the harmful role of algorithms that operate in the shadows of SNS and news aggregate sites. Average people, journalists, talking heads, and even researchers and theorists have painted the concept of online algorithms in a frightening light. This moral panic over the adverse consequences of internet usage, including those that stem from algorithms, often drowns out conversations about the internet’s positive aspects. For instance, Netflix’s 2020 drama-style documentary *The Social Dilemma* was a fiery conversation starter. The documentary describes a slew of negative consequences of the internet world and algorithms – including possible deterioration of mental health, spread of disinformation, and even extremism and the radicalization of users – with virtually no mention of positive aspects of the internet, or even how a person can moderate their internet use to lessen possible harm. Instead, the documentary recommends taking extensive breaks or even quitting SNS use altogether as a solution. Conversations about the pitfalls of the online world such as this are seemingly ubiquitous, particularly when the world was relying on computer-mediated communication during the worldwide COVID-19 pandemic.

Algorithms are often not strictly defined, but people commonly know what they entail. In general, an algorithm is a technological process that gathers input data, and then uses these data to create output (Gillespie et al., 2014). In most cases on SNS, an algorithm displays content to its users that it predicts will be relevant and provoke engagement. By their very nature, online algorithms increase the amount of personalization that can occur for online users. For example, the Facebook algorithm will recommend and display content that is similar to content that its user has already interacted with (Hitlin & Rainie, 2019). Users can interact with content by liking/reacting to posts, sharing posts, opening comment sections, or leaving a comment themselves.

If the public is now relying on SNS and news websites for their news consumption, an algorithm's presentation of similar content may immediately raise a red flag. For example, if a user is more likely to interact with conservative news content on their Twitter or Facebook profile, and an algorithm begins to present significantly more conservative content to this user, then they may no longer be exposed to any information or opinions that contradict their own. Theorists often suggest that exposure to information or opinions that disagree with your own is a crucial component of a healthy democracy (Gutmann & Thompson, 1996). Exposure to disagreement challenges a person's automatic beliefs and may stimulate new knowledge or a new perspective. Therefore, if algorithms are shrinking the variety of information and opinions that users are exposed to, will this shrinking be harmful to democracy, our information gathering process, and our ability to productively deliberate with one another?

Unease is an absolutely reasonable reaction to the pervasiveness of online algorithms. They are a brand-new variable to the landscape of news consumption, and the way algorithms

impact browsing behavior could potentially have adverse consequences. However, an alternative perspective is also feasible.

As aforementioned, a major concern about algorithms is their ability to present significantly more content that agrees with a user's pre-existing attitudes and beliefs. The concept of individuals surrounding themselves with like-minded content, such as news and media, is not novel. One of the most influential theories that tackled this phenomenon was Leon Festinger's cognitive dissonance theory (1957). His theory posits that exposure to dissonant (contradictory) content can elicit feelings of discomfort, and individuals may approach consonant (like-minded) content to alleviate this discomfort. Since Festinger's original work, there have been numerous research studies investigating selective exposure that build from classic cognitive dissonance research. Selective exposure is a term that refers to the inclination to approach content that is expected to be pro-attitudinal (like-minded), and perhaps avoid content that is expected to be counter-attitudinal (contradictory) to one's pre-existing attitudes and beliefs (Garrett, 2009; Garrett & Stroud, 2014; Hart et al., 2009).

Selective exposure has been empirically demonstrated in in-person contexts prior to when online algorithms became such an omnipresent and alarming factor. Although algorithms may be exacerbating the degree of selective exposure, it is difficult to say how much of information approach and avoidance behavior is driven by algorithms and how much is driven by human predisposition. Selective exposure research and research on algorithms tend to be separate, despite the common claim that algorithms are driving pro-attitudinal information seeking and perhaps promoting "filter bubbles" and "echo chambers" (NPR Staff, 2016). A considerable amount of said research on algorithms is correlational, merely observing and analyzing online websites without implementing control over variables.

This dissertation research aims to pit two possibilities against one other. One possibility suggests that online algorithms are significantly increasing the likelihood of selective exposure demonstrated by online users. The second possibility suggests that humans are just as likely to engage in selective exposure themselves when an algorithm is present as when it is absent. The first possibility would mean that information seeking in the online world is indeed more hazardous when algorithms are involved. The second would mean that information seeking in the online world is *not* significantly pushed in an unhealthy direction by algorithms specifically, and instead, perhaps algorithms are simply holding a mirror up to human nature rather than causing a change in user behavior.

To accomplish this, I conducted research that manipulates whether an algorithm is present or not during online news content browsing. Additionally, I included a third condition in which participants are encouraged to seek out and explore counter-attitudinal news content. By presenting the same online environment with and without an algorithm present, as well as with or without encouraging instructions, this research can give further insight into the direct impact of these variables on selective exposure behavior in an online context.

Before explaining hypotheses and methodology, I will review the background literature informing this research, including psychological differences between news consumption in-person and online, cognitive dissonance theory, in-person and online selective exposure research, algorithms, and finally SNS echo chambers/filter bubbles.

How the Internet Changed Information Consumption

The internet has made pronounced changes to how individuals search for and consume information. Advanced contextual changes to how we collect and digest news stories likely come with changes in how those stories are processed, understood, and further distributed. What

specific components of the internet allow it to stand apart from its traditional media counterparts?

Prior to the internet's emergence, individuals consumed the news by reading newspapers, listening to a radio station, or watching a televised news show. These three avenues of information involve careful curation before content is presented to consumers. In other words, journalists and TV/radio/print news companies meticulously decide beforehand which stories will be presented and in which order. This system involves a significant power imbalance, with consumers having little choice over the curation of the news stories they are interested in, and journalists having a considerable ability to shape the news landscape (Carlson, 2007). For example, by breaking down one story for over an hour during prime time, journalists can place heavy emphasis and importance on this one particular news story; in the same vein, they can diminish the importance of other stories by spending little time discussing them or leaving them out of the broadcast altogether. A clear demonstration of this power was outlined by Noam Chomsky in the documentary "Manufacturing Consent: Noam Chomsky and the Media." During the 1970's, the largest media conglomerates actively left conversations about the atrocities occurring in East Timor out of their broadcasts. Consequently, Americans were virtually unaware of these events.

As a consequence of this system, consumers cannot choose with ease which story they would like to move to next. If a listener of a radio show or a viewer of a televised show wishes to hear about a news story, they would have to patiently wait for said story to be covered. Although newspapers allow for switching topics more easily, it is possible that the desired news story is left out of the newspaper entirely. This system has been dubbed "pushing" and can be contrasted with the "pulling" process of online information consumption. News presented in traditional

formats is “pushed” onto the consumer by the media via a systematized process. On the other hand, online news is “pulled” by the consumer, often from a variety of sources within a short time frame (Furey, 2016; Knobloch-Westerwick & Kleinman, 2012).

Unlike their traditional counterparts, online consumers do not have to wait patiently for their preferred story to be covered. Instead, they can instantly search for a specific story and likely have several sources to “pull” from. If they begin with one source and do not like how the story is covered, they can switch sources within a matter of seconds. Traditional news media consumers often must commit to one or two sources at a time, whether it is a preferred cable news network or a handful of newspapers delivered to the door. However, online users can quickly easily hop between sources, and no longer must commit to a select few at a time (Messing & Westwood, 2014).

Compared to the “casual” nature of traditional news consumption, online browsing is considered a focused and purposeful process (Pearson & Knobloch-Westerwick, 2019). The way in which consumers are exposed to news headlines and news content vastly differs in the online space. Traditionally, a cable news viewer would be casually exposed to a headline at the bottom of the screen while simultaneously hearing the news anchor break down the story. In contrast, online news consumers often view headlines on news websites or SNS, and then must *click* into the headline to be exposed to the full story. This added necessary step of selecting and opening online news stories of interest may potentially exacerbate avoidance of content that is counter-attitudinal to a consumer’s attitudes/beliefs (Pearson & Knobloch-Westerwick, 2019). Television viewers who are avoidant of a certain story can turn off the television or change the channel, but it is likely that they have already heard and processed components of the story before making the decision to stop watching. On the other hand, online news consumers can potentially avoid news

content without processing *any* of the story by simply not clicking into the headline.

Nevertheless, it is important to note that not all news content is concealed behind the click of a headline, and online users can be incidentally exposed to counter-attitudinal content on many different platforms (Lu & Lee, 2019).

In the online space, journalists are no longer the only sources and curators of news. Instead, news that is found through SNS in particular is shaped by five primary sources. These avenues of information and shaping include elites (e.g., news journalists), focused campaigns and/or advertisements (e.g., senatorial election campaigns), personal relationships (e.g., friends and family members who are connected through social media), a user's own personal control over their online space, and finally algorithms (Thorson & Wells, 2016). This shift from one major branch of information (journalistic) with traditional sources to multiple branches of information with online platforms is both exciting and alarming. As previously stated, this system strips journalists from their monolithic ability to control the narrative and places more power into the hands of the public. However, this power may not always be a positive thing, as the public is not always well informed and can spread misinformation. Furthermore, most research to this date is focused on the relationship between journalistic curation and news consumption (Thorson & Wells, 2016). Therefore, there is still a significant amount that is unknown about the other four avenues of information shaping.

Another novel component of online news browsing that sets it apart from traditional platforms is *personalization*. Personalization of online platforms involves crafting an environment that is more personally interesting and relevant to individual users; this can occur for a variety of online content, such as email preferences, product and brand advertisements, and social networking pages (Kalyanaraman & Sundar, 2006). In some cases, online users have

direct control over customizing their online space through behaviors such as selecting preferences, following certain pages, and blocking other users. However, there is the addition of algorithm processes that personalize spaces as well, which the user often has little to no control over. Algorithms will be discussed in length later in this dissertation.

This sense of personalization is virtually impossible for other traditional forms of news media. Television and radio hosts simply cannot craft a personalized broadcast for each individual unique consumer. Like other aspects of the internet, the ability of the online news world to be personalized for each person has both positives and negatives. Idealistically, narrowing down the amount of information that is presented to a user, and ensuring that this information has personal interest and relevance, should make navigating news on the internet easier and more efficient (Beam & Kosicki, 2014). Furthermore, automated processes that curate and filter news, such as algorithms, *may* be more thorough, quicker, and less biased than human journalists who must curate traditional news media (Carlson, 2007). However, there is of course concern over whether personalization can augment selective exposure tendencies, and potentially give way to echo chambers.

Finally, online news is frequently found and consumed specifically through social media platforms (Shearer, 2021). SNS provide the unique ability to find news and sources that have been socially endorsed by close others. A friend or family member may be able to socially endorse traditional media, such as a specific cable news segment, by perhaps bringing it up during conversation. However, the online world makes this process rather quick and straightforward by providing certain functions, such as “like” or “upvote” buttons, or the ability to reshare news stories to a personal feed (Lee & Ma, 2012). These affordances bring a unique

social aspect to news consumption and additionally enhance the speed at which news is shared between consumers.

Although the act of browsing online news shares some similarities with traditional media, there is a myriad of distinct differences that set it apart psychologically. Researchers are still trying to catch up with the shifting landscape by creating studies that can empirically capture and explain the effects of such differences. In the following sections, this dissertation will dive deeper into two areas of research that expand on the differences between online and offline news consumption: selective exposure and algorithms.

Selectivity: Seeking Out What We Like

At its core, the conversations surrounding online algorithms involve the concept of *selective exposure*. This concern that individuals will only approach news and opinions that they agree with, and may possibly avoid those that disagree, has been a valid concern even before computers existed.

Psychological researchers really delved into investigating this concept of selective exposure around the 1960's, and selective exposure theory was initially intertwined with cognitive dissonance theory. Although modern selective exposure research does not often explicitly mention cognitive dissonance, it is important to discuss its origin and how it tied into classic selective exposure research.

Cognitive Dissonance Theory

Festinger's (1957) theory on cognitive dissonance, in essence, hinges on the principle that human beings do not easily tolerate inconsistency within themselves. We are motivated to ensure that our attitudes, behaviors, and beliefs all consistently align. If we are made aware that an inconsistency exists between two or more of our own attitudes, behaviors, or beliefs, Festinger

theorized that this would elicit a state of discomfort called *cognitive dissonance*. When a person is in a state of dissonance, they will be motivated to alleviate this discomfort, whether that is by changing an attitude/behavior/belief to resolve the inconsistency, or through other means.

Early research demonstrated this phenomenon rather clearly by implementing a forced compliance task (Festinger & Carlsmith, 1959). After partaking in a horribly boring task, participants were asked to lie to a confederate in the next room and claim that the task was actually fun and enjoyable; participants were randomly assigned to be told they would be paid either \$1 or \$20 for this lying behavior. Following the lying portion, participants were then asked to evaluate how much they enjoyed the objectively boring task. Participants who expected \$20 to lie evaluated the task as *not* enjoyable at all, while participants who expected \$1 to lie reported that they actually found the task quite enjoyable! For both conditions, the participants' attitude (this task is boring) and their behavior (saying, "this task is fun!") were inconsistent. However, those who expected to be paid \$20 to do so had an external justification for their inconsistency, and therefore likely never felt the discomfort of cognitive dissonance; they could simply blame the fact that they were offered a moderately large sum of money to lie. However, those who expected to be paid a measly \$1 were likely in a state of cognitive dissonance, as this small amount of money was not a good enough external justification for the inconsistency. Therefore, these participants *changed* their attitude towards the boring task to match their behavior, as represented by their higher evaluation of enjoyment at the end of the study. This early influential study was a clear demonstration of how people may go out of their way to overcome the discomfort of cognitive dissonance.

Cognitive dissonance can be induced in more ways than just forcing a person to lie. According to Festinger's early theory, exposure to content that is dissonant (oppositional) to an

individual's pre-existing attitudes or beliefs can additionally elicit the discomfort of cognitive dissonance, as it creates an inconsistency. Early cognitive dissonance research introduced dissonant information to participants through pamphlets, radio station broadcasts, or sometimes by having participants listen to talks/lectures. In many cases, a person in a state of cognitive dissonance from exposure to dissonant content may then consequently choose to *approach* content that they expect to bolster and confirm their pre-existing beliefs/attitudes (Adams, 1961; Berkowitz, 1965; Feather, 1962; Maccoby et al., 1961). In other words, cognitive dissonance may motivate the act of *selectively exposing* oneself to like-minded information in an attempt to alleviate discomfort.

For example, mothers who attended dissonant talks on the ideal time to potty-train a child subsequently sought out conversations that they expected to be consonant with their original attitude (Maccoby et al., 1961). Similarly, participants who heard dissonant talks on the origin of a child's disposition (nature vs. nurture) were inclined to seek out consonant information later (Adams, 1961). A sizeable amount of research has been conducted on the cognitive dissonance of cigarette smokers. For instance, regular smokers in a state of cognitive dissonance were more attracted to an article arguing that smoking *does not* cause cancer than their non-smoking counterparts (Feather, 1962). However, interestingly, regular smokers were not avoidant of the article arguing that smoking *does* cause cancer, suggesting that perhaps dissonance provokes approach but not avoidance. Overall, this line of research indicates that approaching like-minded content may serve to ease discomfort and reaffirm pre-existing attitudes and beliefs.

Certain variables may augment or diminish this relationship between dissonance and motivated exposure, including confidence, strength of attitude/belief, and perception of personal responsibility. Research suggests that people in a state of cognitive dissonance due to exposure

to dissonant information will be more likely to subsequently approach like-minded individuals when they have low confidence in their attitudes (Berkowitz, 1965). This suggests that highly confident individuals may not be “shaken” by dissonant information and may not require the reassurance of consonant conversations. Furthermore, for cognitive dissonance to be elicited in the first place, individuals need to be committed to and feel strongly about the attitudes/beliefs in question (Brehm & Cohen, 1962; Greenwald & Ronis, 1978). Additionally, individuals should feel some semblance of personal responsibility for the attitude/belief/behavior; if any of these are outside of a person’s control, they are less likely to feel discomfort when two things become inconsistent (Greenwald & Ronis, 1978; Wicklund and Brehm, 1976).

As cognitive dissonance research continued to expand, a branch of cognitive dissonance work began to focus more directly on this information-seeking consequence of cognitive dissonance, and from here selective exposure research began to develop and grow.

Classic Selective Exposure Research

The story of classic selective exposure research is somewhat of a bumpy tale. In its early days, when much of it was connected to cognitive dissonance theory, researchers were not fully certain if selective exposure was a robust and ubiquitous phenomenon. This seed of doubt led to more work on and refinement of selective exposure theory.

As previously mentioned, selective exposure is the predisposition to approach content that is expected to be consistent with one’s attitudes/beliefs (pro-attitudinal), and potentially avoid content that is inconsistent (counter-attitudinal) (Garrett, 2009; Garrett & Stroud, 2014; Hart et al., 2009). Although similar to the earlier discussion on cognitive dissonance, current selective exposure theory does not necessitate the existence of dissonance for this phenomenon to occur (although dissonance may still exacerbate it). Early selective exposure research tested

this theory with methods incorporating media such as radio broadcasts, book jacket covers, in-person discussions and lectures, sharing pamphlets, gambling scenarios, and print messages (Brock & Balloun, 1967; Clarke & James, 1967; Frey, 1982; Kleck & Wheaton, 1967; Lowin, 1967; Thayer, 1969).

An early and influential criticism of in-person selective exposure research came from Sears and Freedman (1967). Their conceptual review of existing selective exposure literature argued that research up to that point had found no conclusive patterns, and that far too many studies found either null effects or effects in an unexpected direction. Additionally, although cognitive dissonance theory would suggest that selective exposure is a *motivated* behavior (with the goal to alleviate discomfort), Sears and Freedman were somewhat critical of this viewpoint. Instead, they suggested that most selectivity may not be purposeful, and instead may be *de facto* selective exposure.

De facto selective exposure as a theory suggests that individuals do not intentionally surround themselves with content or opinions that match their own through direct selective exposure. Rather, individuals become, over time, surrounded by like-minded content as a byproduct of their group memberships, such as education level, age, socioeconomic status, ethnicity, and gender. For example, someone may find that all their close friends and loved ones all share a similar opinion on forgiving and eradicating student loan debt for undergraduate degrees. However, they may not be surrounded by this opinion because they *purposefully* sought out friends who desire student loan debt elimination, and instead just happen to have many friends they made in college, and this shared group membership influences the opinions on this relevant topic. This theory contradicted Festinger's (1957) theory by positing that selective

exposure is more likely the consequence of group homogeneity rather than the consequence of dissonance reduction.

In tandem with this contradiction, Sears and Freedman ended their 1967 review unconvinced of dissonance-motivated selective exposure. In response, selective exposure researchers began addressing the concern and refining the theory through later studies. Later in-person research on selective exposure behavior sought to determine whether it is an intentional behavior as opposed to a consequence of a confounded group membership, whether it can be driven by cognitive dissonance, what can exacerbate it, and when/why it may *not* occur.

Some researchers speculated that studies mentioned in the Sears and Freedman (1967) review failed to find consistent and clear results due to weak methodology (Cotton & Heiser, 1980; Frey, 1982). Subsequent in-person research was often successful in finding selective exposure patterns, although each study went about investigating this question slightly differently, and there are known circumstances during which exposure to counter-attitudinal content may be more prevalent.

When connected to dissonance theory, a variable that makes in-person selective exposure to pro-attitudinal content more probable is *choice*. As opposed to forced compliance, freely choosing to partake in a dissonance-inducing activity is more likely to consequently lead to selective exposure behavior (Frey, 1986; Frey & Wicklund, 1976). When a person enacts a behavior at the behest of a research assistant and is not given a choice, they can blame the dissonance on an external factor (“I was asked to do it!”). However, when a person is given a choice and they still choose to partake in a dissonant behavior, the lack of external reason requires a further step to reduce the dissonance – that further step may be approach to pro-attitudinal content. For example, participants who freely chose to write a counter-attitudinal

essay on the topic of nuclear power plants exhibited more selective approach to pro-attitudinal information (pamphlets and discussions) following the writing portion (Cotton & Hieser, 1980). The authors argue that cognitive dissonance *can* motivate selective exposure, but said dissonance needs to be induced at high levels to provoke selectivity.

A second variable that may make in-person selective exposure more likely is attitude strength/relevance. In terms of dissonance, it is unlikely that a person will feel discomfort from an inconsistency if it is provoked by a topic that is uninteresting or unimportant to the individual. Similarly, one may be inclined to alleviate dissonance through selective exposure only when it involves a personally important and self-relevant subject matter. When required to remove static from a headset in order to hear information, smokers were more likely to remove static for the “smoking *does not* cause cancer” talk, and non-smokers were more likely to remove static for the “smoking *does* cause cancer” talk (Brock & Balloun, 1967). However, smokers did not necessarily avoid the counter-attitudinal talk, suggesting that perhaps approach behavior is more likely than avoidance behavior. Importantly, number of cigarettes smoked strengthened this effect for smokers, such that heavier smokers were more motivated to hear the “smoking *does not* cause cancer” talk. The authors posit that this finding represents the relationship between the strength of an attitude (i.e., heavy smokers likely feel more strongly towards smoking) and selective exposure behavior. In a separate study, participants who were given the choice of selecting up to two articles to read over a variety of religious, political, and moral topics were significantly more likely to select pro-attitudinal content when they held strong attitudes on the selected topics (Clarke & James, 1967). Both sets of results suggest a pull towards pro-attitudinal information when it covers a personally relevant attitude that is held strongly by the chooser.

Researchers additionally investigated the effects of dogmatism on selective exposure behavior. As a psychological concept, dogmatism refers to a personal rigidity in attitudes and beliefs, a resistance to change, and a proclivity to follow valued authority (Rokeach, 1954). Selective exposure researchers briefly investigated this variable because of its connection to attitudes – if higher levels of dogmatism predict resistance to attitude change, then attitude change may be less likely as an avenue for dissonance reduction, and selective exposure may occur instead. This prediction was not always confirmed through empirical in-person research. After listening to counter-attitudinal talks regarding the age at which teenagers should receive driver’s licenses, participants high in dogmatism were *not* more likely than their open-minded counterparts to seek out pro-attitudinal content (Kleck & Wheaton, 1967). All participants in this study overwhelmingly preferred approaching pro-attitudinal sources. However, those high in dogmatism did recall less information about the counter-attitudinal talks, which may suggest that individuals high in dogmatism may struggle to integrate opposing information into their current cognitive belief system (Kleck & Wheaton, 1967). Research published in the same year demonstrated that the privacy of information selection may interact with dogmatism (Clarke & James, 1967). Participants who were *low* in dogmatism were more likely to explore counter-attitudinal articles only in the private setting, in which the articles would be mailed to them, and no other participants would know which articles were chosen. Those high in dogmatism approached pro-attitudinal articles both in the private and the public settings (Clarke & James, 1967). Together, this suggests that those low in dogmatism are keen to maintain a consistent attitude (and image) in the eyes of other individuals. However, when left to their own devices, they may be likely to explore opposing information. On the other hand, those high in dogmatism prefer approaching confirming information even when no one else will be privy to their choices.

Though many in-person studies demonstrated selective exposure patterns, a subset of studies found either null effects or results in the opposite direction. A particular study that found null results involved reading summaries on book jacket covers (Thayer, 1969). Contrary to past literature, participants approached both pro-attitudinal and counter-attitudinal book jacket covers at a similar rate; furthermore, the variable of confidence had no significant effect, contradicting previous cognitive dissonance work (e.g., Berkowitz, 1965). Among several explanations, it is possible that participants in this study were not in a state of strong cognitive dissonance, and therefore did not feel the need to approach only pro-attitudinal content. Additionally, participants were originally told to analyze said book jacket covers and rate their appeal to children aged seven to nine. These specific instructions may have shifted participants' goals, and put them into a *neutral* frame of mind, such that they were interacting with pro-attitudinal and counter-attitudinal information in a much more balanced manner.

A consistent line of research has additionally demonstrated that individuals may actively approach *counter-attitudinal* content when they believe it is easily refutable, or it is persuasively weak. One may be attracted to counter-attitudinal exposure when the content is weak because they can cognitively counter-argue against it (Lowin, 1967; Taber & Lodge, 2006). Perhaps this counter-argumentation may itself lessen cognitive dissonance, and therefore selective exposure to pro-attitudinal sources is no longer necessary. In-person selective exposure research has directly investigated the effect of refutability on approach behavior. For example, participants were more likely to remove static from a headset in order to hear counter-attitudinal talks on marijuana legalization when the arguments were weak and easy to disprove; on the other side of the coin, they were additionally more likely to approach pro-attitudinal arguments that were competent and difficult to disprove (Kleinhesselink & Edwards, 1975). Some later research has

also demonstrated this approach to counter-attitudinal content that is argumentatively weak (Frey, 1986). However, different research was able to demonstrate that participants prefer competent pro-attitudinal sources, but did not significantly prefer competent counter-attitudinal sources over non-competent counter-attitudinal sources (Frey, 1981). Although these results slightly contradict one another, overall, this line of research demonstrates a moderate preference for intellectually strong pro-attitudinal content and intellectually weak counter-attitudinal content.

Finally, a separate line of research has investigated the effect of information utility on approach to counter-attitudinal information. Individuals may be drawn towards counter-attitudinal content rather than demonstrating the typical selective exposure effect when they believe this content to be informative or useful in some fashion (Freedman, 1965; Frey, 1986). For example, when participants expected to have to defend their position in a debate that would favor the counter-attitudinal position, they were more likely to approach counter-attitudinal information beforehand (Canon, 1964). In this example, understanding counter-attitudinal information prior to a debate can be *useful* because it prepares the debater and familiarizes them with oppositional talking points. Together, classic selective exposure research pin-pointed two primary ways in which the proclivity to approach consonant information can be overridden: when dissonant content is weak and easily refutable, and when dissonant information can be beneficial.

Despite its bumpy past, classic in-person selective exposure research overall demonstrated a pattern of pro-attitudinal approach across a wide variety of studies. This was later substantiated by a meta-analysis that found significant evidence for selective exposure across both classic and online studies (Hart et al., 2009). As previously reviewed, the tendency to

approach pro-attitudinal content can be exacerbated by lower confidence levels, higher levels of dogmatism, freely choosing to partake in a dissonance-inducing behavior, and having strong attitudes/beliefs. Furthermore, this tendency may be outweighed when counter-attitudinal information potentially provides utility for future endeavors, or when the counter-attitudinal content is persuasively weak. Importantly, Sears and Freedman's original critique of the field helped to stimulate productive investigations into cognitive dissonance and the selective exposure effect.

Many of these illustrated in-person phenomena have been more recently examined and expanded upon in the context of online information seeking. The following section will discuss recent online selective exposure research, and additionally will tie in some of the aforementioned results from classic research.

Online Selective Exposure Research

With the rise of the internet in the late 1980's, this brand-new context of information searching and sharing piqued the interest of selective exposure researchers. Unlike the early days of classic in-person selective exposure, online selective-exposure research paints a slightly more coherent picture. Thus far, there is overwhelming support for the pervasive proclivity to approach pro-attitudinal content across different studies, regardless of a state of cognitive dissonance (Brannon et al., 2007; Garrett, 2009; Garrett & Stroud, 2014; Hart et al., 2009; Iyengar & Hahn, 2009; Iyengar et al., 2008; Knobloch-Westerwick et al., 2015; Knobloch-Westerwick & Meng, 2009; Knobloch-Westerwick et al., 2017; Messing & Westwood, 2014; Pearson & Knobloch-Westerwick, 2019; Stroud, 2008; Stroud, 2010; Wojcieszak & Garrett, 2018). However, direct avoidance of counter-attitudinal content has not been strongly supported in an online context (Garrett, 2009; Garrett & Stroud, 2014). While approach and avoidance seem

like two sides of the same coin, they are distinct processes, and only one has been consistently observed in selective exposure research. This distinction may perhaps be an optimistic finding (or lack thereof) because avoidance of opposing opinion is regarded as particularly detrimental to a healthy society. Avoidance of counter-attitudinal content is often mentioned in tandem with fears about algorithm processes online. However, avoidance in terms of algorithms and echo chambers will once more be unpacked later in this dissertation.

Like in-person research, online selective exposure research has delved into investigating variables that exacerbate pro-attitudinal approach tendency. For example, the inclination to approach pro-attitudinal content may be amplified when an individual is operating under a defensive motivation (Hart et al., 2009; Kunda, 1990). In other words, when participants have the motivation to defend their perspective (as opposed to having the motivation to be as accurate as possible), they may approach pro-attitudinal sources more often. However, recent research that allowed participants to select an article on marijuana legalization, prior to debating the topic with either like-minded or opposing individuals, showed an interesting pattern for motivation. In this study, participants overwhelmingly approached pro-attitudinal articles. Furthermore, participants who selected the counter-attitudinal article reported both higher accuracy motivation *and* higher defensive motivation than their pro-attitudinal counterparts (Fey & Brand, 2020). One interpretation of this finding suggests that pro-attitudinal content approach is the normal, automatic option. Therefore, overriding it and instead approaching counter-attitudinal content requires significantly more motivational processes, whether those involve accuracy goals or defense goals.

In terms of other impactful variables, research demonstrates that selective pro-attitudinal approach becomes more likely when individuals are feeling less positive affect, for individuals

who are personally more likely to make strong distinctions between themselves and others, for people who self-report higher personal interest in politics, as well as those who identify more strongly with their political party (Knobloch-Westerwick et al., 2015; Knobloch-Westerwick & Meng, 2009; Knobloch-Westerwick et al., 2017).

Replicating earlier in-person research, recent studies additionally suggest that stronger attitudes predict a higher likelihood of approaching pro-attitudinal content regarding said attitude (Brannon et al., 2007; Knobloch-Westerwick et al., 2015). Furthermore, a topic's personal relevance draws in information seekers to pro-attitudinal content, but not necessarily counter-attitudinal content (Iyengar et al., 2008). Together, this suggests that attitude strength and personal relevance of a topic have unique effects on exposure to pro-attitudinal content, and the personal relevance of a counter-attitudinal source is not enough to override this selective exposure tendency.

Alongside these internal qualities that push and pull selective exposure, external cues surrounding information in an online context can additionally affect pro-attitudinal approach. One way to administer an external cue is by priming information seekers prior to their selection. For example, one study instructed half of their American participants to thoughtfully consider what it means to be an "American." For participants who were already opposed to immigration to the United States, they were significantly more likely to select pro-attitudinal immigration articles if they were primed with this nationalistic cue (Wojcieszak & Garrett, 2018). While this increased selective exposure behavior in this particular study, perhaps this suggests that a priming cue can also be used to change participants' patterns in a way that *reduces* selective exposure, as well.

Peripheral cues also surround online information in the form of “likes” or other social endorsements to headlines, as well as through the name of sources that post information (e.g., the names of news organizations, social media profiles, or journals). Research has indicated that participants may be willing to approach counter-attitudinal sources when they are socially endorsed by other online users in the form of “likes” (Messing & Westwood, 2014), but may *not* be inspired to approach counter-attitudinal information even when it is posted by a credible source (Knobloch-Westerwick et al., 2015). It may be somewhat surprising and counter-intuitive that endorsements from non-experts overrode selective exposure behavior while source credibility did not. Perhaps this indicates that information seekers in the online space are influenced more strongly by their peers than by the integrity of a news source. However, more research needs to be conducted to flesh out how peripheral cues inspire information approach.

Much like in-person research, online selective exposure research has detailed the rare instances in which counter-attitudinal approach may be more likely to occur. Replicating research by the likes of Freedman and Frey, online research on the information utility effect demonstrates that participants are more willing to seek out counter-attitudinal information when they believe it will be useful in some shape or form. For instance, participants were more likely to select articles that were *critical* of the United States (rather than supportive), even when they were counter-attitudinal to the participant’s own political affiliation (Knobloch-Westerwick et al., 2017). The authors posit that this represents information utility, as it can be valuable to understand criticism of one’s own country, even when that understanding requires the reading of something that disagrees with a pre-existing attitude. A separate study found significantly more approach to counter-attitudinal articles overall, particularly for participants who felt *low confidence* in their scientific expertise (Jang, 2014). The articles in this study all involved

scientific topics, such as stem cell research and genetically modified foods. Therefore, for those with a weak scientific understanding, approaching counter-attitudinal articles may provide more insight and knowledge that pro-attitudinal articles may not have afforded (i.e., the information utility effect!). Another consideration is that individuals may not feel as strongly or identify as strongly with the scientific topics explored in Jang's 2014 study. Since pro-attitudinal approach is exacerbated by strong attitudes, it is possible participants in this particular study (who did not feel very strongly about these issues) felt more comfortable exploring dissonant content.

Another separate study investigating the impact of information utility on selective exposure involved participants who ranged in states of anxiety. Participants who were highly anxious were more likely to seek out counter-attitudinal content when they were told that they would need to defend their choice in political candidate against a detractor (Valentino et al., 2009). Those in a high state of anxiety may perceive this counter-attitudinal content to contain critical information that pro-attitudinal content may not otherwise, and therefore they may be able to use this newfound information to organize and develop a defense against their opponent. However, this finding seems to be at odds with Hart and colleagues' (2009) extensive meta-analysis that found that having a defensive motivation during information seeking actually increases *pro-attitudinal* exposure. There may be two key differences between these opposing findings: anxiety and perception of utility. Perhaps it is the state of anxiety in tandem with a defensive motivation that compels individuals to seek out counter-attitudinal content rather than pro-attitudinal. On the other hand, perhaps counter-attitudinal information is only approached while having a defensive motivation when the content is perceived to have information utility. Or, perhaps, all three need to be present simultaneously for this effect to occur!

A significant consideration when discussing online selective exposure research is the variable of pre-existing political affiliation. Much work has been conducted to analyze the differences in approach/avoidance behaviors between liberals and conservatives, or Democrats and Republicans. Although affiliation has been demonstrated to be an important variable to the story of selective exposure, it is important to remember that it is often quasi-independent, and may be confounded with other variables.

Thus far, evidence suggests that selective exposure may not be demonstrated equally across liberal and conservative participants, although the research is still quite mixed. In one study, Democratic participants were more likely to approach pro-attitudinal content, while Republican participants were more likely to avoid counter-attitudinal content (Garrett & Stroud, 2014). In separate studies, it was only conservative participants who demonstrated significant selective exposure to pro-attitudinal content, while liberal and independent participants more evenly exposed themselves to both sides of the issue (Iyengar & Hahn, 2009; Iyengar, et al., 2008; Knobloch-Westerwick & Meng, 2009). Furthermore, when given the opportunity to sift through candidate positions on various topics, Kerry (Democrat) supporters were more likely than Bush (Republican) supporters to approach counter-attitudinal content (Garrett, 2009).

These results may suggest that liberal participants are less likely than conservatives to fall prey to selective exposure, but it is not that straightforward. In a large survey study, liberals and conservatives self-reported their approach to pro-attitudinal sources (including television, cable news, and news websites as sources) at equal rates. Lagged analyses in this study indicated that such selective exposure increased political polarization on both sides of the spectrum (Stroud, 2010). Similarly, a later study found that liberal participants exposed themselves more to pro-attitudinal headlines when browsing online, while conservative participants exposed themselves

more to pro-attitudinal headlines when reading a newspaper (Pearson & Knobloch-Westerwick, 2019). Here, both political sides exhibited selective exposure, but the context of news consumption mattered.

Political affiliation can be complicated to investigate as a moderator, because it carries many other implications and confounds with it. For example, one selective exposure study was conducted right before the 2008 election while polls indicated that Obama would be the likely winner (Knobloch-Westerwick & Kleinman, 2012). In this specific study, it was conservatives who were more likely to seek out counter-attitudinal information. The authors argued that this may be due to the information utility effect: if their candidate is expected to lose, it may benefit them to read about and understand the opposing side that is about to take the presidential office (Knobloch-Westerwick & Kleinman, 2012). In this case, time of the year may have significantly contributed to selective exposure behavior for conservatives. Since political affiliation cannot be directly manipulated, it is crucial to consider what other variables may influence the relationship between political leaning and selective exposure behavior. The topic/issue that is explored, the time of the year, the political and social climate, and the context of news consumption may all differentially impact political party affiliates.

Finally, it is important to consider some possible effects of being exposed to counter-attitudinal content. Psychologically, an individual may react to exposure to dissimilar points of view in several ways. While they may occasionally understand and eventually integrate the counter-attitudinal information into their own pre-existing body of knowledge and opinion, this unfortunately is often not the case. Instead, exposure to counter-attitudinal content may increase attitude certainty (Borah, 2014; Knobloch-Westerwick & Meng, 2009). In other words, instead of thoughtfully considering an opposing point-of-view, often this exposure leads individuals to

doubling down and becoming *more* confident in their pre-existing opinion. This process is antithetical to the goal of many deliberations, which often seek to find a reasonable consensus between two opposing sides. It is important to additionally note that exposure to pro-attitudinal content may increase attitude certainty as well. In this case, doubling-down in this case may be due to a reinforcement of prior beliefs rather than through a defensive process.

Additionally, individuals frequently do not read counter-attitudinal information with an open mind. Rather, they may experience biased cognitive responses during the exposure phase that work to diminish how impactful and persuasive said information is. A technique called counter-argumentation allows individuals to cognitively argue against content during exposure (Taber & Lodge, 2006). Counter-argumentation involves a sense of skepticism and can include belittling the counter-attitudinal content or belittling the source of the content, as well as conjuring up pro-attitudinal arguments in response. This process can occur entirely in the mind, and argumentation does not need to be verbalized to have an effect. Together, a rise in attitude certainty and a tendency to counter-argue content potentially make counter-attitudinal content less convincing to readers even when exposure *does* occur.

Despite the tumultuous history of classic selective exposure research, recent online research has continued to find significant evidence of selective exposure across several sociopolitical topics and contexts. Approach to pro-attitudinal information is demonstrated more frequently, while avoidance of counter-attitudinal information is found less often in empirical research. Certain individuals may be more prone to online selective exposure, such as those who are more interested in politics and those who hold attitudes more strongly. Furthermore, online selective exposure research has replicated findings on the information utility effect, such that counter-attitudinal information is more likely to be approached when it is seen as useful or

informative. Liberal and conservative participants often demonstrate approach and avoidance differently. However, political orientation carries confounds that complicate the interpretation of results. Finally, when counter-attitudinal exposure *does* occur, individuals can engage in counter-argumentation or experience an increase in attitude certainty; both responses may work to diminish the impact of a dissenting argument.

Algorithms and Echo Chambers: A Personalized Wonderland

Of course, the aforementioned concern over the current landscape of online news consumption reaches past simple selective exposure and instead provokes unease over the role of algorithms in producing echo chamber-like environments. In other words, the issue is not simply that individuals are naturally more attracted to pro-attitudinal content. Rather, the issue may be that social media contexts that inherently include an algorithm process are making it easier for individuals to surround themselves *only* with consonant information, and all other disagreeing content is blocked or filtered out. This concern proposes two things: the issue is more extreme than simple selective exposure, and algorithms are accelerating this process.

Echo chambers are relatively closed social systems in which pro-attitudinal messages are quickly disseminated and amplified, while counter-attitudinal messages are dampened, inhibited, or fully blocked (Bessi, 2016; Boutyline & Willer, 2017). Echo chambers may be the most harmful consequence of selectivity because they can completely irradicate the chance of exposure to counter-attitudinal information. Therefore, theorists have expressed unease over the levels of fragmentation and polarization that may result from an upsurge in echo chambers in an online context (Levendusky, 2013; Sunstein, 2001).

When individuals use social networking sites (SNS) and news websites for their news consumption, these platforms provide “closable” systems. For example, SNS commonly allow

users to unfriend, unfollow, or block other people/sources who express disagreeing opinions. These affordances may allow full control over what messages filter into the system, and which are filtered out. Furthermore, selectivity and content filtering can occur on three levels: the individual cognitive level (e.g., selective exposure), the social level (e.g., group dynamics and who we surround ourselves with), and finally the technological level (e.g., SNS algorithms) (Geschke, Lorenz, & Holtz, 2018).

While selective exposure and perhaps even echo chamber behavior can result from simply the cognitive level alone, SNS add the other two levels on top, which potentially augments this echo chamber effect (Geschke et al., 2018). In other words, SNS can magnify social categorization and make group identification much more salient; all the while, an algorithm is pushing content that it predicts users to enjoy (i.e., pro-attitudinal content) to the top of the page. Altogether, these three filtering levels theoretically make SNS a petri dish for echo chambers. However, what does the research suggest about algorithms and echo chambers in an online context thus far? Are these fears and considerations grounded in empirical work?

Research on Algorithms

First and foremost, let us take a deeper dive into algorithms, including what they are, how they work, and what current research says about them. As previously stated, algorithms are technological processes that recommend and present information based on inputs they have previously gathered from user behavior. Unfortunately, many online platforms are somewhat secretive on the topic of their algorithms and are often unwilling to fully divulge how they operate. However, in general, SNS algorithms prioritize content that features media such as photos or videos, content posted more recently, content that has wide engagement in general (i.e., is liked by several users or has many comments), content that has been previously engaged

with directly by a user, content that features a topic that seems relevant to a user, and finally content from sources that a user has previously engaged with (Berman & Kaltona, 2020).

Therefore, if a user is drawn to certain sources or pieces of content that heavily favor one side of an issue or one side of the political spectrum, it is plausible that, through algorithms, their SNS timelines will become entirely engulfed with only pro-attitudinal content.

Algorithms can provide a myriad of benefits for platform creators, platform users, and advertisers. For creators, algorithms that enhance the relevance of presented content may increase user engagement, which in turn increases the amount of time spent on a platform and potentially increases revenue. For users, algorithms may enhance the browsing experience by making it easier to find enjoyable content. For example, the up-and-coming platform TikTok features a “For You” feed page that involves content that is entirely curated by a sophisticated algorithm. Many TikTok users describe the experience of browsing this page as addictive and highly enjoyable (Medium, 2020). Finally, companies who intend to advertise their products and services can take advantage of this higher relevance and engagement. Online platforms like SNS can provide advertisers with the ability to find target audiences who match the product/service on certain criteria, which allows their advertisements reach a more relevant selection of users (Hitlin & Rainie, 2019).

In terms of extent literature, platforms that narrow down suggestions to its users through an algorithm process are often called “personalized” platforms. Past research has manipulated “personalization” of online spaces to analyze certain outcomes, including, in few cases, selective exposure. Despite common fears of over-personalized platforms that utilize algorithms, studies show that participants often *prefer* personalized online spaces (Furey, 2016). Personalization may lead to more positive attitudes towards specific platforms because it allows for more

interactivity and higher relevance of present content (Kalyanaraman & Sundar, 2006). However, research on the darker outcomes of personalization is somewhat mixed. There is evidence to suggest that algorithm personalization on Facebook and Google does *not* narrow down variety during the information seeking process (Furey, 2016). An additional study demonstrated that personalization did not lead to selective exposure, and in fact participants became exposed to a wider variety of sources and topics through a personalized platform (Beam & Kosicki, 2014). On the other hand, research published in the same year found that participants experienced slightly more selective exposure to pro-attitudinal sources through a personalized platform, and furthermore, this personalized system led to less knowledge gain overall (Beam, 2014).

Although the public has expressed immediate concern over the effect of algorithms and automatic personalization of online platforms, there is a surprising dearth of research analyzing the direct relationship between algorithms and selective exposure or echo chambers. The field would benefit from more empirical studies that actively manipulate the presence of an algorithm to investigate its impact on online information seeking behavior and attitudes.

Social Media Echo Chambers

There has been a significant amount of research investigating whether social networking platforms lead to echo chamber environments. Unfortunately, few studies explicitly mention or manipulate algorithm processes. Instead, they are assumed to be existent in the background of SNS, and therefore inherently relevant to the story of social media echo chambers.

Thus far, online echo chamber research has produced diverse conclusions. A portion of this research found a lack of echo chamber effects when analyzing SNS usage. For example, correlational research indicates that time spent on social media predicts *more* diversity in opinions in the online environment (Lee et al., 2014). Research that utilized an Internet Explorer

toolbar add-on that tracked participants' online behavior indicated that participants were significantly more likely to be exposed to *counter-attitudinal content* when they accessed news through social media as opposed to an online news website (Flaxman et al., 2016). Similarly, research that explored self-reported behavior across different social media platforms indicated that individuals who are more politically involved and individuals who have more diversity in the news they consume are less likely to commit echo chamber related behaviors (Dubois & Blank, 2018). Additionally, participants self-report that they discuss issues with both pro-attitudinal and counter-attitudinal discussants on SNS (Karlsen et al., 2017). This suggests that counter-attitudinal content is not necessarily avoided or blocked on social media.

The echo chamber research discussed so far examined behavior across a wide variety of online platforms at once. However, a significant portion of echo chamber research instead focuses on specific SNS within each study. Research has demonstrated interesting findings about echo chambers on the platforms Twitter and Facebook, including levels of SNS homophily. Homophily refers to the tendency to surround oneself with like-minded others (Colleoni et al., 2014). Regarding echo chambers, homophily on SNS suggests that friends, followers, and pages followed share similar qualities to the user, such as political orientation. High homophily would suggest that users are crafting an echo chamber space full of only pro-attitudinal members. A study analyzing roughly ten million public Facebook profiles concluded that most Facebook profiles are indeed high in political homophily (Bakshy et al., 2015). Furthermore, Facebook users are unlikely to come across counter-attitudinal content while on the platform, and they are even less likely to actually click and engage with this content. However, although the role of SNS algorithms concern researchers and the public alike, the authors suggest that individual

processes (such as unfriending/blocking) are more impactful on echo chambers than technological processes (Bakshy et al., 2015).

While Facebook was once the go-to social networking site for users of all ages, Twitter has gained in popularity in recent years. Twitter has been frequently studied for its potential to foster political echo chambers. In fact, Twitter may be the most popular SNS for political discussion and information dissemination because certain functions, such as searching hashtags for content, allow users to quickly access and join discussions about any specific topic (Colleoni et al., 2014). Much like Facebook, Twitter profiles are likely to be high in political homophily (Barberá et al., 2015; Halberstam & Knight, 2016; Vaccari et al., 2016). Hard topics, such as sociopolitical issues, are more likely to lead to echo chamber effects than soft topics, such as the Olympics or the Superbowl (Barberá et al., 2015). Additionally, although homophily is high and pro-attitudinal content reaches users at a faster rate, exposure to counter-attitudinal information on Twitter still occurs somewhat often (Barberá et al., 2015; Halberstam & Knight, 2016). Furthermore, researchers posit that the level of homophily on SNS such as Twitter does not differ greatly from homophily in offline social networks (Barberá et al., 2015). Finally, research by Vaccari and colleagues (2016) revealed that more politically active Twitter users (i.e., users who shared and interacted with more political content) had higher levels of homophily in their networks. This finding starkly contrasts Dubois and Blank's (2018) results that more politically interested participants reported less echo chamber behaviors across platforms. Perhaps Vaccari et al.'s (2016) findings are constrained exclusively to Twitter, or perhaps participants were not as forthcoming on self-reported measures.

Much like selective exposure research, political affiliation has been examined as a variable that may moderate SNS echo chamber behavior. Conservatives and liberals may use and

experience Twitter slightly differently. Significantly more conservative Twitter users follow official political profiles than their liberal counterparts (Colleoni et al., 2014). Researchers posit that conservative users prefer to use SNS like Twitter in a more organized sense – they follow official pages and profiles for politicians to keep updated and may use their own personal profile to retweet and disseminate official information. On the other hand, liberals are more likely to utilize SNS as a deliberation or discussion platform. They are more likely have a back-and-forth dialogue with peers (Colleoni et al., 2014).

Although some research suggests that liberal and conservative Twitter profiles feature similarly high levels of homophily (Halberstam & Knight, 2016), other studies indicate that conservative profiles are significantly higher in homophily (Barberá et al., 2015; Boutyline & Willer, 2017; Colleoni et al., 2014). Some researchers theorize that this homophily is related to political conservatives preferring more certainty (Boutyline & Willer, 2017). According to this theory, exposure to counter-attitudinal content would reduce certainty in a pre-existing attitude by challenging it. Therefore, conservatives may be more likely to surround themselves with echo chambers and high homophily. Conversely, liberals are more likely to address and even retweet (share) counter-attitudinal messages on Twitter, but they may do so with the intent to criticize or mock them (Barberá et al., 2015). This does not mean that liberals are bastions of open-mindedness and thoughtful deliberation. More accurately, it suggests that liberals do not require echo chambers and instead may instead debate, belittle, and counter any message they disagree with.

Currently, a vast majority of research analyzing algorithms focuses on advertising practices and user enjoyment, and little investigates their direct impact on selective exposure behavior during online information seeking. Although there is a growing body of work on SNS

and echo chambers, algorithms are often not explicitly mentioned or considered. Extant literature that *does* directly manipulate personalization illustrates mixed results on selective exposure behavior. Furthermore, literature investigating echo chambers on social media often indicates high homophily for online platforms, but counter-attitudinal content does not seem to be fully ignored or blocked. However, unfortunately, a significant portion of this research does not manipulate variables, nor mention algorithms directly. More work is needed here to clarify whether algorithms are truly exacerbating selective exposure to a worrisome extent.

Current Research

The goal of this proposed research is to directly address the gaps in the literature mentioned thus far. Primarily, this research is designed to empirically compare information seeking behavior in an online context with and without an algorithmic process present. This algorithm process will continue to recommend articles that are similar to participants' previous article choices on the topic of recreational marijuana legalization. By manipulating the presence of an algorithm in a controlled setting, I can directly analyze how much variance in selective exposure behavior can be explained by algorithms. As previously stated, it is possible that algorithms do, in fact, increase the propensity to approach pro-attitudinal content. This would be represented by an increase in pro-attitudinal article approach in the algorithm condition when compared to the neutral (no algorithm) condition. However, if algorithms are not driving selective exposure, and instead selective exposure occurs regardless of algorithm processes, then pro-attitudinal article approach will not be significantly different between conditions.

Furthermore, a third condition was introduced in order to investigate whether participants can be encouraged to override the tendency towards selective exposure. By urging participants to explore opinions and articles that may disagree with their own pre-existing condition during the

information seeking process, we can reveal whether individuals are responsive to such instructions, and whether this motivation can be an avenue towards fighting the urge to approach primarily pro-attitudinal content.

H1-a: Participants in the algorithm condition will approach pro-attitudinal articles significantly more than participants in the neutral condition and motivated condition.

H1-b: Participants in the motivated condition will approach pro-attitudinal articles significantly less than participants in the neutral condition and algorithm condition.

Although selective exposure behavior is of primary interest, there are other variables that may be involved in the information seeking process. For example, research has investigated increases in the variable of attitude certainty after searching for and reading online sociopolitical content (Borah, 2014). Attitude certainty refers to a “doubling-down” on pre-existing attitudes, and it is opposed to the process of thoughtfully considering a counter-attitudinal opinion and potentially changing one’s mind. Research suggests that interacting with sociopolitical content can lead to individuals becoming even more certain in their prior attitudes and beliefs. This is contrary to the suggestion that simply reading articles and interacting in conversations can lead to individuals on both sides of a spectrum coming to a consensus in the middle.

In terms of the current study, I investigated how the condition and subsequent article selection can influence attitude certainty. I hypothesized that, if those in the algorithm condition are more likely to choose and read pro-attitudinal articles, then they will consequently experience higher levels of attitude certainty when compared to the neutral condition, because they are consuming content that agrees with and bolsters their pre-existing attitude.

Rather than predicting a *decrease* in attitude certainty for the motivated condition, I instead hypothesized that attitude certainty will be higher for this condition when compared to the neutral condition, as well. This prediction is predicated on past literature that suggests that individuals do not often consume counter-attitudinal information with an open mind. Rather, they often are highly critical while reading counter-attitudinal content, and this high level of scrutiny can often lead to a subsequent increase in attitude certainty. Therefore, if participants are indeed approaching more counter-attitudinal content in the motivated condition, I predicted that they will show higher levels of attitude certainty in this condition than the neutral condition. Finally, I hypothesized that the effect of condition on attitude certainty in this case will be mediated by the extent to which pro-attitudinal articles are approached during the selection period.

H2-a: Participants in the algorithm condition will report significantly higher levels of attitude certainty than participants in the neutral condition.

H2-b: Participants in the motivated condition will report significantly higher levels of attitude certainty than participants in the neutral condition.

H2-c: Exposure to pro-attitudinal articles will mediate the effect of condition on attitude certainty.

In a similar pattern, the desire to counter-argue is another variable of interest. As previously stated, individuals often read counter-attitudinal content with a scrutinous eye. Rather than consuming such content in an unprejudiced and thoughtful manner, it is likely that participants who approach counter-attitudinal articles will instead have a strong desire to counter-argue the information. Individuals can counter-argue against opinions verbally with other individuals, but this is also a cognitive, internal process. Since I predicted higher exposure

to counter-attitudinal articles in the motivated condition, I therefore predicted the desire to counter-argue will be highest for this condition when compared to the neutral and algorithm conditions.

H3-a: Participants in the motivated condition will report significantly higher desire to counter-argue during the article reading process than participants in the neutral condition and the algorithm condition.

H3-b: Exposure to counter-attitudinal articles will mediate the effect of condition on desire to counter-argue.

Finally, I included two separate manipulation checks with the goal of analyzing how impactful the algorithm system was on perceptions of article variability, as well as how motivated participants felt after receiving the motivational instructions (to approach opposing opinions). If the algorithm process does in fact truncate the attitude-valence of available articles based on previous selection, then participants in this condition should perceive the available articles as having less variability and variety. Additionally, the second manipulation check determined whether participants in the motivated condition actually report feeling more motivated to explore opposing opinion than participants in the other two conditions.

H4-a: Participants in the algorithm condition will report significantly lower perceptions of available article variability than participants in the neutral and motivated conditions.

H4-b: Participants in the motivated condition will report significantly higher levels of motivation to explore counter-attitudinal content during article selection than participants in the neutral and algorithm conditions.

Method

This proposed study was pre-registered with the Open Science Framework prior to starting data collection. Data collection was ceased slightly early to ensure a reasonable graduation date (as described in the OSF registration).

Participants

Data for this study included a final sample of 303 participants. Participants received credit in their General Psychology course for their participation. Roughly 13% of the sample was removed prior to the final analysis due to missing an attention check, indicating poor quality in responding. This sample had a $M_{\text{Age}} = 19.04$ ($SD = 1.51$). 60.73% of participants self-identified as female, 85.15% self-identified as White, and 12.54% self-identified as Hispanic or Latinx. 81.52% of the sample reported that they were supportive of the legalization of recreational marijuana, with the remained reporting that they are against legalization. See Tables 1 and 2 for a full report on this sample's demographic information.

Procedure

This study was administered through a Qualtrics survey. Participants completed this study from their own personal computer. Following the informed consent, participants first indicated their attitude and attitude strength on the topic of recreational marijuana legalization. During a pilot study ($N = 216$), this topic was selected as the most interesting topic to University of Arkansas students. After indicating their attitude, they were presented with the following instructions: "In this study, you will be presented with a variety of articles covering recreational marijuana legalization. You will be asked to read three short articles of your choosing. After selecting and reading your chosen articles, we will ask you a few short questions about your experience."

Following this page, participants were randomly assigned to one of three conditions. For all conditions, participants were directed to a page with six different articles' headlines listed. All articles in this study were randomly organized, counter-balanced, and matched on important criteria such as length and content. Participants were allowed to select one of the six articles at each selection period. Once selected, they were allowed to read the article before returning to the selection page again for their next choice. Participants repeated this process two more times, totaling in three article selection choices.

In the neutral condition, participants saw three pro-attitudinal and three counter-attitudinal articles available for *every* selection period. All six available articles were brand new for each selection period (no articles were shown twice). In the algorithm condition, however, the attitude of the articles available during the selection period changed slightly depending on the participant's previous selection. At selection time 1, articles available for selection were evenly split, with three pro-attitudinal articles and three counter-attitudinal articles. If a participant selected a pro- article at time 1, when they returned for the second selection period, there were four pro- articles and only two counter- articles. On the other hand, if a participant selected a counter- article, they saw four counter- articles and only two pro- articles at selection time 2. This process occurred following their second selection. In other words, in the algorithm condition, articles available for selection became increasingly more similar to the article the participant chose during the previous selection period. This design is intended to mimic social media algorithms, which expose social media users to content that is similar to content users have previously interacted with on the platform. See Appendix for a representation of the survey flow for the algorithm condition in Qualtrics.

Finally, in the motivated condition, articles were evenly pro- and counter- at each selection period like the neutral condition. However, before choosing an article to read, participants in this condition were given the following additional instructions: “The articles you choose to read today are entirely up to you. However, we encourage you to explore articles that you may not agree with in order to get a better understanding of the other side. Exploring articles that may not agree with your opinion today can boost your open-mindedness. Research suggests that open-minded individuals are happier overall, are less likely to fall for fake news, and are more successful in life achievement.”

After article selection and reading is concluded, participants were asked to respond to manipulation checks as well as all dependent variables. A short true-false comprehension “test” was then given to participants to investigate how much information they retained during the article reading process. This variable was included for explorative purposes only. Finally, participants indicated their demographics (age, gender identity, ethnicity, and political affiliation) and were debriefed.

Measures

Selective Exposure Behavior

Participants’ selective exposure behavior was captured in two ways. Firstly, the survey recorded the time in seconds spent on both pro-attitudinal and counter-attitudinal articles. Total amount of time spent on each was considered. Secondly, the amount of pro- and counter- articles *selected* throughout the survey was considered, as well. Recording both article selection and the time spent reading articles provided the most in-depth analysis of selective exposure behavior.

Manipulation Checks

Two statements were included to investigate the impact of the independent variable. The first question, “How many of the articles that were **available** for you to read were opposed to/supportive of recreational marijuana legalization?”, is intended to investigate what percentage of available articles participants perceived to be in line with their indicated attitude. If the algorithm does indeed constrict the availability of certain content, this likely will be different in the algorithm condition than in the other two conditions. Participants responded to this question using a sliding scale between 0% and 100%. For the neutral and motivated conditions, participants should overwhelmingly respond to this measure around the 50% mark. For the algorithm condition, this response will be dependent on their article selection choices. If hypotheses are correct and the algorithm truncates variety in available articles, participants in this condition should respond to this measure towards the polar ends of the spectrum (i.e., closer to 0% or 100%).

The second question, “While selecting articles, how motivated were you to explore articles that **DISAGREED** with your opinion on recreational marijuana legalization?”, investigates participants’ motivation to approach counter-attitudinal content. If the additional motivational instructions are effective, this motivation will likely be highest in the motivated condition. Participants responded to this question on a 5-point Likert-type scale (1 – *not at all motivated*; 5 – *very motivated*).

Attitude Polarization and Certainty

Participants indicated their attitude once more on the topic on a 0-100 scale (0 – *strongly oppose*; 100 – *strongly support*). Polarization was determined by the score’s distance from the center value (50). Then, attitude certainty was operationalized as Borah (2014)’s measure

(Cronbach's $\alpha = 0.69$). Participants responded to statements such as "I feel my opinions on this issue became stronger after reading through articles" on a 7-point Likert scale (1 – *strongly disagree*; 7 – *strongly agree*).

Desire to Counter-Argue

A measure of desire to counter-argue was created for this study and pilot-tested to ensure a reasonable Cronbach's α value (Cronbach's $\alpha = 0.79$). Participants responded to the following three statements on a 7-point Likert scale (1 – *strongly disagree*; 7 – *strongly agree*): "When reading through articles, I had the desire to argue with the author against some of the points being made," "It would make me feel better if I had the chance to argue against some of the points made in these articles," and "When I was reading the articles, I wish I could explain to the author why they are wrong." Responses to these three statements were averaged together to represent participants' desire to counter-argue during the article reading process.

Perception of Information Richness

A measure to investigate participant's perception of information richness was created for this study and pilot-tested to ensure a reasonable Cronbach's α value (Cronbach's $\alpha = 0.64$). Participants responded to four statements on a 7-point Likert scale (1 – *strongly disagree*; 7 – *strongly agree*). Sample statements include: "I felt like I could learn new information from the articles available to me" and "There was a wide variety in information on this topic available to me." Responses to these four statements were averaged together to represent how much participants felt they could learn new information from available articles presented during the study.

Perceived Consensus

To investigate how much participants perceived other group members to agree with their pre-existing attitude, they responded to the following instructions by using a 0-100% sliding scale: “Using the slider below, estimate how many University of Arkansas students **agree** with your opinion on recreational marijuana legalization.” Higher values would suggest that participants perceive high consensus among group members on this topic.

Need for Closure

An individual difference measure was employed to investigate participants’ levels of need for closure, particularly facet four and facet five (Neuberg, Judice, & West, 1997; Webster & Kruglanski, 1994). Facet four of this measure represents discomfort with ambiguity and involves statements including “I don't like situations that are uncertain” and “When I am confused about an important issue, I feel very upset.” Facet five of this measure represents closed-mindedness and involves statements including “I feel irritated when one person disagrees with what everyone else in a group believes” and “When thinking about a problem, I consider as many different opinions on the issue as possible” (reverse scored). Participants responded to these statements on a 7-point Likert scale (1 – *strongly disagree*; 7 – *strongly agree*). Facets were averaged together to additionally represent a total score of need for closure. This relevant variable was included to explore whether this individual difference involving closed-mindedness and desire for certainty may interact to predict other dependent variables.

Results

First, a series of one-way ANOVAs were conducted to investigate the effect of condition on each dependent variable, including selective exposure as defined as number of articles selected and time spent reading articles. A chi squared test was then employed to analyze the

break down in selection behavior between conditions. Then, a series of linear regressions were employed to investigate the variance in dependent variables that were explained by predictors. Predictors in these regressions included condition (dummy coded to isolate the algorithm condition and to isolate the neutral condition), total need for closure scores, number of pro-attitudinal articles selected, and strength of pre-existing attitude towards legalization of recreational marijuana.

Number of pro-attitudinal articles selected was chosen to represent levels of selective exposure in these regressions only, because time spent reading articles did not predict unique changes to dependent variables that number of articles did not already capture. Therefore, they were not included in the reported linear regressions as to reduce collinearity between predictors. Subscales within the need for closure measure (facet 4 and facet 5) did not have unique effects from the total score; therefore, only total need for closure scores were included in this results section for parsimony's sake. Finally, several Pearson's r correlations were conducted to make a correlation matrix for all variables in this study. See Table 3 for all zero-order correlations between variables.

Effect of Condition on Dependent Variables

A series of one-way ANOVAs were conducted to investigate the effect of condition on each dependent variable. A significant effect of condition on time spent reading counter-attitudinal articles was revealed, $F(2,300) = 3.295$, $p = 0.038$, $\eta^2 = 0.021$. A follow up post-hoc Tukey's HSD test was performed to investigate where the difference(s) in conditions occurred. This test revealed that time spent reading counter-attitudinal articles in the neutral condition ($M = 46.75$, $SE = 10.04$) was marginally lower than time spent reading in the algorithm condition ($M = 78.61$, $SE = 9.80$), $t = 2.272$, $p = 0.061$, and marginally lower than time spent reading in the

motivated condition ($M = 77.95$, $SE = 10.29$), $t = 2.17$, $p = 0.078$. Overall, participants in the neutral condition spent less time reading counter-attitudinal articles than their counterparts. See Tables 4 and 5 and Figure 1 for further information on this ANOVA, condition means, and the post hoc test.

A chi squared test was then employed to determine the breakdown in selection frequency between conditions. This test revealed a significant effect, $\chi^2(6, N = 303) = 17.957$, $p = 0.006$. Results suggest that the algorithm condition pushed participants towards both extremes, as they were more likely to select either 0 pro-attitudinal articles, or 3 pro-attitudinal articles, than their counterparts. See Tables 6 and 7 for further information on this chi squared test.

ANOVAs conducted to investigate the effect of condition on number of pro-attitudinal articles selected, time spent reading pro-attitudinal articles, motivation to approach counter-attitudinal articles, attitude polarization, attitude certainty, desire to counter-argue, perception of information richness, perceived group consensus, and perceived availability of pro-attitudinal content found *no* significant effect of condition. See Tables 8 – 25 for information on these nonsignificant ANOVAs and condition means.

Regressions – Selective Exposure

To further investigate how selective exposure was influenced by other variables, a series of linear regressions were conducted, with condition (dummy coded) and strength of pre-existing recreational marijuana legalization attitude input as simultaneous predictors.

The first linear regression revealed a significant effect of marijuana attitude strength on number of pro-attitudinal articles selected. Stronger attitudes significantly predicted a higher number of pro-attitudinal articles selected over the three selection periods, $\beta = 0.18$, $t(299) =$

3.168, $p = 0.002$. Coded condition did not predict a change in number of pro-attitudinal articles selected in this regression. See Table 26 for further information on this regression.

Linear regressions investigating the effect of these two predictors on time spent reading pro-attitudinal articles revealed no significant effects of either predictor. However, similar to aforementioned ANOVA results, dummy coded condition with 1 representing the neutral condition significantly predicted time spent reading counter-attitudinal articles, $\beta = -0.15$, $t(299) = -2.23$, $p = 0.026$. See Tables 27 and 28 for further information on these regressions.

Regression – Motivation to Approach Counter-Attitudinal Articles

For the remaining regressions, coded condition, number of pro-attitudinal articles selected, total need for closure scores, and marijuana attitude strength were simultaneously input as predictors. The linear regression investigating motivation to approach counter-attitudinal articles revealed a significant effect of number of pro-attitudinal articles selected. Higher numbers of pro-attitudinal articles selected across selection periods significantly predicted lower self-reported motivation to approach counter-attitudinal articles during the study, $\beta = -0.482$, $t(297) = -9.394$, $p < 0.001$. Additionally, higher need for closure scores predicted lower motivation, $\beta = -0.103$, $t(297) = -2.02$, $p = 0.044$. This suggests that higher need for closure was associated with less motivation to approach counter-attitudinal content within this study.

No other predictors were significantly associated with motivation. See Table 29 for further information on this linear regression.

Regressions – Attitude Polarization and Attitude Certainty

Linear regressions investigating participants' levels of attitude polarization and levels of attitude certainty revealed significant effects in the same pattern and same direction. Therefore, only polarization will be discussed in further detail to remain concise. The linear regression

investigating polarization revealed a significant effect of number of pro-attitudinal articles selected. Higher numbers of pro-attitudinal articles selected across selection periods significantly predicted higher attitude polarization, $\beta = 0.233$, $t(297) = 5.695$, $p < 0.001$. This result could reflect polarization leading selection behavior, or reflect exposure to like-minded content increasing polarization.

This linear regression additionally revealed a significant effect of marijuana attitude strength, $\beta = 0.642$, $t(297) = 15.673$, $p < 0.001$. Stronger pre-existing attitudes significantly predicted higher attitude polarization at the end of the study. This result likely reflects a similar variable, such that strongly polarized attitudes at time 1 predict strongly polarized attitudes at time 2.

No other predictors were significantly associated with attitude polarization or certainty. See Table 30 and 31 for further information on this linear regression, as well as information on the analysis on attitude certainty.

Regression – Desire to Counter-Argue

A linear regression investigating participants' desire to counter-argue throughout the study revealed a significant effect of number of pro-attitudinal articles selected. Higher numbers of pro-attitudinal articles selected across selection periods significantly predicted lower desire to counter-argue, $\beta = -0.16$, $t(297) = -2.864$, $p = 0.004$. This theoretically makes sense, as it is unlikely that participants would want to counter-argue content that agrees with their pre-existing opinion.

This linear regression additionally revealed a significant effect of marijuana attitude strength, $\beta = 0.302$, $t(297) = 5.403$, $p < 0.001$. Stronger pre-existing attitudes significantly predicted higher desire to counter-argue during the duration of the study. This result may reflect

that more polarized individuals consume content with higher scrutiny and are more likely to cognitively counter-argue against information.

No other predictors were significantly associated with desire to counter-argue. See Table 32 for further information on this linear regression.

Regression – Perceptions of Information Richness

A linear regression investigating participants' perception of the richness in information of available articles throughout the study revealed a significant effect of number of pro-attitudinal articles selected. Higher numbers of pro-attitudinal articles selected across selection periods significantly predicted higher perceptions of information richness, $\beta = 0.115$, $t(297) = 1.97$, $p = 0.05$. This p -value just barely meets the cut-off, and therefore this effect should be met with a healthy dose of skepticism. However, this result suggests that individuals who self-selected more pro-attitudinal articles throughout the study were more likely to perceive available articles as being rich in information that they did not already know.

No other predictors were significantly associated with perceived information richness. See Table 33 for further information on this linear regression.

Regression – Perception of Available Pro-Attitudinal Articles

A linear regression investigating participants' perception of the availability of pro-attitudinal articles throughout the study revealed a significant effect of number of pro-attitudinal articles selected. Higher numbers of pro-attitudinal articles selected across selection periods significantly predicted higher perceptions of available pro-attitudinal content, $\beta = 0.275$, $t(297) = 4.924$, $p < 0.001$. In other words, participants who self-selected more pro-attitudinal articles additionally were more likely to estimate a higher percentage of available articles within the study overall as matching their pre-existing marijuana attitude. This was regardless of condition,

meaning that this effect involved participants who were in the neutral and motivated condition who were exposed to 50% pro-attitudinal articles and 50% counter-attitudinal articles. Despite this equal balance in these two conditions, selective exposure tendencies predicted a change in perceived availability.

This linear regression additionally revealed a significant effect of marijuana attitude strength, $\beta = 0.127$, $t(297) = 2.267$, $p = 0.024$. Stronger pre-existing attitudes significantly predicted higher perceived availability of pro-attitudinal content throughout the study. Once again, this was despite condition, suggesting that perception of the availability of information that *agrees* was one's pre-existing attitude may cognitively shift depending on attitude strength and selective exposure tendencies.

No other predictors were significantly associated with perceived availability. See Table 34 for further information on this linear regression.

Regression – Perceived Consensus

A linear regression investigating participants' group consensus revealed a significant effect of pre-existing marijuana attitude strength. Stronger marijuana attitudes predicted significantly higher perceived consensus among University of Arkansas students, $\beta = 0.246$, $t(297) = 4.275$, $p < 0.001$. This result may suggest that individuals who themselves are polarized may have a bias in assuming that other in-group members implicitly agree with their own attitude.

No other predictors were significantly associated with perceived group consensus. See Table 35 for further information on this linear regression.

Correlations

A handful of correlations between variables stand out in the correlation matrix that were not already represented in the above regressions. Firstly, total time spent reading was positively associated with percentage of correct answers on the comprehension test, $r(302) = 0.187, p = 0.001$. This result does suggest that participants who thoroughly read articles were more likely to succeed on comprehension questions. This result will be revisited in the limitations section.

Secondly, perceived information richness was negatively associated with the desire to counter-argue, $r(302) = -0.233, p < 0.001$. This finding may reflect that participants associate only pro-attitudinal content with being full of information, and therefore do not need to argue with something they already agree with.

See Table 3 for all correlation coefficients between all fourteen variables.

Discussion

At first glance, it is clear that no a-priori hypotheses of this study were supported by the data. However, this study still provides a glimpse into different perceptual biases and behavioral responses of polarized individuals during the information selection process. Additionally, this study may provide a small amount of evidence that perhaps algorithmic processes do not overwhelmingly increase pro-attitudinal content approach as fears would suggest.

Overall, individuals who self-selected more pro-attitudinal articles were more polarized in their marijuana attitudes, had low motivation to approach counter-attitudinal information, desired to counter-argue with articles and authors less, perceived the information landscape of available articles to be *more* rich, and perceived there to be *more* pro-attitudinal content available during the study overall (although this perception was not accurate).

Overall, individuals who were polarized in their pre-existing marijuana attitudes self-selected more pro-attitudinal articles, perceived fellow in-group members as having a stronger consensus about the topic of marijuana legalization, desired to counter-argue with articles and authors more, and perceived there to be *more* pro-attitudinal content available during the study overall.

For each dependent variable, I will discuss important significant results and null results in further depth.

Selective Exposure

As aforementioned, selective exposure was recorded as both the number of pro-attitudinal articles selected throughout the study (between 0 and 3) and the time spent reading pro- and counter- articles. This decision was made because an individual can select an article but not fully read it, which would suggest that they are not actually fully exposing themselves to the information. Therefore, analyzing all three versions of selective exposure as dependent variables can give the most insight into the phenomenon.

H1-a and H1-b were not supported by the data. Number of articles selected and time spent reading pro-attitudinal content did not significantly differ between the three conditions within the ANOVA analyses. In fact, time spent reading counter-attitudinal content was lowest in the *neutral* condition, not the algorithm condition. This finding suggests that individuals in the algorithm condition spent more time reading counter-attitudinal articles than those in the neutral condition, which is the opposite of expected results. Rather than solely pushing individuals towards their own like-minded content, perhaps the algorithm in this study additionally exposed participants to more counter-attitudinal options that intrigued them, therefore leading to more time spent reading. Additionally, the increase in time spent reading counter- articles in the

motivated condition may represent successful motivational instructions, although this will be discussed in the next section.

However, the chi squared analysis did help to further clarify selective behavior. It appears that participants in the algorithm condition were more likely to be extreme in their selection habits when compared to the neutral and motivated conditions. Algorithm participants selected 0 pro-attitudinal articles 24% of the time (neutral selected 9%, motivated selected 11%), and 3 pro-attitudinal articles 33% of the time (neutral selected 24%, motivated selected 26%). These results do not suggest that algorithms overwhelming cause selective approach to pro-attitudinal behavior. Rather, and perhaps more interestingly, it suggests that algorithms just strengthen the divergence of selective behavior towards both pro- and counter- content. Despite this, participants in the algorithm condition were still more likely to spend time reading counter-attitudinal articles than neutral condition participants.

Overall, this study does not necessarily provide evidence that algorithm processes increase selective behavior tendencies. In fact, participants overall selected pro-attitudinal articles 57.4% of the time, which is barely above chance. Null results do not always represent the absence of an effect, and these null results do not guarantee that algorithms do *not* cause increased selective exposure tendencies. It is important to contemplate the limitations of this study. However, I believe that the results put a modest amount of pressure on the assumption that algorithmic processes will lead to individuals only reading like-minded information; this falls in line with past research that demonstrated no change in selective exposure when introducing algorithmic or personalization processes (Beam & Kosicki, 2014; Furey, 2016). I would argue that algorithms may strengthen pre-existing tendencies, as demonstrated by the chi squared

results. If an individual is already leaning one way, the algorithm may make that leaning stronger.

Those who *did* overwhelming exhibit selective exposure to pro-attitudinal content were participants who were already polarized in their marijuana legalization attitudes. This paints a picture of individuals who are already strongly convinced in their perspective, so they are seeking out content that they expect to uphold and confirm their pre-existing attitudes. In other words, their goal in article selection may be to affirm their own identity and beliefs, rather than learn new or thought-provoking information. This interpretation is in line with past research on polarized sociopolitical attitudes (Knobloch-Westerwick et al., 2015).

If we are to take these selective exposure results at full face-value, they may indicate that browsers of online news should be more aware of their own polarization and how it influences their bias in selection habits, rather than focusing their concern on algorithm processes. However, limitations to this study and how they may have impacted these results will be unpacked.

Motivation to Approach Counter-Attitudinal Content

Assessment of motivation to approach counter-attitudinal articles throughout the study was intended as a manipulation check – however, this check failed, therefore H4-b was not supported. Although participants in the motivated condition spent more time reading counter-attitudinal articles than their neutral counterparts, they did not self-report more motivation on this measure. This finding may either reflect an actual lack of motivation, *or* it may reflect a desire of participants to “push back” against the study. In other words, it is possible that participants did not take kindly to our motivational instructions, found them to be irritating or condescending, and therefore at the end of the study reported less motivation.

It is difficult to reconcile the two findings – marginally more time on counter- articles but less self-reported motivation. Perhaps the instructions were an extrinsic form of motivation, such that it increased a behavior for the duration of the study to an extent, but the self-report measure was capturing an intrinsic motivation. Participants may have simply been following instructions, but the instructions were not enough to change actual, internal motivation. This interpretation would paint a pessimistic picture for motivation in the real world. If explaining why the benefits of open-mindedness and exploring dissimilar opinions isn't enough to change genuine motivation, and paying money isn't feasible, what would people in the real world be receptive to?

Furthermore, higher need for closure scores predicted less motivation to approach counter-attitudinal content. This finding is in line with how need for closure is conceptualized. Individuals who are more closed-minded and who like to come to conclusions quickly and decisively are likely not intrinsically motivated to approach dissimilar information, as searching for this information would only challenge previously held conclusions and increase ambiguity. However, it was surprising that need for closure did not predict any other variables, and this variable only marginally. In the future, the entire measure including all facets should be included to investigate whether other facets may be related to the investigated variables.

Attitude Polarization and Certainty

In terms of the effect of condition, H2-a, H2-b, and H2-c were not supported, and there were no differences in attitude polarization/certainty by condition. This null effect is likely because selective exposure tendency did not differ greatly between conditions. However, regression results indicate a clear relationship between selective exposure when it *did* occur and

attitude polarization/certainty, such that this variable was associated with higher number of selected pro-attitudinal articles.

Because selection was self-driven and *not* manipulated, it is not entirely clear whether one variable causes the other, or if another variable not accounted for in the analysis is driving both variables. However, there are two reasons to suggest that exposure to pro-attitudinal content predicts later increased polarization, and not the other way around.

Firstly, participants' selection choices were recorded first in the analysis, then their polarization and certainty were recorded at a later time point. This temporal aspect does provide some evidence that this result is capturing an effect of pro-attitudinal content exposure on later polarization. Additionally, questions on Borah's attitude certainty measure involve temporal phrasing, such as "I feel my opinions on this issue became stronger **after reading through articles**" (2014). Consequently, attitude certainty in particular likely represents a self-reported change in attitude strength *after* exploring articles, as opposed to attitude strength *driving* article selection. This interpretation is in line with past lagged analyses that demonstrated that polarization is a consequence of exposure (Stroud, 2010).

On the other hand, strength in pre-existing marijuana attitudes at time one predicted higher amount of selective exposure during the study. With this additional effect in mind, it is probable that the relationship between polarization and selection behavior is a vicious cycle. Those who are already polarized seek out like-minded content, and this like-minded content in turn may increase or at least uphold polarization.

This cycle does pose a genuine threat to online information seeking and deliberation. When given their own autonomy, individuals who are already polarized may surround themselves with like-minded content, which may further exacerbate division. Some have argued

that the most polarized individuals are the ones who could benefit from being exposed to opposing opinions the most (e.g., Sunstein, 2001). However, without intervention, it is not likely that individuals with strongly held attitudes will go out of their way to expose themselves to counter-attitudinal content.

Desire to Counter-Argue

In terms of the effect of condition, H3-a and H3-b were not supported, and there were no differences in desire to counter-argue by condition. Once again, this null effect is likely because selective exposure tendency did not differ greatly between conditions. However, individuals who exhibited more selective exposure self-reported lower desire to counter-argue with articles and authors throughout the study. This is an intuitive finding, as it is unlikely that individuals will want to argue with an article that agrees with their pre-existing attitude. On the other hand, polarized individuals self-reported higher desire to counter-argue. This finding is a bit less intuitive, as polarized individuals were also more likely to select pro-attitudinal articles.

It is possible that this measure is capturing higher levels of cognition, attention, and interest in a round-about way. Polarized individuals may be more cognitively involved in the reading process than those with milder attitudes. This type of person may be considering possible arguments on both sides while reading a variety of articles, imagining what devil's advocate positions could be taken, or may find small things to scrutinize or nitpick in even pro-attitudinal articles. In summary, I theorize that this finding reflects that passionate people have higher desire to argue, even with someone who generally agrees with them. Perhaps this act of arguing (or discussing something in a passionate manner) is an act that helps to solidify understanding of a topic, solidify talking points, and solidify the polarized attitude as a whole. Imagine a lawyer

practicing their defense – perhaps this is the cognitive process that polarized individuals experience while seeking and reading information.

Perception of Information Richness

Participants' perceptions of the richness in information that available articles provided was included in this dissertation as an exploratory variable. Analyses indicate that individuals who self-selected more pro-attitudinal articles additionally perceived available articles *overall* in the study to be more information rich. Although this finding was barely significant, it may be hinting at some of the behind-the-scenes processes of individuals who trend towards selective exposure.

Theoretically, counter-attitudinal articles should also be rich in information. Even if one does not *agree* with the overall point being made in an article, it likely is still providing facts or points of view that one may not have otherwise known or considered. Additionally, a person is likely to know many of the arguments and information on their own side of the attitude – hopefully, that is why they agree with the attitude in the first place.

In contrast, for individuals who selected more confirming articles, it appears that they perceived like-minded content to be the type of content that they could learn new things from. Perhaps this finding suggests that these types of individuals are highly pessimistic about the quality of information contained in counter-attitudinal articles and arguments. In other words, they may inherently believe that counter opinions are not based in fact or genuine information; this interpretation reflects Taber and Lodge's concept of motivated skepticism (2006). Therefore, information richness being higher for those who were exposed to more pro-attitudinal articles suggests that this may be a perceptual bias, rather than an objective assessment.

This finding needs fleshing out but may be hinting at a deeper phenomenon. For future research, I would be interested in gauging participants' direct interpretations of a pro-attitudinal article and a counter-attitudinal article, and then investigate whether possible perceptual bias interacts with selective exposure behavior. Does skepticism of the information richness of other side drive selection, or the other way around?

Perceived Availability of Pro-Attitudinal Content

Perceived availability of pro-attitudinal content throughout the study was originally included as a manipulation check. This manipulation check failed, as there was no effect of condition on this variable, resulting in the rejection of H4-a. This null effect is likely because participants even in the algorithm condition exposed themselves to relatively equal amounts of pro- and counter- articles, rather than overwhelmingly selecting pro- as I originally hypothesized.

Despite this null effect of condition, regression analyses still revealed fascinating results involving this variable. Firstly, participants who self-selected more pro-attitudinal articles throughout the study reported higher perceptions of available pro-attitudinal content *overall*. This variable gauged how many articles available overall that participants estimated agreed with their opinion, not how many they *selected*. Therefore, this effect suggests that individuals who trend towards selective exposure behavior also perceive the selection environment generally as more skewed towards their own pre-existing attitude. Once again, this perception does not reflect reality as a majority of participants saw an equal amount of pro- and counter- articles, and instead appears to be a perceptual bias.

This bias could be explained in multiple ways. It is possible that this variable was increased by the exposure to pro-attitudinal articles themselves (i.e., reading more pro-attitudinal content led to higher perception of availability of content of that type). This theory could involve

salience – selecting and reading pro-attitudinal content made it more salient, and therefore participants noticed additional pro-attitudinal titles more and reported higher availability. On the other hand, it is possible that individuals who trend towards selective exposure are less likely to notice or attend to counter-attitudinal content in the first place (and this may partially explain why they consequently selected more pro- articles). Furthermore, perhaps individuals who trend towards selective exposure may erroneously perceive even counter-attitudinal article titles as agreeing with their opinion, leading to higher perceptions of pro-attitudinal content availability. Finally, it is possible that those who selected more pro-attitudinal content wanted to justify their behavior, and did so by claiming that a majority of available articles were pro-attitudinal.

Participants who were polarized in their pre-existing attitudes were additionally more likely to report higher perceptions of available pro-attitudinal content overall. This trait was correlated with selective exposure, so there is some cross over in both these variables and how they impact perceived availability (although selective exposure tendency explained more of the variance than attitude strength). Several of the above proposed explanations may also work for this predictor. Polarized individuals may attend less to counter-attitudinal content, or mistakenly perceive counter-attitudinal titles as supporting their pre-existing attitudes.

Once again, these possibilities paint a worrisome picture for solving the issue of polarization and selectivity. No matter in which direction the effect occurs, these results suggest that selective exposure and polarization may involve perceptual biases while exploring the online informational landscape. Future research should work to investigate in which direction this occurs – does polarization lead to this bias, or does this bias lead to polarization? Is selectivity a result of this bias, or is this bias a result of exposure to primarily like-minded content?

Perceived Consensus of Group Members

Finally, results indicated that polarized individuals perceive a higher amount of consensus among their in-group members (fellow University of Arkansas students) on the topic of recreational marijuana legalization. People who hold strong attitudes may additionally operate under the assumption that most people think like them and agree with them. Once again, this could be explained in two ways. It is possible that a part of the reason why individuals feel so strongly and so passionately about a topic is because they believe most people to be on the same page about it (i.e., the bandwagon fallacy). However, I believe it is more likely that holding a polarized attitude leads to believing that most people agree, because it is less threatening to believe that you agree with the majority, and it affirms the strongly held attitude. Either possibility sheds light into group dynamics, and may have further implications for the intersection of attitude strength and perceptions of the in-group.

Future research should investigate topics other than recreational marijuana legalization. In this sample, over 80% of college students supported legalization. Therefore, polarized individuals were *more accurate* in their assumption of consensus. It would be interesting to consider other topics that involve far lower consensus and investigate whether polarization can predict higher perceived consensus for these topics, as well.

Limitations and Future Directions

This study had its fair share of limitations, and future research should predominantly aim to resolve these limitations. Primarily, the originally proposed sample of 450 participants was not met. Data collection was ceased at a certain date to ensure graduation in a timely manner. Additionally, roughly 13% of the total sample was removed due to poor responding, resulting in a final sample of only 303 participants. There were roughly 100 participants per condition, which

is reasonable, but certain effects may have changed with a larger sample. For example, some of the effects of need for closure were marginal; these effects may have become significant (or completely nonsignificant) with a larger sample.

On the topic of poor responding, these data were collected during a unique time in history. Following the worst of the COVID-19 pandemic, university students appear to be extremely unmotivated in classwork, attendance, and research participation. I believe this was reflected in my data. Multiple participants clicked through the survey as fast as they could, and it is likely that some of the data points that remained in the final analysis were given by unmotivated and uncaring participants. This possibility could have a myriad of consequences. Participants may not have read any of the article titles (and therefore may not have even noticed which were pro- and which were counter-), read any of the articles' content, or answered any measures with genuine answers.

Although this is worrisome, these poor responders are likely spread evenly across conditions. Additionally, this may be an accurate reflection of the real world. Many online news consumers are likely *not* motivated. In fact, many individuals stumble across news and barely read it (or only read the headline) rather than purposefully and thoughtfully engage with it. Perhaps the presence of unmotivated participants provides a more accurate representation of online users of all kinds. Additionally, participants overwhelmingly passed the comprehension questions at the end of the study. Although these true/false questions were relatively simple, this suggests that participants paid a modicum of attention to the study's content.

Nonetheless, for future studies, there are a few ways in which poor responding can be accounted for. Primarily, I would like to conduct a similar study but bring participants into the lab to use a lab computer for the duration of the study. I believe that participants who come to a

study in person, and who relinquish their phone for the study, will engage with and respond to the study's content more thoughtfully. Moreover, if a bigger sample can be collected, participants who spent less than 30 seconds or so overall reading (between three articles) can be removed from the analysis, as this suggests that they are not fully engaged with the study's content. Finally, it would be interesting to replicate this study with an older sample by potentially using a website like MTurk or Prolific. By utilizing these crowd sourcing sites, I can collect a larger sample, remove the poor responders, and investigate whether any of the findings change depending on the average age of the sample.

Another striking limitation to this study is that the online environment did not fully mirror social media platforms. To better generalize to phenomena found on SNS, future research should include the same article selection and same algorithm process, but make the online environment feel as close to social media as possible. Participants may have felt a bit psychologically disconnected from the study because it felt too "clinical." It is highly possible that this study was lacking in both psychological *and* mundane realism.

Although participants in the motivated condition exposed themselves to more counter-attitudinal content than the neutral condition, they did not have higher levels of self-reported motivation. Future research should further investigate which motivational instructions can increase motivation in participants in a way that is reflected on this self-reported measure. Other things that may motivate participants could include the possibility of being attractive to other people or increasing group cohesion or group acceptance. I am particularly interested in working with a highly polarized sample, because this study's results suggest that they could potentially benefit from counter-attitudinal exposure the most. Exploring how these individuals could be

motivated to break out of their selectivity cycle has important implications for information seeking and sharing and discussion dynamics in the real online world.

Lastly, participants overall in this study overwhelmingly supported the legalization of recreational marijuana. This topic was selected because undergraduate students indicated during a pilot study that they cared the most about this topic. I wanted to investigate a topic that provoked enthusiasm and passion in my participants. However, I believe that selecting a topic in future research that is more balanced on both sides (as opposed to having a strong consensus) can help to better understand how perceptions of group consensus may differ for these topics. Furthermore, selective exposure may be more likely for topics that are a bit more heated, such as abortion, religion, “PC culture,” or gun rights. Although undergraduate students reported that they care most about recreational marijuana legalization, it may not be the most “heated” of all possible topics. In other words, exposure to counter-attitudinal content on this topic may not be as psychologically threatening as other possible topics.

Overall Takeaways

Despite its limitations and null effects, this dissertation study highlights the dynamics of polarized and selective individuals during the information seeking process. Results provide a *small* amount of evidence that perhaps algorithm processes do not inherently pull individuals into a selective exposure hole, and in fact it may increase how long individuals spend reading counter-attitudinal content (when compared to a neutral condition). Participants who were polarized in their pre-existing attitude and participants who were more likely to demonstrate selective exposure demonstrated several perceptual biases during the study. For example, they were more likely to perceive a higher amount of the total available articles as being pro-attitudinal (although this was not objectively accurate). These perceptual biases and the

seemingly endless cycle of polarization and selectivity highlight the importance of intervention techniques. Future research should further explore *how* these individuals can be encouraged to explore dissimilar views and break out of this cycle.

In terms of previous in-person research, these results reflect long-standing research that has demonstrated the power of strong attitudes and how they can guide not only behavior, but related cognitive processes (Brehm & Cohen, 1962; Clarke & James, 1967; Greenwald & Ronis, 1978). Regardless of whether attitude is sliced as strength, polarization, or certainty, this factor appears to have serious consequences for other variables during the information-searching process. Furthermore, this study adds to the growing body of literature for both in-person and online selective exposure research, although this study did not find that approach to pro-attitudinal content was quite as ubiquitous as past research. This divergent finding may be a consequence of the addition of an algorithm process, the topic used, the environment used, or all the above.

In summary, this dissertation does *not* provide evidence that the public's concern about algorithms and echo chambers are accurate. Rather than focusing on concern about the external factors of the online environment, such as algorithmic processes, perhaps our concern should shift inward. Are we particularly polarized on a topic? Do we feel stubborn in the face of dissimilar arguments? Do we wish to counter-argue it until we are blue in the face? Does our pre-existing polarization push us to perceive the environment around us differently, and does that change our selection behavior? Such reflections may encourage us to pause, for even a brief moment, the next time we find ourselves searching for information on social media platforms.

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Tables

Table 1

Race/Ethnicity Frequency

Racial Category	Percent
White	85.15
Black	3.96
Asian/Alaskan Native	3.63
Native Hawaiian/Pacific Islander	0.33
Mixed Race	6.93

Table 2

Gender Frequency

Gender Category	Percent
Female	60.73
Male	38.28
Non-binary or agender	0.66
Other	0.33

Table 3
Pearson's r Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. % Correct	--													
2. Total Read	.187*	--												
3. Motiv	.060	.186	--											
4. NFC	.001	-.025	-.117	--										
5. Consensus	-.034	.036	.009	-.027	--									
6. Info Rich	-.002	.006	.023	.056	.031	--								
7. Counter-Argue	-.052	.015	.22*	.098	.050	-.233*	--							
8. Att Cert	-.037	.005	-.203*	.007	.072	.196*	.183*	--						
9. Perc Agreement	.022	.016	-.087	.068	.120	.076	.041	.106	--					
10. Att Strength	-.049	.042	-.009	.079	.227*	.051	.277*	.249*	.182*	--				
11. Time Counter	.180	.532*	.373*	-.065	.009	<.001	.030	-.202*	-.161*	-.062	--			
12. Time Pro	.111	.857*	-.008	.010	.038	.008	<.001	.129*	.117*	.087	.018	--		
13. Att Polar	.042	-.007	-.152*	.067	.202*	-.019	.231*	.426*	.165*	.685*	-.159*	.088	--	
14. Amount Pro	-.084	-.106	-.468*	.060	-.029	.122*	-.100	.367*	.299*	.180*	-.527*	.197*	.349*	--

* indicates significance at the < 0.05 level.

Table 4
ANOVA Results – Effect of Condition on Time Spent Reading Counter Articles

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	33,520.962	3.295	0.038*	0.021
Residuals	300	10,172.422			

Table 5
Tukey's HSD Results – Time Reading Counter Articles Contrast Between Conditions

Predictor	Mean Diff	SE	<i>t</i>	<i>p</i> _{Tukey}
Alg - Motiv	0.662	14.21	0.047	0.999
Alg - Neut	31.864	14.024	2.272	0.061 [†]
Motiv - Neut	31.202	14.376	2.170	0.078 [†]

Table 6
 χ^2 Results – Number of Pro Selected By Condition

Amount of Pro	Algorithm	Motivated	Neutral	Total
0	25	11	9	45
1	19	31	28	78
2	27	29	40	96
3	35	25	24	84

Table 7
 χ^2 Results – Number of Pro Selected By Condition

	Value	<i>df</i>	<i>p</i>
χ^2	17.957	6	0.006
N	303		

Table 8
ANOVA Results – Effect of Condition on Amount of Pro Articles Selected

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	0.289	0.272	0.762	0.002
Residuals	300	1.060			

Table 9
Means of Condition on Amount of Pro Articles Selected

Condition	Mean	SD
Algorithm	1.679	1.167
Motivated	1.708	0.983
Neutral	1.782	0.912

Table 10
ANOVA Results – Effect of Condition on Time Spent Reading Pro Articles

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	13,525.494	0.485	0.616	0.003
Residuals	300	27,913.557			

Table 11
Means of Condition on Time Spent Reading Pro Articles

Condition	Mean	SD
Algorithm	75.026	119.627
Motivated	69.013	70.598
Neutral	91.525	252.942

Table 12
ANOVA Results – Effect of Condition on Motivation

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	1.714	1.143	0.320	0.008
Residuals	300	1.500			

Table 13
Means of Condition on Motivation

Condition	Mean	SD
Algorithm	3.085	1.243
Motivated	3.281	1.246
Neutral	3.327	1.184

Table 14
ANOVA Results – Effect of Condition on Attitude Polarization

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	135.200	0.475	0.622	0.003
Residuals	300	284.361			

Table 15
Means of Condition on Attitude Polarization

Condition	Mean	SD
Algorithm	28.509	16.955
Motivated	30.771	16.915
Neutral	29.149	16.716

Table 16
ANOVA Results – Effect of Condition on Attitude Certainty

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	0.490	0.413	0.662	0.003
Residuals	300	1.187			

Table 17
Means of Condition on Attitude Certainty

Condition	Mean	SD
Algorithm	4.802	1.125
Motivated	4.667	1.080
Neutral	4.767	1.060

Table 18

ANOVA Results – Effect of Condition on Desire to Counter-Argue

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	0.394	0.250	0.779	0.002
Residuals	300	1.576			

Table 19

Means of Condition on Desire to Counter-Argue

Condition	Mean	SD
Algorithm	3.660	1.250
Motivated	3.538	1.258
Neutral	3.625	1.259

Table 20

ANOVA Results – Effect of Condition on Perception of Info Richness

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	0.437	0.587	0.557	0.004
Residuals	300	0.745			

Table 21

Means of Condition on Perception of Info Richness

Condition	Mean	SD
Algorithm	5.053	0.777
Motivated	4.904	0.906
Neutral	4.970	0.906

Table 22

ANOVA Results – Effect of Condition on Perceived Consensus

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	15.639	0.037	0.964	< 0.001
Residuals	300	424.423			

Table 23

Means of Condition on Perception of Perceived Consensus

Condition	Mean	SD
Algorithm	59.849	20.837
Motivated	59.927	22.378
Neutral	60.564	18.470

Table 24

ANOVA Results – Effect of Condition on Perceived Availability of Pro Articles

Predictor	<i>df</i>	MS	<i>F</i>	<i>p</i>	η^2
Condition	2	34.912	0.104	0.901	< 0.001
Residuals	300	336.305			

Table 25

Means of Condition on Perceived Availability of Pro Articles

Condition	Mean	SD
Algorithm	51.085	18.602
Motivated	52.083	18.227
Neutral	51.020	18.118

Table 26

Linear Regression Results – Amount of Pro-Attitudinal Articles Selected

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	1.233	0.181			
Neutral 1	0.099	0.145	0.046	0.684	0.494
Algorithm 1	-0.013	0.143	-0.006	-0.093	0.926
Marij Att Strength	0.172	0.054	0.182	3.201	0.002*

Table 27

Linear Regression Results – Time Spent Reading Pro-Attitudinal Articles

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	30.865	29.785			
Neutral 1	24.537	23.537	0.069	1.031	0.303
Algorithm 1	7.247	23.497	0.021	0.31	0.757
Marij Att Strength	13.768	8.812	0.090	1.562	0.119

Table 28

Linear Regression Results – Time Spent Reading Counter-Attitudinal Articles

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	95.638	17.994			
Neutral 1	-32.141	14.387	-0.149	-2.234	0.026*
Algorithm 1	0.077	14.208	< 0.001	0.005	0.996
Marij Att Strength	-6.383	5.328	-0.068	-1.198	0.232

Table 29

Linear Regression Results – Motivation to Approach Counter Articles

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	4.712	0.398			
Neutral 1	0.139	0.154	0.054	0.90	0.369
Algorithm 1	-0.192	0.151	-0.075	-1.268	0.206
Amount of Pro	-0.575	0.061	-0.482	-9.394	< 0.001*
NFC	-0.193	0.095	-0.103	-2.02	0.044
Marij Att Strength	0.099	0.058	0.088	1.707	0.089

Table 30

Linear Regression Results – Attitude Polarization

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	-3.496	4.354			
Neutral 1	-0.460	1.688	-0.013	-0.273	0.785
Algorithm 1	-1.247	1.655	-0.035	-0.754	0.452
Amount of Pro	3.812	0.669	0.233	5.695	< 0.001*
NFC	0.077	1.043	0.003	0.074	0.941
Marij Att Strength	9.913	0.632	0.642	15.673	< 0.001*

Table 31

Linear Regression Results – Attitude Certainty

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	3.729	0.370			
Neutral 1	0.113	0.143	0.049	0.791	0.430
Algorithm 1	0.167	0.141	0.073	1.186	0.237
Amount of Pro	0.354	0.057	0.334	6.222	< 0.001*
NFC	-0.054	0.089	-0.033	-0.613	0.540
Marij Att Strength	0.194	0.054	0.194	3.609	< 0.001*

Table 32

Linear Regression Results – Desire to Counter-Argue

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	2.335	0.442			
Neutral 1	0.124	0.171	0.047	0.721	0.471
Algorithm 1	0.139	0.168	0.053	0.825	0.410
Amount of Pro	-0.195	0.068	-0.160	-2.864	0.004*
NFC	0.153	0.106	0.080	1.444	0.150
Marij Att Strength	0.347	0.064	0.302	5.403	< 0.001*

Table 33

Linear Regression Results – Perception of Information Richness

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	4.449	0.319			
Neutral 1	0.051	0.124	0.028	0.416	0.678
Algorithm 1	0.133	0.121	0.074	1.095	0.274
Amount of Pro	0.097	0.049	0.115	1.971	0.050*
NFC	0.060	0.076	0.046	0.790	0.430
Marij Att Strength	0.023	0.046	0.029	0.492	0.623

Table 34

Linear Regression Results – Perceptions of Availability of P-A Content

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	33.146	6.461			
Neutral 1	-1.349	2.504	-0.035	-0.538	0.591
Algorithm 1	-0.740	2.456	-0.019	-0.301	0.763
Amount of Pro	4.890	0.993	0.275	4.924	< 0.001*
NFC	1.250	1.548	0.045	0.808	0.420
Marij Att Strength	2.128	0.938	0.127	2.267	0.024*

Table 35
Linear Regression Results – Perceived Consensus

Predictor	<i>B</i>	SE	β	<i>t</i>	<i>p</i>
Intercept	54.946	7.454			
Neutral 1	1.696	2.889	0.039	0.587	0.558
Algorithm 1	0.395	2.833	0.009	0.139	0.889
Amount of Pro	-1.425	1.146	-0.071	-1.244	0.214
NFC	-1.443	1.786	-0.046	-0.808	0.420
Marij Att Strength	4.628	1.083	0.246	4.275	< 0.001*

Figures

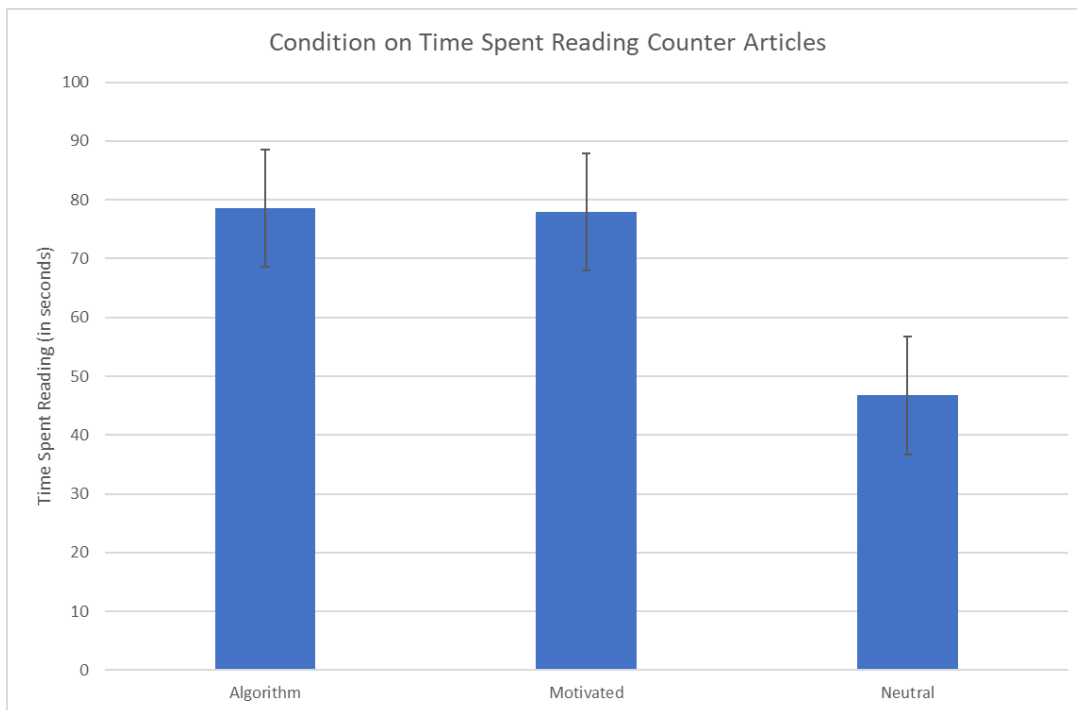


Figure 1. Effect of condition on time spent reading counter-attitudinal articles.

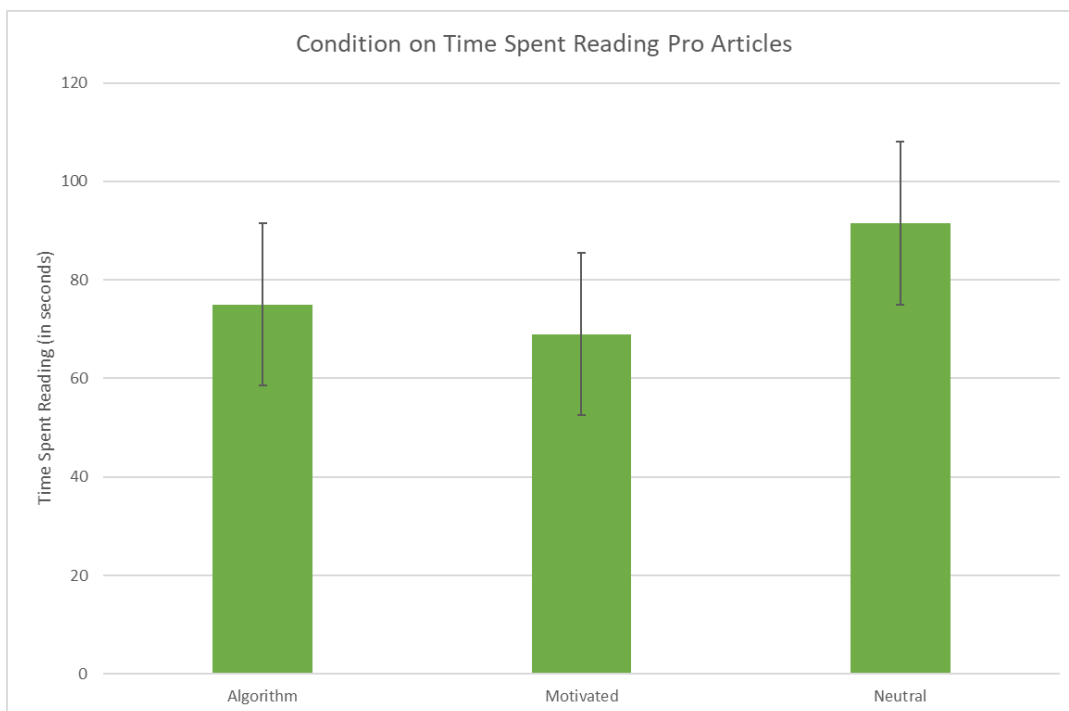


Figure 2. Effect of condition on time spent reading pro-attitudinal articles.

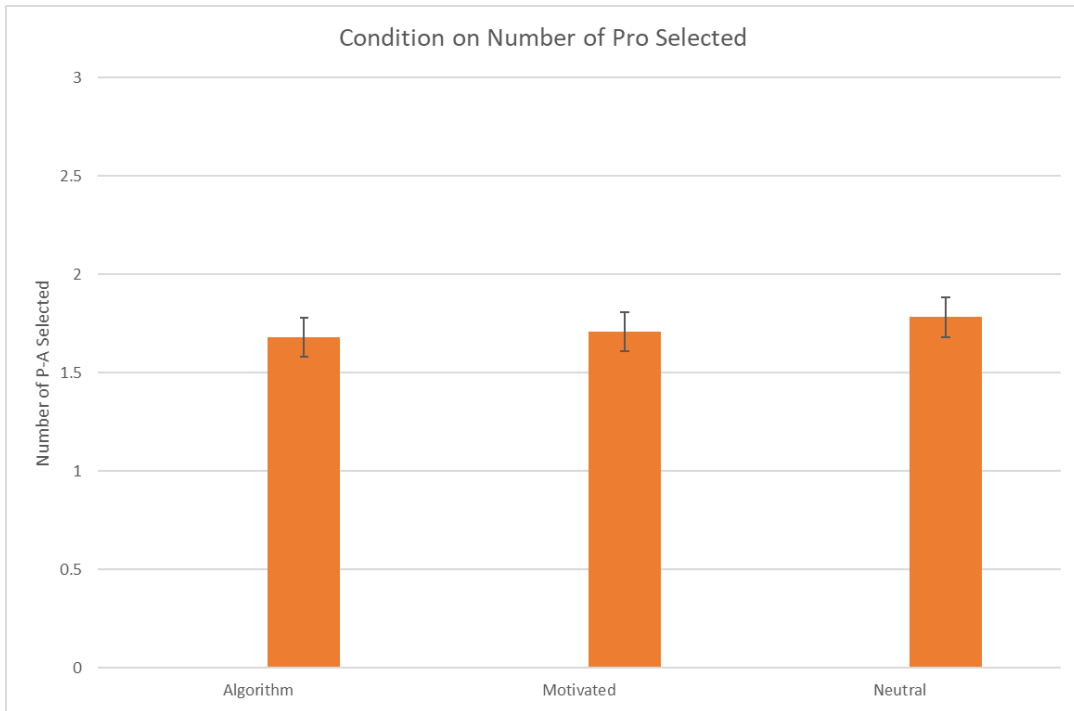


Figure 3. Effect of condition on number of pro-attitudinal articles selected.

Appendix

Show Block: Prelim Questions (9 Questions) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

Randomizer
Randomly present of the following elements Evenly Present Elements [Edit Count](#)
[Add Below](#) [Move](#) [Duplicate](#) [Collapse](#) [Delete](#)

Show Block: Algorithm - Prelim (1 Question) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

Show Block: Neutral - Prelim (1 Question) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

Show Block: Motivated - Prelim (2 Questions) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

+ Add a New Element Here

Then Branch If:
If In the following section, you will be shown several political and social issues/topics. Please in... [Is Displayed](#) [Edit Condition](#)
[Move](#) [Duplicate](#) [Options](#) [Collapse](#) [Delete](#)

Show Block: Selection - All Balanced (1 Question) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

Then Branch If:
If Please read the following titles of articles on marijuana legalization. Then, select which one ar... **Legitimate Concerns Associated with Legalization of Recreational Marijuana** [Is Selected](#) [Edit Condition](#)
[Move](#) [Duplicate](#) [Options](#) [Collapse](#) [Delete](#)

Show Block: Legitimate Concerns Associated with Legalization of Recreational Marijuana (2 Questions) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

+ Add a New Element Here

Then Branch If:
If Please read the following titles of articles on marijuana legalization. Then, select which one ar... **Keeping Marijuana Illegal Protects Our Families** [Is Selected](#) [Edit Condition](#)
[Move](#) [Duplicate](#) [Options](#) [Collapse](#) [Delete](#)

Show Block: Keeping Marijuana Illegal Protects Our Families (2 Questions) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

+ Add a New Element Here

Then Branch If:
If Please read the following titles of articles on marijuana legalization. Then, select which one ar... **Marijuana Is, In Fact, Addictive** [Is Selected](#) [Edit Condition](#)
[Move](#) [Duplicate](#) [Options](#) [Collapse](#) [Delete](#)

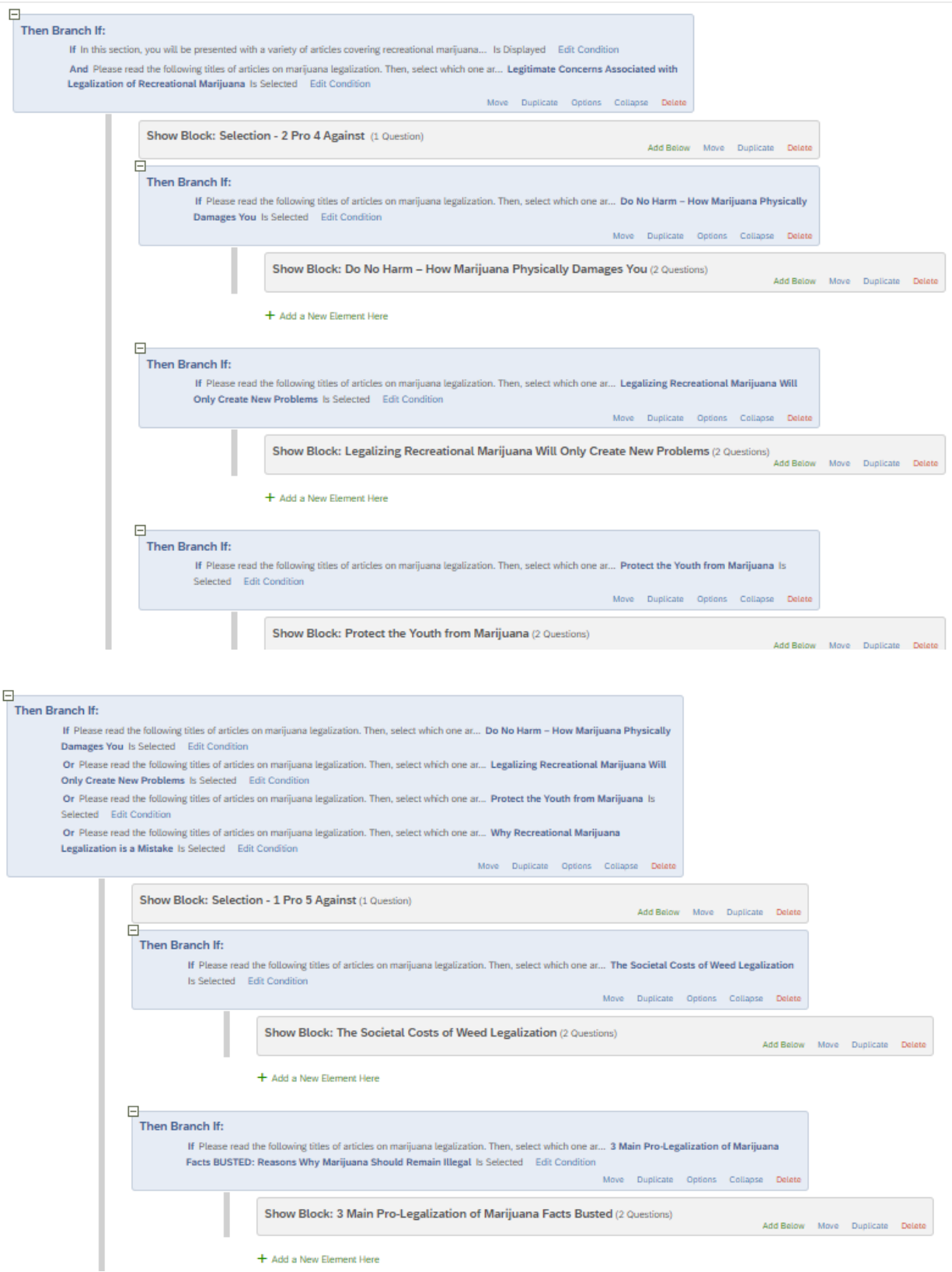
Show Block: Marijuana Is, In Fact, Addictive (2 Questions) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

+ Add a New Element Here

Then Branch If:
If Please read the following titles of articles on marijuana legalization. Then, select which one ar... **Combating Black Markets and Cartels with Marijuana Legalization** [Is Selected](#) [Edit Condition](#)
[Move](#) [Duplicate](#) [Options](#) [Collapse](#) [Delete](#)

Show Block: Combating Black Markets (2 Questions) [Add Below](#) [Move](#) [Duplicate](#) [Delete](#)

+ Add a New Element Here



Note: the screenshots above represent a *small* portion of the “survey flow” for this Qualtrics survey.

IRB Letter

To: Denise R Beike
MEMH 202D

From: Douglas J Adams, Chair
IRB Expedited Review

Date: 04/21/2021

Action: **Exemption Granted**

Action Date: 04/21/2021

Protocol #: 2104326456

Study Title: Article Selection Pilot Study

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: Dene Wamsley, Investigator

Questionnaires

Attitude Certainty (Borah, 2014)

Closely read the following statements. Then, indicate how strongly you agree with each statement (1 – strongly disagree; 7 – strongly agree):

1. I feel my opinions on this issue became stronger after reading through articles.
2. I feel more confident in my own opinion after reading through articles.

Desire to Counter-Argue

Closely read the following statements. Then, indicate how strongly you agree with each statement (1 – strongly disagree; 7 – strongly agree):

1. When reading through articles, I had the desire to argue with the authors against some of the points they made.
2. It would make me feel better if I had the chance to argue against some of the points made in these articles.
3. When I was reading articles, I wished I could explain to the authors why they are wrong.

Perception of Information Richness

Closely read the following statements. Then, indicate how strongly you agree with each statement (1 – strongly disagree; 7 – strongly agree):

1. I felt like I could learn new information from the articles available to me.
2. There was a wide variety in information on this topic available to me.
3. I felt like the articles available for me to read were full of information I did not already know.
4. I felt articles available for me to read were lacking in variety.

Need for Closure (Neuberg, Judice, & West, 1997)

Closely read the following statements. Then, indicate how strongly you agree with each statement (1 – strongly disagree; 7 – strongly agree):

1. I don't like situations that are uncertain.
2. When I am confused about an important issue, I feel very upset.
3. In most social conflicts, I can easily see which side is right and which is wrong.
4. I feel uncomfortable when someone's meaning or intention is unclear to me.
5. I feel irritated when one person disagrees with what everyone else in a group believes.
6. Even after I've made up my mind about something, I am always eager to consider a different opinion.
7. I do not usually consult many different opinions before forming my own view.
8. When thinking about a problem, I consider as many different opinions on the issue as possible.