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“Pick and Choose” Opinion Climate:

How Browsing of Political Messages Shapes Public Opinion Perceptions and Attitudes

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Abstract

High-choice media environments allow people to cocoon themselves with like-minded messages (confirmation bias), which could shape both individual attitudes and perceived prevalence of opinions. This study builds on motivated cognition and spiral of silence theory to disentangle how browsing political messages (both *selective exposure* as viewing full articles and *incidental exposure* as encountering leads only) shapes perceived public opinion and subsequently attitudes. Participants ($N = 115$) browsed online articles on controversial topics; related attitudes and public opinion perceptions were captured before and after. Multi-level modeling demonstrated a confirmation bias. Both selective and incidental exposure affected attitudes per message stance, with stronger impacts for selective exposure. Opinion climate perceptions mediated selective exposure impacts on attitudes.

Keywords: confirmation bias, selective exposure, political polarization, spiral of silence, public opinion

“Pick and Choose” Opinion Climate:**How Browsing of Political Messages Shapes Public Opinion Perceptions and Attitudes**

Citizens now face an unprecedented diversity of political sources and messages —input from news media, politicians and parties, amateur journalists, and fellow citizens are easily accessible through traditional, online, and social media. In this high-choice media context (Prior, 2007), media users are thought to attend to attitude-consistent messages more so than to attitude-challenging ones (e.g, Bennett & Iyengar, 2008), and this confirmation bias could lead to increasing polarization (e.g., Stroud, 2010). Moreover, when citizens try to make sense of how other people feel about an issue, they can now potentially create a cocoon of like-minded opinions by selecting attitude-aligned messages, instead of taking full advantage of the diversity of information. Accordingly, the present study examines whether a confirmation bias in selective exposure to political messages shapes not only attitudes but also perceived opinion climate (Noelle-Neumann, 1974), which could act as a catalyst for attitude impacts.

In the wake of concerns that the internet age drives a wedge into the electorate (Boxell, Gentzkow, & Shapiro, 2017) by making them increasingly politically polarized and intolerant, it is of crucial importance to understand underlying mechanisms. The present work will focus on attitude impacts and perceptions of opinion climates. As a novel contribution to prior research, the study will differentiate between incidental and selective exposure when examining how exposure to political online messages affects citizens’ political attitudes. As an additional contribution, a mechanism of such attitude change from exposure will be tested, namely whether the unobtrusively observed exposure shapes perceptions of upcoming opinion climate change, which could subsequently impact attitudes. If a confirmation bias affects perceived opinion climates, citizens could create a perception of an opinion climate through what they choose to

attend to, with important implications for political expression and behavior.

In the following, we first discuss (a) important concepts regarding media exposure and the confirmation bias in high-choice media contexts, before addressing (b) attitude impacts from media exposure as well as (c) arguments on how spiral of silence theory (SOS) concepts may shape these impacts. A pre-post-test design will test hypotheses derived from this discussion, based on tracked incidental and selective exposure to attitude-consistent and –discrepant content.

Motivated Cognition in High-Choice Environments

Several scholars have argued that selective exposure per *confirmation bias*—attending to attitude-consistent messages more so than counter-attitudinal messages (Knobloch-Westerwick, 2015)—fosters polarization and more extreme political attitudes (e.g., Stroud, 2010). This view is rooted in Festinger’s (1957) theory of cognitive dissonance, the origin of the more current perspective of motivated cognition (e.g., Taber & Lodge, 2006). The term *selective exposure* denotes that individuals choose from messages and thus exhibit preferences, which may reflect a confirmation bias rooted in political attitudes but can also demonstrate other leanings. Hence, selective exposure refers to “any systematic bias in audience composition for a given medium or message, as well as any systematic bias in selected messages that diverges from the composition of accessible messages” (Knobloch-Westerwick, 2015, p. 3).

The specific case of selective exposure per a confirmation bias has garnered much scholarly attention (Donsbach, 2009), even though non-political entertainment may account for much of everyday media consumption and thus curtail the role of confirmation bias shaping media exposure (Arceneaux, Johnson, & Cryderman, 2013; Prior, 2013). Further, it is sometimes argued that the preference for attitude-consistent content and the avoidance of attitude-discrepant content are distinct phenomena (Garrett & Stroud, 2014), even though they are commonly

summarized as confirmation bias. Aside from these nuances, the scholarly debate on the confirmation bias continues to flourish amid concerns on increasing polarization and intolerance.

In contrast, *incidental exposure* occurs when individuals encounter messages they did not specifically seek out (e.g., Tewksbury, Weaver, & Maddex, 2001). For example, when searching information online on yahoo.com or attending to social media, a user may happen to view news headlines and pick up information, without having sought it out. While some authors emphasized the *motivation* with which media users accessed the information channel in the first place to distinguish incidental from selective exposure (Feezell, 2018; Fletcher & Nielsen, 2018), others emphasized actual *behavior*. This latter approach labels merely coming across a news lead as incidental exposure, in contrast to actually engaging with the information by selecting to view the full news article (Karnowski, Kümpel, Leonhard, & Leiner, 2017). The present study aligns with this latter, behavioral differentiation, wherein merely viewing a news lead constitutes incidental exposure while accessing an article page is considered selective exposure.

The difference between incidental and selective exposure garnered attention lately. Scholars worry that easier selectivity in the internet age may lead to reduced consumption of political information, but social media use may revive greater incidental exposure to political messages while interacting with peers (e.g., Fletcher & Nielsen, 2018). It could be argued that the internet *facilitates* careful choice of political messages (Bennett & Iyengar, 2008), resulting in a pronounced confirmation bias demonstrated in recent works. Even though original findings on the confirmation bias were inconclusive (see review by Donsbach, 2009), recent research and methods yielded consistent support for it (e.g., review by Knobloch-Westerwick, 2015). However, the presence of abundant choices could *undermine* careful selection of messages per motivated cognition, because these choices absorb cognitive resources, as detailed next.

Because “Being a motivated reasoner takes effort” (Taber & Lodge, 2006, p. 757), an influx of a multitude of messages and topics could reduce motivated reasoning, as this influx takes away cognitive resources even upon brief encounters. Both motivated cognition theorizing (Taber & Lodge, 2006) and empirical evidence suggest that the confirmation bias as a pattern requires cognitive resources. Several studies have shown that people with lower need for cognition exhibited a weaker confirmation bias (Knobloch-Westerwick, Mothes, & Polavin, in press; Westerwick, Johnson, Knobloch-Westerwick, 2017). Further, an experiment by Jang (2014) found that participants assigned to a simultaneous-distraction task did not demonstrate a confirmation bias, whereas participants without distraction spent more time with attitude-consistent content. Accordingly, in complex message environments—in which media users encounter algorithm-compiled headlines, posts, tweets, social media updates, etc., when casually browsing online—motivated reasoning could be largely absent due to lack of cognitive resources available. Hence, the high-choice environment that is characteristic for many current online political communication contexts may not necessarily facilitate attitude-consistent choices per motivated cognition because it may absorb the required cognitive resources, especially if no attitude-consistent content is available for some featured topics.

Accordingly, the current research mimics a cognitively more taxing high-choice environment by including *six different* issues, with three conservative-stance and three liberal-stance messages. Thus, for each issue, participants would see *only one* stance (even though across different participants, specific issues were featured with different stances displayed). In other words, participants could not choose from articles with opposing stances on the *same* issue. Past examinations of a confirmation bias and selective exposure to political messages often displayed messages on only *one* issue at a given time (e.g., Taber & Lodge, 2006; Wojcieszak,

Bimber, Feldman, & Stroud, 2016; Westerwick, Kleinman, & Knobloch-Westerwick, 2013), but sometimes four issues (e.g., Knobloch-Westerwick & Meng, 2009, 2011; Stroud & Muddiman, 2013). Yet these earlier studies presented both pro and contra messages (e.g., Knobloch-Westerwick & Meng, 2009; Taber & Lodge, 2006; Wojcieszak et al., 2016), which in itself could reduce confirmation bias, with cues for opposing views present simultaneously. To our knowledge, the present study offers the first test per H1 with such high diversity of topics.

H1: People spend more time reading attitude-consistent than attitude-discrepant messages.

Attitude Impacts from Selective and Incidental Exposure

Several studies tackled whether the confirmation bias contributes to attitude-based polarization (e.g., Arceneaux et al., 2013; Lau, Andersen, Diltonto, Kleinber, & Redlawsk, 2017) and did not always find a polarizing impact (Trilling, van Klingeren, & Tsfati, 2017). Even when polarization was demonstrated, the exact mechanisms were not fully elucidated. In fact, “there are also good theoretical reasons to expect that blatantly partisan messages will leave public opinion mostly unchanged” (Prior, 2013, p. 101) and that impacts of partisan exposure are confined to small segments that are extremely interested in politics. Some survey and panel data indicated that a partisan-based confirmation bias per self-reported media use increases polarization (e.g., Garrett, Dvir-Gvirsman, Johnson, Tsfati, Neo, & Dal, 2014; Kim, 2015; Stroud, 2010). Yet, findings from the few observational studies that indeed examined attitude impacts from *selective exposure* to political messages are inconsistent, as discussed next.

A widely cited study by Taber and Lodge (2006) showed that when individuals selected attitude-consistent messages, their attitudes were reinforced, but selective exposure to attitude-discrepant messages did not influence attitudes. Other work (Knobloch-Westerwick, 2012; Westerwick et al., 2013; Knobloch-Westerwick, Johnson, Silver, & Westerwick, 2015;

Knobloch-Westerwick et al., in press) has also demonstrated that attitude-consistent selective exposure strengthens attitudes. However, in contrast to Taber and Lodge’s (2006) finding, attitude-discrepant selective exposure weakened attitudes in these four studies. This inconsistency has been interpreted as follows (Westerwick, Johnson, & Knobloch-Westerwick, 2017): In Taber and Lodge’s (2006) study, source cues served to signal political stance, which enables recipients to brace themselves against anticipated persuasive impact. In other words, even if media users select messages that they anticipate will be counter-attitudinal based on source cues, they are likely to dismiss or counterargue right away before engaging with the actual content. Hence, Taber and Lodge’s (2006) influential study’s design possibly encouraged more counterarguing against attitude-discrepant messages than other common contexts, where source cues are not as focal or do not convey actual content stance. On the other hand, when media users select messages based on content stance cues, they are more likely to process attitude-discrepant content and less likely to immediately dismiss the message (as detailed by Westerwick et al., 2017). The studies (Knobloch-Westerwick, 2012; Knobloch-Westerwick, Mothes, Johnson, Westerwick, & Donsbach, 2015; Westerwick et al., 2013) that showed attitude-discrepant content weakens attitudes all used such content cues and not source cues. The outlined interpretation of inconsistent findings detailed by Westerwick and colleagues (2017) built on persuasion models to specify relevant information processing. The current study, presenting content-cues, will thus further test the postulations below to address the inconsistent evidence. Consequently, H2a aligns with the motivated cognition perspective, whereas H2b departs from it.

H2: Selective exposure to (a) attitude-consistent messages reinforces attitudes, whereas selective exposure to (b) attitude-discrepant messages weakens attitudes.

Further, message stance cues could affect recipients upon first encounter, as they may not be able to shield their preexisting attitudes through selective exposure or careful counterarguing. Even though incidental exposure garnered increased scholarly interest as a means to overcome selectivity (Feezell, 2018; Fletcher & Nielsen, 2018; Karnowski et al., 2017), prior work has not tested this notion. Indeed, often opposing message stance cues were presented, which would wash out any persuasion effects from such casual encounters of cues without actual selection of related messages. The motivated cognition perspective, however, suggests that selective exposure should induce stronger impacts on attitudes than incidental exposure, both due to a motivation to engage with a point of view and due to longer exposure and deeper processing than during incidental exposure, to be tested per H4. Hence, the following hypotheses will be tested:

H3: Incidental exposure to (a) attitude-consistent messages reinforces attitudes, whereas incidental exposure to (b) attitude-discrepant messages weakens attitudes.

H4: The selective exposure effect suggested in H2 is stronger than the incidental exposure effect suggested in H3.

Attitude Impacts from Spiral of Silence Processes

Incidental exposure effects per H3 could occur if individuals utilize political stance cues to derive impressions of public opinion, per spiral of silence (SOS) theory. In contrast to the motivated cognition tradition reviewed above, Noelle-Neumann's (1974) influential SOS theory suggests that attitude changes do not require selective exposure to attitude-consistent messages or subsequent motivated cognition. Even though individuals tend to believe that others agree with their own opinions and attitudes (the false-consensus effect; e.g., Ross, Greene, & House, 1977), Noelle-Neumann suggested they derive their perceptions of the opinion climate from mass media coverage (and, less relevant for the present study, from interpersonal discussions).

With climate of opinion, we refer to the perceived prevalence of opinions in a relevant population (Glynn, Shapiro, O’Keefe, Lindeman, & Herbst, 2015). If supporters of a policy perceive an attitude-discrepant climate of opinion, such that the majority holds a different view than their own, they are less likely to express support. This relative “silence” then sets dynamics in motion such that people encounter fewer expressions of support for the policy in question, which then leads them to perceive the opponents’ majority to be even greater. SOS theory further suggested that individuals are sensitive to possible changes in opinion climate, such that a perceived increase in frequency of encountering a particular view implies the perception of a trend toward that view, which, in turn, makes supporters of that view *more* and opponents *less* likely to speak out. Hence, anticipated change in opinion climate matters as well for opinion expression, in addition to current climate.

Building on the notion that individuals derive their perceptions of the opinion climate in part from views encountered in the media, experimental evidence shows that news slant shapes issue attitudes as well as perceived related public opinion (e.g., Gunther & Christen, 1999). These studies used forced-exposure designs in which participants were merely presented with messages and could not select. However, exposure to message stance cues, which are encountered while browsing and selecting messages, could have similar impacts on attitudes as well as public opinion perceptions. Hence, based on Noelle-Neumann’s theory and supportive survey evidence, the following hypotheses will be tested:

H5: Exposure to (a) attitude-consistent messages leads to perceiving a more attitude-consistent climate of opinion, while exposure to (b) attitude-discrepant messages leads to perceiving a less attitude-consistent climate of opinion.

The dynamic that Noelle-Neumann proposed—the spiral of silence—not only silences people; it

further makes people who originally supported a policy possibly change their position to opposing it. Specifically, Noelle-Neumann (1974, p. 49) wrote “I hypothesize that, in the process of public opinion formation, observation of changes in the environment precedes changes in one's own opinion.” This prediction has received empirical support in a recent forced-exposure study that presented social media opinion expressions (Neubaum & Krämer, 2016). Thus, perception of change in the opinion climate should influence attitudes, per H6. Further, the postulated impacts in H2, H3, H5, and H6 are assumed to work in conjunction, such that exposure affects anticipated opinion climate change, which, in turn, shapes attitudes.

H6: Change in (a) current and (b) future opinion climate, impacts attitudes per the change.

H7: The effects of (a) selective exposure and of (b) incidental exposure are mediated by impacts on perceived opinion climate change, which in turn influence the attitudes.

The arguments leading up to H6 and H7 primarily build on theory and empirical work that neglected selectivity in media exposure. But interestingly, Noelle-Neumann (1974, p. 49) touched upon selective exposure by saying that opinion minorities with ‘hard core’ views may stick with their view despite isolation fears and “manage to support their opinions by selecting out persons and media which confirm their views.” Her comment suggests that a confirmation bias could allow people to create individually desired (perceived) opinion climates—à la carte. Studies most closely connected to Noelle-Neumann’s (1974) propositions were presented by Tsfaty and colleagues. Tsfaty, Stroud, and Chotiner (2014) concluded, based on survey data from the U.S. and Israel, that confirmation bias in selective exposure leads to greater polarization via public opinion perceptions. Further, Tsfaty and Chotiner (2016) studied attitudes regarding the Israeli–Palestinian conflict and found through mediation models that a confirmation bias in selective exposure leads to increased polarization via impacts on public opinion perceptions.

Along the same lines, behavioral selective exposure data from Israel showed that the confirmation bias increased political participation (which is related to attitudes and polarization) via public opinion perceptions (Dvir-Gvirsman, Garrett, & Tsfati, 2018).

Hence, drawing on Noelle-Neumann’s mention of the importance of selectivity, as well as Tsfati and colleagues’ outlined surveys, the present study considers selective exposure as a moderator of the impacts in H5 and H7 per the following hypotheses:

H8: The effects on perceived opinion climate suggested in H5 are stronger for selective exposure than for incidental exposure.

H9: The mediation suggested in H7 is stronger for selective exposure (H7a) than for incidental exposure (H7b).

For easy reference, Appendix A provides a list of all hypotheses.

Method

Overview

Participants ($N = 130$, 115 used for analyses) completed a computerized research procedure in a lab. They first indicated their attitudes toward nine controversial policies, including six target policies and three distractor policies. For each policy, they were then asked to indicate the perceived current and future opinion climate. Participants also reported their general media use and answered distractor questions. Then, participants were directed to an overview page featuring six article headlines and corresponding leads. They were told that they should read whichever articles they found interesting. Each article pertained to one of the six target policies. The content of the overview page was randomized across participants to avoid sequence effects, but each participant was presented three conservative and three liberal articles to browse. Selective exposure to articles was unobtrusively logged by software. After a 3-minute

browsing period, participants reported their emotional reactions to the articles they read to provide closure. Finally, participants completed the same attitude and opinion climate measures again, demographics, and additional distractor items.

Participants

The main study recruited college students at a large Midwestern university in the U.S. to participate in a study on news, from a research participant pool and via emails sent out to classes for extra credit. Hence, the participants were undergraduate students enrolled in introductory communication classes. Of the 130 participants who completed the main study, 56.2% identified as female. The average age of participants was 20.58 ($SD = 1.79$), with 1.4% of participants identifying themselves as Asian, 10.4% as African-American, 3.0% as Hispanic or Latino, 70.9% as non-Hispanic White or Caucasian, 0.7% as Pacific Islander, 2.2% as multi-racial, and 1.5% wrote in their ethnicity (Ethiopian, for example). Fifty-two respondents identified themselves as Republicans or, if independent, leaning Republican, 57 as Democrats, or leaning Democrat, and 9 as independent without leaning towards either party. An additional twelve participants opted not to indicate their partisanship.

Three persons who skipped all the attitude baseline measures were excluded because their exposure could not be categorized as attitude-consistent or -discrepant. Twelve participants spent more than 90 seconds on the overview page and were excluded from analyses to screen out inattentive respondents. These exclusions bring the number of participants to 115 for the hypotheses testing. Neither age, $t(128) = 1.19, p = .235$, nor gender $t(128) = .448, p = .655$, varied by exclusion.

Stimuli were tested on 80 participants from the same research participant pool from which the main study recruited. No participant was included in both stimuli testing and the main

study. A gender-balanced sample was recruited (40 men, 40 women) for the stimuli test. The average age was 21.18 ($SD = 3.39$). For race/ethnicity, 29.1 % of participants identified as Asian, 1.3 % as African American, 3.8 % as Hispanic or Latino, 59.5 % as non-Hispanic White, 1.3 % as Pacific Islander, and 1.3 % as multi-racial. 3.7 % opted not to report their ethnicity. Thirty participants identified as Democrat or leaning Democrat, 24 as Republican or leaning Republican, 12 as independent, and 14 as supporting a different party.

Procedure

Baseline measures (t1). Participants reported to a research laboratory where they completed a computerized procedure. After providing consent, they indicated their attitude toward various policies—six target issues and three distractor issues—and the importance of these attitudes to them. The specific target issues were stricter gun control, race-based affirmative action, government regulation of business, the death penalty, abortion, and social welfare. The distractor issues were increasing the defense budget, increasing minimum wage, and increasing immigration. Participants were then asked to estimate current and projected public opinion for each issue (including the distractors).

Distractor task. To veil the purpose of the study, participants were then asked about habitual media use and to write about how they were feeling that day. The prompt was: “Before you look at current news, because prior research has shown that moods shape responses to news, we would like to know how you are feeling today. In the textbox below, please indicate how happy are you with how your life and social relationships are going today! Most people type one to two paragraphs.” Participants wrote between 4 and 184 words, $M = 58.49$ ($SD = 32.25$).

Exposure task. The software then redirected participants to the overview news screen that displayed three conservative-stance and three liberal-stance headlines and leads in

randomized order, with random assignment by topic. Each headline and lead pertained to a unique issue – with all six target issues being presented. The overview news page adopted the design of an actual website (*WIRED*), see Figure 1 for an example screenshot of the overview page. After three minutes, participants were redirected to a page that served to provide closure for the browsing task and to further distract from the purpose of the study; they indicated moods on nine items (e.g., ‘happy’ and ‘bored’).

Post-exposure measures (t2). After that page, they once again completed attitude and public opinion measures for the target issues. Finally, measures of political partisanship and ideology and demographics were collected.

Stimuli and Stimuli Pretesting

Twelve articles in total were used in the study. Two articles, one presenting a liberal perspective and one presenting a conservative perspective, were developed for each of the six controversial issues that served as target issues: stricter gun control, race-based affirmative action, governmental regulation of business, the death penalty, abortion, and social welfare. The employed articles were culled from mainstream news sites (New York Times, for example) and think tank websites (Brookings Institution, for example). Each article was edited to be 700 words. Each headline was between 8 and 10 words, $M = 8.25$ ($SD = 1.06$), and each lead between 25 and 30 words, $M = 27.67$ ($SD = 1.15$).

Perceptions of the stimuli headlines and leads were examined with a sample recruited from the same research participant pool as the main study as follows: Participants viewed four headlines and leads and rated them regarding political stance on a scale from (-4) very conservative to (+4) very liberal with a neutral middle point. They also reported how interesting they perceived the leads to be on a scale from (-4) very uninteresting to (+4) very interesting

with a neutral option of neither uninteresting nor interesting. For each lead, ratings were obtained from 18 to 28 participants. The headlines and leads differentiated by political stance as desired and were rated as similarly interesting. See online supplemental file Appendix C for details.

Measures

Attitudes. Based on the prompt “How much do you personally oppose or support each issue below?” participants indicated their attitudes, with a slider scale to be positioned between “strongly oppose” (-5) and “strongly support” (+5) as anchors, without numeric feedback displayed. The six target issues and three distractor issues were presented in randomized sequence to avoid sensitization to target issues. See online supplemental file Appendix B for descriptive statistics.

Attitude importance. Participants reported how important each issue was to them personally on a scale with “not at all important” (-5) to “extremely important” (+5) as anchors, with no numeric feedback displayed, $M = 0.22$, $SD = 2.46$.

Attitude consistency. For each of the six issues, a binary variable was created to indicate whether the stance of an article lead displayed to an individual participant aligned with his/her attitude, with positive attitude scores reflecting support of a policy and negative scores reflecting opposition. No participant reported being exactly neutral on any policy, so attitude consistency could always be determined. On average, participants encountered $M = 2.82$ ($SD = 1.21$) attitude-consistent leads; the proportion of attitude-consistent article encounters on average was 46.47% ($SD = 20.07$).

The proportion of articles that a participant found attitude-consistent served as a covariate in order to render model intercepts more conceptually meaningful. This proportion is centered at .50 so that intercepts in each model will have a set interpretation: what the mean of the

dependent variable would be, when other variables are set to 0, if participants had seen three attitude-consistent and three attitude-discrepant articles.

Incidental exposure and selective exposure time. Incidental exposure is operationalized as seeing the headline and lead of an article on the overview page (recall that each participant saw three conservative leads and three liberal leads, which were randomly selected). Incidental exposure alone occurred when a participant did not choose to click on an article. Across all 688 observations (six articles and article leads per person), 58.58% of the displayed leads were not selected and thus represent instances of incidental exposure.

On the other hand, selective exposure time was measured per viewing time on an actual article page. This approach has been validated, ensuring that longer selective exposure time indicates more reading and is highly correlated with article choice as selective exposure measure and recall of information (Zillmann, Knobloch, & Yu, 2001); it has been widely used in observational selective exposure studies (Clay, Barber, & Shook, 2013). Selective exposure was logged unobtrusively for each article in seconds and later analyzed in 10-second units.¹

On average, participants spent $M = 33.45$ s ($SD = 19.60$ s; min = 5, max = 90) on the overview page (after excluding 12 individuals with more than 90 s on the overview). Participants selected less than half of six available articles on average ($M = 2.49$, $SD = 1.33$, min = 1, max = 6); for any selected articles, the average time spent was $M = 60.23$ ($SD = 1.35$; min = 1, max = 177). Across all 688 observations (six articles and article leads per person), the distribution of reading times was right-skewed (skewness = 1.78), however, within acceptable range for normality (George & Mallory, 2010) with this sample size (Tabachnick & Fidell, 2013).

Attitude reinforcement. For participants who agreed with a policy (with a positive score), attitude reinforcement was calculated by subtracting their pre-exposure score from their

post-exposure score. For those who disagreed with the policy (indicated by a negative score), post-exposure scores were subtracted from pre-exposure scores. Thus, negative numbers indicate weakening and positive numbers reinforcement (see online supplemental file Appendix B for descriptives).

Current public opinion perception. Participants estimated the percentage of Americans who support a specific policy on each issue, by positioning a slider between 0% and 100%. The prompt was: “For political issues, opinions among Americans may often be diverse, with some people opposing and others supporting a particular policy. Additionally, some Americans may also not have any opinion on the matter. Please indicate what you think, for the issues below, about what percentage of Americans CURRENTLY SUPPORTS the policy.”

Future public opinion perception. Because Noelle-Neumann (1974) attached particular importance to people’s perception of how public opinion will change, anticipated developments in public opinion were ascertained by asking participants to indicate whether more Americans would oppose or support the policy “three months from now.” The prompt was: “Imagine Americans three months from now. For each policy below, you might imagine that more Americans will support the policy, or you might imagine that more Americans will oppose the policy. You might also think that Americans will feel exactly the same way three months from now as they do today.” Sliders were positioned between “A lot more Americans will oppose,” “There will be no change,” and “A lot more Americans will support.” All issues were presented in random order on the same page. Responses were recorded between 0 and 10, up to two decimal places. Attitude-consistent change in the anticipated future opinion climate was operationalized as pre-exposure score subtracted from post-exposure score. For those who disagreed with the policy, post-exposure scores were subtracted from pre-exposure scores.

Negative numbers indicate decreased favorability, positive numbers increased favorability (see online supplemental file Appendix B for descriptives).

Data Analysis

Multi-level linear regressions with random intercepts and fixed slopes were performed across the six target issues and related article contacts. There were six cases for each participant so that each potential article contact was represented by one case. The data thus had two levels, participant and article ($n = 12$, 6 liberal, 6 conservative), resulting in 688 cases distributed over 115 participants after pairwise deletion of missing data. Analyses were performed with the lme4 package (Bates, Maechler, Bolker, & Walker, 2016) and the lmerTest package (Kuznetsova, Brockhoff, & Christensen, 2016) in the R environment (R Core Team, 2017) and restricted maximum likelihood estimation. See online supplemental file Appendix D for model fit statistics.

Regarding model construction, the proportion of attitude-consistent articles was always included as a covariate in order to account for the fact that participants could agree with different numbers of articles, which would change the amount of time they could allocate to any one attitude-consistent article. Further, the proportion of attitude-consistent articles was centered at .50 in order to give the fixed-effect intercept a meaningful interpretation, to equate the estimated value with a situation when a participant sees three attitude-consistent and three-attitude discrepant articles. Mean-centered attitude importance, which could influence both reinforcement and sensitivity to public opinion cues, was also included as a covariate. The centering helps to ensure meaningful interpretations of coefficients (Hayes, 2017). When dependent variables are difference scores, pre-exposure extremity is included as a covariate in order to correct for ceiling and floor effects (Allison, 1990; Dalecki & Willits, 1991). Further,

when a difference score is used to predict another difference score, as when anticipating a more attitude-consistent future opinion climate is used to predict attitude reinforcement, the sum of the pre- and post-exposure measures for the predictor is included to correct for non-normal distributions (Judd, Kenny, & McClelland, 2001). These additions ensure more accurate estimates of the regression coefficients.

Selective exposure time, a right skewed variable, is probed at no exposure (to test hypotheses relevant to incidental exposure) and, for hypotheses relevant to selective exposure, at the percentile cut off point values corresponding to one standard deviation below the mean (instances of low exposure), the mean (instances of moderate exposure), and one standard deviation above the mean (instances of high exposure), on the normal curve. Low exposure corresponds to 14 seconds (1.40 in ten-second intervals), moderate exposure to 53 seconds, and high exposure to 107 seconds. Selective exposure time was treated as a continuous variable, as is common in current selective exposure research (Knobloch-Westerwick, 2015).

Results

Impact of Attitude Consistency on Selective Exposure (H1)

The first analysis addressed the confirmation bias postulated in H1. A multi-level regression model, as described in the methods section, predicted selective exposure (reading time) from consistency (coded 1) versus -discrepancy (coded 0). Examining the fixed-effect intercept (the grand mean of exposure times for attitude-discrepant articles), participants spent 18.68 seconds reading attitude-discrepant content, $t(20.40) = 5.69, p < .001$. In contrast, participants spent, on average, 31.12 seconds reading attitude-consistent content, $b = 12.45$ seconds longer, $t(671.90) = 3.60, p < .001$. Thus, H1 was supported.

Impact of Selective and Incidental Exposure on Attitudes (H2-4)

The first analysis tested H2-H4 simultaneously. H2a suggested that selective exposure to attitude-consistent articles reinforces attitudes, while per H2b, selective exposure to attitude-discrepant articles weakens them; H3a/b made parallel predictions for incidental exposure. Further, H4 claimed the effect in H2 is stronger than the effect proposed in H3.

A multi-level regression model (details described in the methods section) predicted reinforcement from dummy coded attitude consistency (coded 1), selective exposure, and their interaction. In this model, the intercept represents the impact of attitude-discrepant messages, the dummy-coded attitude consistency term represents the difference in impact between attitude-discrepant and attitude-consistent messages.

First off, the interaction pertaining to H4 was significant, $b = 0.07$, $t(676.0) = 2.231$, $p = .03$. To understand more, impacts of selective and incidental exposure were probed. To test H2, the selective exposure term was centered at low, moderate, and high exposure, respectively. For instances of low exposure, attitude weakening occurred in response to attitude-discrepant messages, $b = -0.89$, $t(309.70) = -7.98$, $p < .001$. Attitude-consistent messages led to more reinforcement relative to attitude-discrepant messages, $b = 0.52$, $t(576.10) = 3.45$, $p < .001$. At moderate exposure, attitude-discrepant messages led to weakening, $b = -1.16$, $t(498.40) = -8.36$, $p < .001$, and attitude-consistent messages led to relatively more reinforcement, $b = 0.81$, $t(605.70) = 4.66$, $p < .001$. For high exposure, attitude-discrepant messages led to weakening, $b = -1.54$, $t(680.80) = -6.25$, $p < .001$, while attitude-consistent messages led to relatively greater reinforcement, $b = 1.20$, $t(655.10) = 3.89$, $p < .001$. Hence, both H2a and H2b were supported at low, moderate, and high levels of selective exposure.

To test H3, selective-exposure was centered at 0 (representing incidental exposure—cases where participants saw headlines and leads but did not click on them to read their

associated articles). Supporting H3a, attitude-consistent exposure led to greater reinforcement relative to attitude-discrepant exposure, a difference of $b = 0.41$, $t(600.30) = 2.47$, $p = .01$.

Supporting H3b, incidental exposure to attitude-discrepant messages weakened attitudes, $b = -0.79$, $t(380.00) = -6.53$, $p < .001$. Given that the interaction regarding H4 was significant as mentioned above, and the selective exposure impacts were indeed greater than the incidental exposure impacts, H4 was supported.

Impact of Attitude Consistency and Incidental vs. Selective Exposure Opinion Climate Change (H5a/b, H8)

A single model served to test H5a/b and H8, which postulated that exposure to attitude-consistent {discrepant} messages leads to perceiving a more {less} attitude-consistent climate of opinion, with this impact being stronger for selective exposure than for incidental exposure.

Parallel analyses were conducted for current and future opinion climate; the present section focuses on future opinion climate (see online supplemental file Appendix E for current opinion climate findings).

Accordingly, a multi-level regression model predicted an attitude-consistent change in perceived future opinion climate from attitude consistency (coded 1), selective exposure, and their interaction. Negative coefficients represent anticipating a *less* attitude-consistent future opinion climate. As before, the intercept represents the impact of attitude-discrepant messages; the dummy-coded attitude consistency term represents the difference in impact between attitude-discrepant and attitude-consistent messages. The interaction of attitude-consistency and selective exposure time was significant, $b = .07$, $t(669.90) = 2.11$, $p = .04$, which speaks to H8. Further probing below shows that the selective exposure effect on perceived public opinion was stronger than the incidental exposure effect, supporting H8.

To test H5 first for selective exposure, the impact of selective exposure was probed at low, moderate, and high selective exposure. Significant impacts were found for instances of moderate and high selective exposure. For instances of moderate selective exposure, a significant difference between attitude-discrepant and attitude-consistent articles was found, $b = 0.46$, $t(543.10) = 2.57$, $p = .01$, supporting H5a. The intercept term, representing the impact of attitude-discrepant articles, was also significant, $b = -0.35$, $t(78.20) = -2.46$, $p = .02$, supporting H5b. For instances of high selective exposure, once again attitude-consistent messages had a significantly more positive impact, $b = 0.84$, $t(654.70) = 2.67$, $p = .001$, supporting H5a. The intercept term, representing the impact of attitude-discrepant content, was significant, $b = -0.70$, $t(374.50) = -2.77$, $p = .001$, which supports H5b. Hence, H5a/b was supported, except at low exposure.

H5 was further tested focusing on incidental exposure. A multi-level model was constructed with selective exposure centered at 0 (instances of incidental exposure only). There was no difference in the effects of attitude consistent versus discrepant messages, $p = .62$. Further, the intercept, representing the impact of attitude-discrepant messages, was not significant, $p = .99$. For instances of incidental exposure, neither attitude-consistent nor attitude-discrepant content impacted perceptions of the future opinion climate. Thus, H5 was not supported for incidental exposure, which however supports H8 because selective exposure had significant impacts on perceived opinion climate.

In conclusion, it is important to note that the assumption in H5 that exposure impacts anticipated changes in opinion climate in line with the message stance was only supported for selective exposure. While H8 postulated that the H5 impact would be stronger for selective exposure compared to incidental exposure, the impact was significant for selective exposure but nonexistent for incidental exposure. Accordingly, H5 received conditional support.

Parallel analyses regarding H5 and H8 with *current* opinion climate change (see details in online supplemental file Appendix E) yielded similar findings. They were slightly weaker in that impacts were only significant at high levels of selective exposure, however, which is why more space was dedicated here to future opinion climate change.

Impact of Attitude Consistency and Incidental vs. Selective Exposure on Attitudes Via Opinion Climate Change (H6, H7a/b, and H9)

Regarding H6, H7a/b, and H9, a multi-level moderated mediation model was tested, following Rockwood (2017). As before, the present section focuses on future opinion climate while findings for current opinion climate are detailed in online supplemental file Appendix E.

H6 simply suggested that a change in opinion climate perception affects attitudes in line with the change, while H7 postulated that effects of (a) selective and (b) incidental exposure on attitudes are mediated by exposure impacts on perceived opinion climate change. It should be noted that the ‘a’ paths (in Hayes’, 2017, terminology) were already tested in the prior section that examined impacts on perceived opinion climate, which is the mediator in this model. To test the ‘b’ and ‘c’ paths per Hayes’ (2017) terminology, a model was constructed predicting attitude reinforcement from anticipation of a more attitude-consistent future climate of opinion (‘b’ path), as well as attitude-consistency (‘c’ path), selective exposure, and their interaction.

The ‘b’ path, the impact of perceiving a more attitude-consistent *future* opinion climate on attitude reinforcement, was significant, $b = 0.16$, $t(665.60) = 4.40$, $p < .001$, supporting H6.

As the prior section showed that attitude consistency impacts were moderated by selective versus incidental exposure (in line with H8), mediation for the two types of exposure was probed separately.

To test H7a specifically for selective exposure, Monte Carlo simulations generated using

the R package *mvrnorm* (Venables & Ripley, 2002; Ripley, Venables, Bates, Hornik, Gebhardt, & Firth, 2018) with 10,000 iterations, probed the significance of the moderated mediation pathways at different levels of selective exposure. While the mediation was not significant at low selective exposure (the coefficient of the $a*b$ pathway = 0.03 $CI_{95}[-0.02, 0.08]$), at moderate selective exposure, the coefficient of the $a*b$ pathway was significant and estimated to be 0.07 $CI_{95}[0.02, 0.15]$. At high selective exposure, it was estimated to be 0.13 $CI_{95}[0.03, 0.26]$.

As this first mediation probing focuses on selective exposure, the examination of the ‘ c ’ pathway allows further testing of H2. The direct effect of attitude-consistency on reinforcement, which is the ‘ c ’ path, was moderated by selective exposure levels, $b = 0.07$, $t(662.90) = 1.98$, $p = .048$. For instances of moderate exposure, $b = 0.75$, $t(600.70) = 4.37$, $p < .001$, attitude-consistent messages promoted attitude reinforcement relative to attitude-discrepant messages, even controlling for anticipating a more attitude-consistent future opinion climate. Similar patterns were found for both low, $b = 0.49$, $t(571.00) = 3.36$, $p = .001$, and high exposure, $b = 1.10$, $t(647.70) = 3.58$, $p < .00$. Hence, the fact that the ‘ c ’ path was significant at moderate and high levels of selective exposure also means that changes in perceived opinion climate only *partially* mediated the relationship between attitude-consistent versus -discrepant selective exposure and attitude-reinforcement.

To test H7b specifically for incidental exposure, Monte Carlo simulations with 10,000 iterations probed the significance of the moderated mediation pathways at no selective exposure (centered at zero), which are the instances of incidental exposure. This analysis yielded an $a*b$ coefficient of 0.01 $CI_{95}[-0.04, 0.07]$. Hence, H7b was not supported. Thus H9 suggested a stronger mediation effect for selective vs. incidental exposure and was supported, because incidental exposure did not influence attitudes via perceived opinion climate (H7a not

supported), but a significant mediation from selective exposure on attitudes via perceived opinion climate was evident in line with H7b.

Considering the ‘c’ path, the impact of incidental exposure was significant, with attitude-consistent incidental exposure leading to greater reinforcement relative to attitude-discrepant incidental exposure, $b = 0.40$, $t(571.60) = 3.36$, $p = .001$. These results indicate that while selective exposure can drive changes in public opinion perceptions, and in turn drive reinforcement, both incidental and selective exposure directly influenced attitude reinforcement.

Parallel analyses regarding H6/7 and H9 with *current* opinion climate change (see online supplemental file Appendix E) yielded similar findings.

Discussion

In light of strong concerns about polarization of the electorate due to selective exposure to partisan media messages, particularly online, the present study extended the existing literature by examining consequences of both selective and incidental exposure. The study utilized an online context that featured six different controversial issues and compared the consequences of exposure for attitude reinforcement. Changes in anticipated opinion climate were examined as a possible mediator of these attitude impacts. Further, the present procedure created a complex message environment (with 6 topics, as opposed to 1-4 topics in earlier studies) that is more reflective of current media use contexts, and used unobtrusive observation measures instead of self-report measures of exposure. Changes regarding attitudes and public opinion perceptions resulting from selective exposure were ascertained with pre-posttest measures across the six issues, allowing for inferences that are robust across topics.

For easy reference, Online Appendix A provides a list of the nine hypotheses. First off, the classic confirmation bias per H1 was supported because online users spent more time reading

attitude-consistent than –discrepant messages. Thus, the comparatively high number of available choices did not reduce cognitive resources such that a confirmation bias would not occur.

Further, H2a/b suggested that attitude-consistent selective exposure reinforces attitudes while attitude-discrepant selective exposure weakens them—both claims were supported. This observation of attitude-discrepant selective exposure could be considered surprising by some scholars, in light of the *disconfirmation bias* suggested by Taber and Lodge (2006), in which people spend more time reading attitude-discrepant material but only because they are counter-arguing. However, the current study as well as earlier selective exposure investigations have found that attitude-discrepant selective exposure weakens attitudes.

Importantly, H3a/b was supported, indicating impacts from incidental exposure to both attitude-consistent and attitude-discrepant leads on attitudes. While H4 was supported, because selective exposure impacts on attitudes were stronger than incidental exposure attitudes, it is important that incidental exposure also impacted attitudes. After all, research in communication and psychology suggests that attitude change is difficult to induce (Albarracín & Shavitt, 2018), so the demonstration of an impact after a fleeting encounter of a lead of 25-30 words is remarkable. One explanation for this astonishing observation is that in a realistically complex stimulus environment, where headlines and leads contain brief persuasive arguments, the persuasive arguments are particularly powerful because recipients have less cognitive resources to defend their preexisting attitudes. As discussed before, motivated cognition requires cognitive effort, making it more difficult to shield against arguments encountered in the course of making a selection decision. Further, as outlined before (Westerwick et al., 2017), when source signals message stance as in Taber and Lodge’s (2006) study, they enable recipients to brace themselves against anticipated persuasive impact and thus attitude-discrepant messages rarely impact

attitudes even when selected. In brief, even short processing of persuasive messages in either incidental or selective exposure may influence attitudes. The role of the complexity of the message environment for such impacts warrants further testing.

These results regarding attitude impacts complement several prior studies (Knobloch-Westerwick, 2012; Knobloch-Westerwick et al., 2015; Westerwick et al., 2013), where selective exposure to attitude-discrepant material weakened attitudes. Unlike in previous work, the current study is probably the first that presented just one stance on any given issue (not both pro and contra), allowing us to isolate the impacts of each. Multi-level modeling combined with sensitive measures may allow for detection of attitude impacts from incidental exposure to brief message leads.

The hypotheses in H5a/b, as conditioned by H8, were supported, as selective exposure affected (both future and current) opinion climate change in line with message stance, while incidental exposure did not. In a complex information environment, incidental exposure to article leads, which signal particular issues stances, directly impacts attitudes but not opinion climate perceptions. Those latter perceptions, however, were impacted by selective exposure, which lead to a stance-consistent shift in public opinion perceptions (supporting H5a/b and H8). Further, in line with H6, H7a/b, and H9, perceiving a less attitude-consistent opinion climate weakened attitudes. This mediation was evident in both current and future opinion climate.

These findings suggest that the confirmation bias allows people to create individually desired “à la carte” public opinion environments, which helps in avoiding attitude weakening. When people encounter attitude-discrepant content, it can weaken their attitudes even in the absence of selection. If selection occurs, these attitudes can weaken further still. The present mediation model cannot speak directly to causality, but the current results suggest that this

weakening of attitudes is driven in part by selective exposure impact on perceptions of a *less* attitude-consistent opinion climate. This evidence supports Noelle-Neumann’s (1974, p. 49) above-mentioned proposition “observation of changes in the [opinion climate] environment precedes changes in one's own opinion.”

Connecting the present investigation with prior studies, the present methodological approaches taken here, such as observing specific instances of attitude-consistent and –discrepant cue exposure and tracking selective message exposure, complements existing work. Most existing studies utilized surveys, self-reported recollections, and respondent’s own categorizations of exposure. For instance, Tsfaty and Chotiner (2016) operationalized the confirmation bias in selective exposure based on self-reported use of partisan media *sources*, which is quite different from the present study’s conceptualization based on attitude-based confirmation bias for unobtrusively observed exposure to specific messages. When media users attend to particular partisan news outlets, they will be more likely to encounter partisan-aligned messages *throughout*, even though their political attitudes may not align with their overall partisanship for all specific issues. The present study did not mimic a partisan outlet and instead examined a context in which media users encountered a message environment with diverse stances, as they might see on popular news aggregators such as *Google News*. While Tsfaty and Chotiner (2016) examined the partisan outlet use context, the present observational data suggests diverse online contexts yield different patterns.

To summarize, the present findings give reason to hope that increasing polarization is not an inevitable fate. Online contexts do not always foster polarization through selective exposure marked by a confirmation bias, as many online platforms feature multi-stance messages. When people encounter attitude-discrepant cues, their attitudes become more moderate. In addition,

when people select attitude-discrepant messages, their public opinion perceptions shift accordingly, leading to further weakening of attitudes. The flipside of the coin is that usually people avoid engaging with attitude-discrepant messages.

The current study differs from most related work, which typically uses self-reports, by employing carefully pretested messages in a pre-posttest design and logging selective exposure. A key limitation is the student sample, which impairs generalizations. Even though findings for the confirmation bias have been largely consistent across student and general-population samples (Knobloch-Westerwick, 2015), it is possible that generational differences in political views and behaviors (Milkman, 2017) limit generalizability. On the positive side, the fact that the present study categorized content and related exposure as attitude-consistent and attitude-discrepant individually for each topic, as opposed to merely drawing on partisanship, appears much more suitable for this cohort that is thought to adhere less to traditional partisanship categorizations. Further, there is a possibility the distracter task increased any possible mood impacts on news choices. It is also desirable to examine the confirmation bias in settings that feature even higher complexity. For instance, it is in theory desirable to use 30 messages available for selection instead of just six. Panek (2016) mimicked a high-choice environment with 30 choices in his study on selection of hard vs. soft news. However, confounds from interestingness likely occurred, because this many different news leads are nearly impossible to compile such that the only differentiating feature is the political stance. While this paper touched on the role of cognitive resources, the theoretical discussion and empirical investigation did not go into depth regarding causes for why confirmation bias occurs (i.e., because attitude-challenging content causes emotional discomfort per Festinger, 1957, or is more taxing in cognitive terms per Stroud, 2011).

Regarding how the confirmation bias might affect attitudes and polarization, we focused on opinion climate, even though other mechanisms are possible as well (e.g., acceptance of frames; Tsfaty & Nir, 2017). In light of space restrictions, the present paper has also not fully tested the dynamics that SOS theory suggests, such that perceived public opinion (change) then, in turn, affects political participation and expression. This shortcoming applies to most empirical work on the complex SOS theory, which often lacks longitudinal data, and will hopefully be addressed in a future analysis. Future work should also examine how long the detected attitudinal impacts last and whether they are possibly mediated by accessibility impacts from exposure (Knobloch-Westerwick, 2012). Additionally, tasks for future research include to examine how source cues shape public opinion perceptions, which could further moderate the mediated impacts on attitudes and how mobile communication induce different perceptions than other communication technologies.

When past research presented both stances on featured issues, impacts of message encounters may have cancelled each other out, leading scholars to possibly underestimate attitude impacts. In the current study, impacts of attitude-discrepant messages were greater than for attitude-consistent (though ceiling effects for the latter are possible). Future research needs to replicate the present findings and examine how long the attitude impacts last. Arguably, media users commonly encounter political messages featured on an online overview page just as in our setup (e.g., in news aggregators such as *Google News*). About half of Americans get their news from such news aggregators each week (American Press Institute, 2014). News leads on those overview pages make users consider attitude-discrepant information and even shift attitudes. Hence, other processes than polarization and reinforcement spirals were observed, which is positive from a democratic norms perspective.

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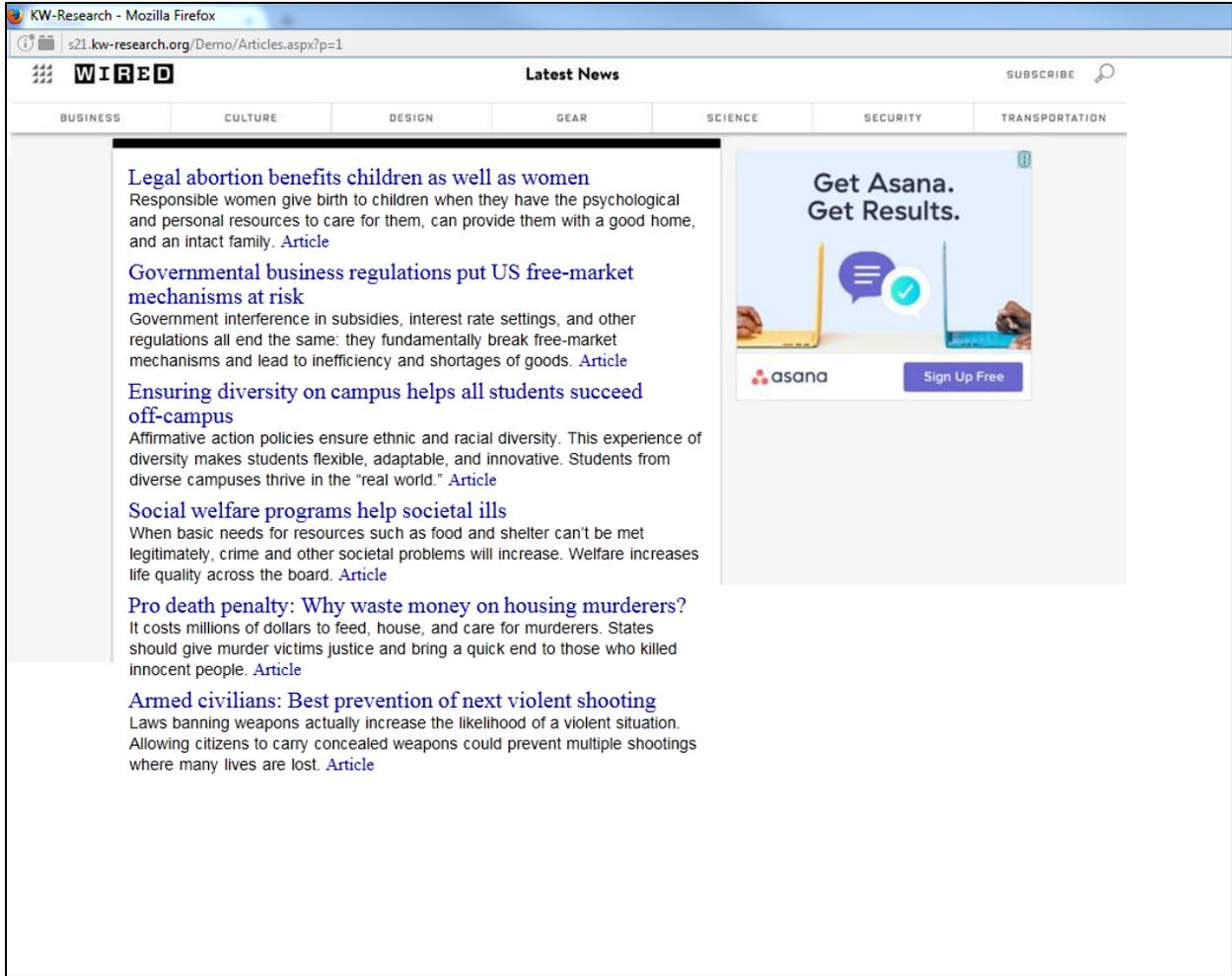


Figure 1

Example Screenshot of Overview Page

Appendix A:
Hypotheses Overview and Findings

H1: People spend more time reading attitude-consistent than attitude-discrepant messages. (supported)
Increase from attitude-consistency (dummy-coded): 12.45 seconds **

H2: Selective exposure to (a) attitude-consistent messages reinforces attitudes, whereas selective exposure to (b) attitude-discrepant messages weakens attitudes. (*supported*)

H3: Incidental exposure to (a) attitude-consistent messages reinforces attitudes, whereas incidental exposure to (b) attitude-discrepant messages weakens attitudes. (*supported*)

H4: The selective exposure effect suggested in H2 is stronger than the incidental exposure effect suggested in H3. (*supported*)

	Low Exposure	Moderate Exposure	High Exposure	Incidental Exposure
Intercept (represents attitude-discrepant content)	-0.89 ***	-1.16 ***	-1.54**	-0.79***
Attitude-consistency (dummy-coded)	0.52 ***	0.81 ***	1.20***	0.41*

Interaction of attitude-consistency and selective exposure time: 0.07 *

H5: Exposure to (a) attitude-consistent messages leads to perceiving a more attitude-consistent climate of opinion, while exposure to (b) attitude-discrepant messages leads to perceiving a less attitude-consistent climate of opinion. (supported for selective exposure)

	Low Exposure	Moderate Exposure	High Exposure	Incidental Exposure
Intercept (represents attitude-discrepant content)	<i>n.s.</i>	-0.35*	0.84**	<i>n.s.</i>
Attitude-consistency (dummy-coded)	<i>n.s.</i>	0.46*	-0.70**	<i>n.s.</i>

H6: Change in (a) current and (b) future opinion climate impacts attitudes per the change. (supported)
*'b' path in mediation b = 0.01 ** for future opinion climate for H6a
*'b' path in mediation b = 0.16 **** for future opinion climate for H6b (also used below)

H7: The effects of (a) selective exposure and of (b) incidental exposure are mediated by impacts on perceived opinion climate change, which in turn influence the attitudes. (H7a supported; H7b not supported)

	Low Exposure (<i>n.s.</i>)	Moderate Exposure	High Exposure	Incidental Exposure (<i>n.s.</i>)
a*b mediation path CI ₉₅	[-0.02, 0.08]	[0.02, 0.15]	[0.03, 0.27]	[-0.04, 0.07]

H8: The effects on perceived opinion climate suggested in H5 is stronger for selective exposure than for incidental exposure. (supported)

Interaction of attitude-consistency and selective exposure time: 0.07*

H9: The mediation suggested in H7 is stronger for selective exposure (H7a) than for incidental exposure (H7b). (supported, shown above under H7)

¹ Upon reviewer inquiry, findings with log-transformed selective exposure time data were explored and revealed the same patterns as for raw selective exposure data in seconds.