Selective exposure to COVID-19 vaccination information: the influence of prior attitude, perceived threat level and information limit

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Abstract

Purpose – The massive amount of available information and functionality of the Internet makes selective information seeking effortless. This paper aims to understand the selective exposure to information during a health decision-making task.

Design/methodology/approach – This study conducted an experiment with a sample of 36 students to examine the influence of prior attitude, perceived threat level and information limit on users' selective exposure to and recall of coronavirus disease 2019 (COVID-19) vaccination information. Participants were assigned to two conditions with or without an upper limit of the number of articles to be examined, and this study collected the number of articles read, the number of articles included in the report and recall score of the articles after one day of the experiment.

Findings – This study found that (1) participants with a negative attitude were more inclined to view attitude-consistent information and recalled attitude-consistent information more accurately, while participants with a positive attitude viewed more balanced information; (2) participants perceiving higher health threat level recalled attitude-consistent information more accurately; and (3) an upper limit on the number of articles to be viewed does not have any impact on selective exposure.

Research limitations/implications – The findings of this paper pinpoint the disparity of influence of positive and negative attitudes on selective exposure to and selective recall of health information, which was not previously recognized.

Practical implications – Vaccination campaigns should focus on reaching people with negative attitudes who are more prone to selective exposure to encourage them to seek more balanced information.

Originality/value – This is the first paper to explore selective exposure to COVID-19 vaccination information. This study found that people with a negative attitude and a higher level of perceived health threat are more prone to selective exposure, which was not found in previous research.

Keywords Selective exposure, Health information seeking, COVID-19 vaccination

Paper type Research paper

1. Introduction

The convenience of the Internet, the amount of information available and functionalities such as search engines and personalized recommender systems make information seeking and selective exposure to information much more effortless. The selective exposure to confirmatory information refers to a tendency for individuals to defend their attitudes, beliefs and behaviors from challenges (Frey, 1986). In the political (Johnson *et al.*, 2009; Knobloch-Westerwick *et al.*, 2015) and health domains (Sawicki *et al.*, 2011; Westerwick *et al.*, 2017; Lachlan *et al.*, 2021; Russo and Russo, 2020; Meppelink *et al.*, 2019; Kim *et al.*, 2018), selective exposure to information is quite commonly recognized.

Research in psychology has long been investigating the cognitive biases related to selective exposure to information. For example, a preference for information supporting pre-

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existing attitudes, beliefs or behaviors was explained by defense motivation – the desire to reinforce one's existing attitudes, beliefs and behaviors, while accuracy motivation – the desire to form accurate appraisals – motivate people to seek for inconsistent information (Hart *et al.*, 2009). Research also found that when facing information limits and restrictions (resource scarcity), participants showed a stronger preference for consistent information because of an increased intention to find the "best" pieces of information and an *a priori* evaluation advantage of supporting information (Fischer *et al.*, 2005). Under certain circumstances people are more likely to seek balanced information, for example, when such information is perceived useful for dealing with a threat or a problem in the political context, i.e. using information from the opposite side to defend one's view in a later debate (Valentino *et al.*, 2009).

The coronavirus disease 2019 (COVID-19) pandemic and the politicization of the pandemic have highlighted the importance of understanding people's health information seeking and avoidance behaviors, to better communicate pandemic-related risks and recommendations to the public (Lachlan *et al.*, 2021). Evidence from Internet search data showed that case announcements in the early stage of the pandemic led to a widespread increase in online search for information about the epidemic (Bento *et al.*, 2020). During the COVID-19 pandemic, social media exposure resulted in information overload as well as information anxiety, which further lead to information avoidance and cyberchondria (Soroya *et al.*, 2021; Laato *et al.*, 2020). Besides measures such as wearing masks, physically distancing and avoiding crowds, vaccines are a critical tool in fighting against the COVID-19 pandemic (World Health Organization, 2021). However, countries and the public vary in their perceptions and decisions about whether and when to get vaccinated, and which vaccine to get if they have the options. Prior research in health communication suggested the presence of confirmation bias in parents seeking vaccination information for their children (Meppelink *et al.*, 2019). Among other factors, prior attitude, perceived threat level and information limit was found to influence selective exposure, but findings of the exact effect remain mixed (Knobloch-Westerwick *et al.*, 2009; Brannon *et al.*, 2007; Sawicki *et al.*, 2013; Fischer *et al.*, 2005; Valentino *et al.*, 2009). Previous research on information seeking about vaccination has yielded inconsistent findings. Some found that online search behavior about vaccination information was relatively stable and did not show attitude-consistent selective exposure (Kessler and Zillich, 2019). Meppelink and others found people select more belief-consistent information about vaccination and perceived belief-confirming information more credible, useful and convincing (Meppelink *et al.*, 2019). Very little is known as to whether selective exposure plays a role in information seeking about COVID-19 vaccination and what factors influence selective exposure.

In this paper, we report an experiment to examine the influence of prior attitude, perceived threat level and information limit on participants' selective exposure to vaccination information. The research questions are:

RQ1. Does selective exposure occur during the information seeking for making COVID-19 vaccination decisions?

RQ2. How do prior attitude, perceived health threat level and information limit influence selective exposure to COVID-19 vaccination information?

RQ3. Is there any attitude change? Is attitude change related to more balanced information seeking, i.e. less selective exposure?

This paper is organized as follows: we first review related literature in psychology, health information seeking and health decisions, as well as research about reducing selective exposure and promoting balanced information seeking. We then describe the experiment

design, data collection and analysis methods, followed by findings, discussion about the findings and implications of this research and conclusion.

2. Literature review and hypothesis development

2.1 Health information seeking and health decision-making

Health information-seeking behavior is the active seeking for health-related information when individuals are faced with tasks of coping with a health threat, making a medical decision or preventing a health issue (Lambert and Loiselle, 2007; Zimmerman and Shaw, 2020). Health information seeking and health decision-making are often found to be associated with selective attention, selective exposure to information and selective interpretation of health messages. For example, selective attention was present in facing an external health threat about whether to engage or disengage in information seeking (Jasper and Witthoeft, 2011). Content and context features of the headlines drove selective exposure when choosing between headlines to read the full news article (Kim *et al.*, 2016). Therefore, the following hypotheses have been proposed:

H1. Confirmation bias occurs in COVID-19 vaccination information seeking and decision-making.

H1a. Participants select more attitude-consistent articles than attitude-inconsistent articles.

Selective exposure and confirmation bias occur before, during and after the decision-making process. Pre-decision and post-decision health information search seem to show different patterns. Before making a decision, individuals might try to improve the quality of their decision by increased information search to evaluate alternative decisions motivated by accuracy motivation or to justify their decisions by seeking consistent information or avoiding inconsistent information (Hart *et al.*, 2009). Post-decision information search is more inclined to confirmatory information to acquire further information to justify a decision and relieve concerns related to the decision (Shani and Zeelenberg, 2012). Therefore, the following hypothesis has been proposed:

H1b. Participants include more attitude-consistent articles in their reports than attitude-inconsistent articles.

Attitude has been found to have a variety of influences on memory and recall (Eagly *et al.*, 1999). Research in psychology has long discovered the relationship between attitude and selective recall (Loken and Hoverstad, 1985; Feather, 1969). Prior research seems to suggest that attitude influences information processing and behavior (Maio and Haddock, 2010). Therefore, the following hypothesis has been proposed:

H1c. Participants recall attitude-consistent articles more accurately than attitude-inconsistent articles.

2.2 Factors related to selective exposure

Two motivations are important to information search and avoidance: the defense motivation to feel validated and the accuracy motivation to gain an accurate understanding of reality (Hart *et al.*, 2009).

Selective exposure was found to be influenced by several factors, including an individual's prior attitude and the attitude strength (Brannon *et al.*, 2007; Frey, 1986; Sawicki *et al.*, 2013; Knobloch-Westerwick *et al.*, 2015; Gaspar *et al.*, 2016), information quantity available (Fischer *et al.*, 2005, 2008), an individual's information processing capacity (Smith *et al.*, 2007), threat

levels (Fischer *et al.*, 2011; Hastall and Knobloch-Westerwick, 2013), anxiety and perceived information utility (Valentino *et al.*, 2009; Jasper and Witthoeft, 2011) and source credibility (Knobloch-Westerwick *et al.*, 2013). Therefore, the following hypothesis has been proposed:

H2. Confirmation bias is positively associated with prior attitude, the perceived severity of the health threat and the presence of an information limit.

The tendency for individuals to seek congruent information and to avoid incongruent information is quite common, leading to selective exposure to information (Frey, 1986). Prior research seems to agree that preexisting attitudes and beliefs resulted in exposure to more consistent information to avoid the psychological discomfort associated with tensions arising from contradictory beliefs (Gaspar *et al.*, 2016). Therefore, the following hypothesis has been proposed:

H2a. Confirmation bias is positively associated with prior attitude.

Research examining the effect of attitude on selective exposure has shown somewhat inconsistent findings. Some found that strong attitudes are associated with selective exposure to attitude-confirming information (Knobloch-Westerwick *et al.*, 2009; Brannon *et al.*, 2007), while others suggested that weak attitudes have strong influences on selective information seeking because uncertainty motivates people to seek attitude-confirming information (Sawicki *et al.*, 2011, 2013). Among other factors, the severity of the health threat, efficacy to avoid negative consequences and the type of message (factual or experience) are found to be related to an individual's selective exposure to health information (Hastall and Knobloch-Westerwick, 2013). Therefore, the following hypothesis has been proposed:

H2b. Confirmation bias is positively associated with the perceived severity of the health threat.

The amount of information available seems to have different effects. Some argue that when the amount of information that people can search for is restricted or when an information scarcity cue is present, there is an increased preference for selecting support over conflicting information (Fischer *et al.*, 2005). A tight upper limit (2 pieces of information) increased selective exposure to inconsistent information while a relatively loose upper limit (10 pieces of information) promoted more balanced exposure to both consistent and inconsistent information (Fischer *et al.*, 2008). Others argue that information overload created by too much information from the Internet and social media information resulted in more selective exposure, creating filter bubbles and echo chambers in which beliefs are reinforced and amplified, resulting in more polarized views (Lachlan *et al.*, 2021; Kim *et al.*, 2018; Beam *et al.*, 2018; Valentino *et al.*, 2009; Russo and Russo, 2020). Therefore, the following hypothesis has been proposed:

H2c. Confirmation bias is positively associated with the presence of an information limit.

2.3 Reducing selective exposure and promoting balanced information seeking

Prior research found that people are more likely to seek information that they do not agree with if they perceive the practical utility of the information, such as defending their political views from the opposite side (Valentino *et al.*, 2009). Individuals are motivated to seek health information by personal relevance, emotions, identity and media coverage (Myrick *et al.*, 2016). Another research found that with increased perceived knowledge levels, attitude change can happen even for information avoiders (Gaspar *et al.*, 2016).

Promoting collectivistic features increase information seeking for more conflicting information. For example, people in the collectivist culture are more likely to seek more

conflicting information than individualism culture; people are more likely to seek conflicting information when collectivistic attributes are important, for example, the interest of the family other than one's own (Kastenmueller *et al.*, 2010).

Previous research found that prompting people to contemplate their reasons for seeking or avoiding information reduces avoidance of personal health information (Howell and Shepperd, 2013). As to individuals' intentions to seek further information and to engage others with opposite views in public deliberation, vaccine-hesitant and vaccine-inclined individuals show different patterns of behavior influenced by message perception and source trustworthiness and expertise (Shen and Zhou, 2020).

System features that allow users to better distinguish information about different aspects of an issue would reduce selective exposure to information consistent with their prior beliefs, resulting in mitigated decision bias (Liao et al., 2015Liao *et al.*, 2015). Therefore, the following hypothesis has been proposed:

H3. Attitude change is negatively associated with selective exposure.

While there is an urgent need for reducing selective exposure and promoting more balanced information seeking for individuals to make serious health decisions such as COVID-19 vaccination, relatively less is known about what motivates balanced information seeking and about whether an individual may change attitude or belief after exposure to more balanced information. This research aims to test the influence of prior attitudes, perceived threat level and information limit on selective exposure. We measured confirmation bias in reading, reporting and recall, as shown in Figure 1.

3. Methodology

3.1 Participants and tasks

We conducted a user experiment to examine the influence of prior attitude, perceived threat level and the presence of an information limit on people's selection of COVID-19 vaccination information. We recruited 36 participants from a major Chinese university, including 6 freshmen, 8 sophomores, 13 juniors, 4 seniors, and 5 graduate students. There were 12 males and 24 females.

During the experiment, the participants were asked to complete a decision-making task. First, they were asked to select from a list of news articles and social media posts about COVID-19 vaccination to read on an interface then to decide about whether they will go get vaccinated within the next year and provide reasons for the decision. The task instruction was as follows:

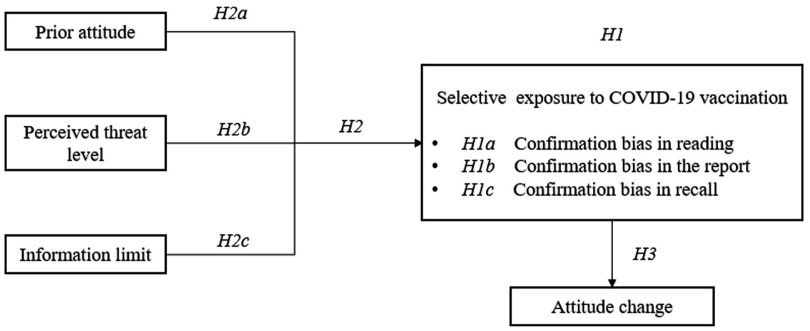

Figure 1.
Research hypotheses and variables

Given the current situation of the COVID-19 pandemic and based on what you read, what is the likelihood that you would choose to receive a COVID-19 vaccine in early 2021 if it is available?

(1) I will definitely get vaccinated

(2) I will likely get vaccinated

(3) I will likely not get vaccinated

(4) I will definitely not get vaccinated

Please provide at least three reasons for your decision and include the titles of the articles or posts that helped your decision-making.

3.2 Experiment design and measures

3.2.1 Prior attitude. The experiment was conducted during December 2020 and January 2021 when large-scaled COVID-19 vaccination has not started. We assessed participants' prior attitude before the experiment by asking participants how willing they were to receive a COVID-19 vaccine ($M = 0.64$, SD = 1.23). Values ranged from −2 (very reluctant), −1 (somewhat reluctant), 1 (somewhat willing), through 2 (very willing). We deliberately used a four-point scale so that participants will indicate a positive or negative preference.

Participants with prior attitudes −1 (somewhat reluctant) and −2 (very reluctant) to get COVID-19 vaccination were considered against getting vaccinated and those with prior attitudes 1 (somewhat willing) and 2 (very willing) were considered supportive of COVID-19 vaccination. Twenty-five participants (69.4%) were supportive of COVID-19 vaccination, while 11 (30.6%) were against COVID-19 vaccination.

3.2.2 Perceived health threat level. We assessed participants' perception of the health threat level of COVID-19 by asking participants how willing they were to do the following activities during the COVID-19 pandemic including visiting relatives and friends during the Chinese New Year ($M = -0.33$, SD = 1.31), traveling within China ($M = -0.39$, SD = 1.30), traveling abroad ($M = -1.69$, SD = 0.84). We divided the participants into four groups based on threat level quartiles.

To test the impact of *information limits* on selective exposure, we adapted the research design of Fischer *et al.* (2005). Eighteen participants were given an upper limit of 4 items to read while the other 18 were not restricted in the number of articles or posts to read.

Selective exposure and recall are measured by three dependent variables:

(1) confirmation bias in reading: number of selected articles consistent to one's prior attitude – number of selected articles inconsistent to one's prior attitude (Fischer *et al.*, 2005);

(2) confirmation bias in the report: number of selected articles consistent to one's prior attitude – number of selected articles inconsistent to one's prior attitude.

(3) Confirmation bias in the recall: recall score of articles consistent to one's prior attitude – recall score of articles inconsistent to one's prior attitude one day after the experiment.

During the experiment, a random list of 16 articles about COVID-19 vaccines was shown to the participants on a Web interface including 8 news media articles (on the left) and 8 social media hashtag discussion threads (on the right), as shown in Figure 2.

Participants can click on the headlines to view the detailed pages of articles. Among the eight news articles and eight social media threads, equal numbers of supporting articles and

Figure 2.
Experiment interface

opposing articles were randomly chosen from three sets. We chose headlines of similar length to avoid any impact of headline length. The order of presentation for each participant was also randomized to reduce the influence of display order.

3.3 Data collection and analysis

Before the experiment, we collected data on participants' background information, prior attitudes and their perception of the health threat with the recruitment survey.

We used screen recording software to record the participants' clicking and scrolling behaviors while selecting and reading the articles. We also collected participants' reports of the decision made and the titles of articles considered helpful in making the decision.

The participants were asked to complete a recall test of the articles they read immediately after the experiment and again on the next day. According to the Ebbinghaus Forgetting Curve, the amount of memory after completing the task is 100% and only 33.7% after one day (Ebbinghaus, 2013). We used the next-day recall score as our measurement for selective recall. The recall test consisted of two parts: factual multi-choice questions and subjective recall of as many items as possible about the articles read.

We then conducted post-experiment interviews to learn about participants' reasons to select the articles they read, and whether they changed their attitude, and why.

We analyzed the experimental data using a one-sample *T*-test, one-way ANOVA, Mann–Whitney *U* and Chi-square tests. We also conducted a supplementary content analysis on the interview data.

4. Findings

4.1 Selective exposure to attitude-consistent and inconsistent information

In total, 18 of the 36 participants (50%) showed a confirmation bias, reading more attitude-consistent articles than attitude-inconsistent articles. Ten participants (27.8%) showed no bias, reading an equal number of attitude-consistent and attitude-inconsistent articles. Eight participants (22.2%) read more attitude-inconsistent articles than attitude-consistent articles. Figure 3 shows the distribution of confirmation bias among participants with a positive prior attitude (blue) and participants with a negative prior attitude (red).

As shown in Figure 3, participants with a negative prior attitude seem to show a stronger confirmation bias, reading more attitude-consistent articles than attitude-inconsistent articles.

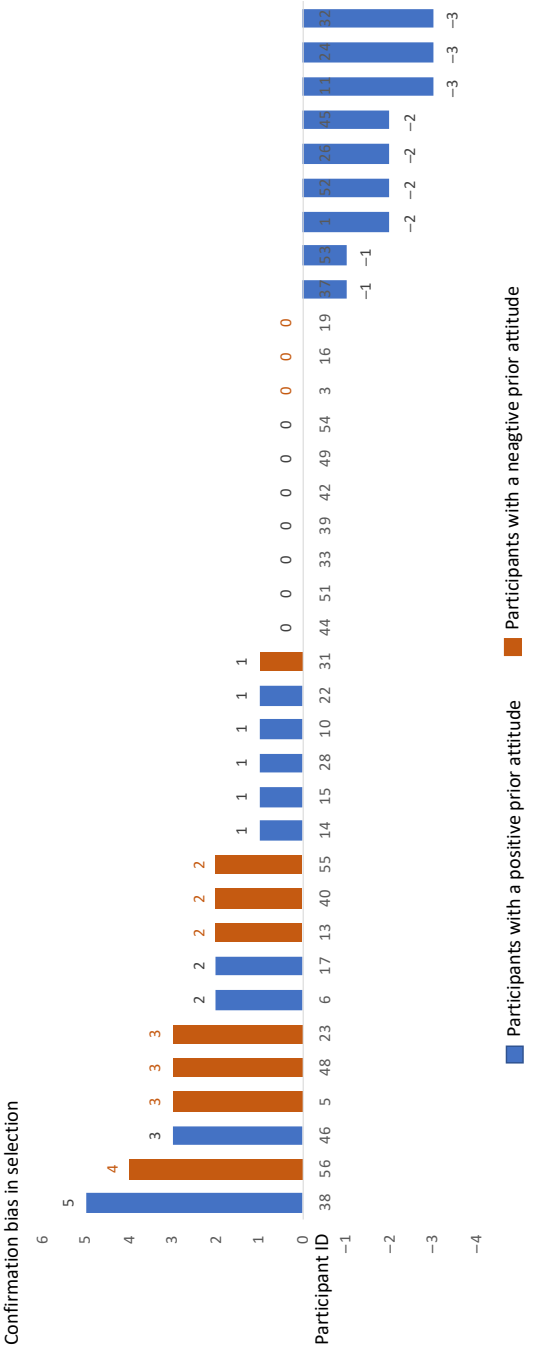

Figure 3.
Confirmation bias in articles read of participants

We conducted a one-sample T-test to compare the distribution of confirmation bias against no confirmation bias (0). Results show that there is no significant confirmation bias in reading ($t = 1.505$, $p = 0.141$) and there is no significant confirmation bias in reporting ($t = 1.505$, $p = 0.141$). H1a and H1b are rejected.

We conducted a one-sample T-test to compare the distribution of confirmation bias in recall of attitude-consistent articles vs. attitude-inconsistent articles against no confirmation bias (0). Results show that there is a significant confirmation bias in recall after one day ($t = 2.175$, $p = 0.036$). H1c is supported.

One-way ANOVA shows that gender, education degree and media preference have no effect on the number of articles read or included in the report. Therefore, H1 is partially supported.

4.2 Effect of prior attitude, threat level and information limit

Tables 1 and 2 show the number of positive articles, number of negative articles and confirmation bias (number of attitude-consistent – number of attitude-inconsistent articles) in terms of articles read and included in the reports.

One-way ANOVA test shows that prior attitude significantly influences confirmation bias in the number of articles to read ($F = 7.045$, $p = 0.012$). Participants with a negative attitude toward COVID-19 vaccination had stronger confirmation bias, meaning they read significantly higher numbers of attitude-consistent articles than attitude-inconsistent articles.

One-way ANOVA test shows that prior attitude significantly influences confirmation bias in the number of articles included in the report ($F = 8.395$, $p = 0.007$). Participants with a negative attitude have stronger confirmation bias in the number of articles included in the report, that is, they are more likely to extract more articles consistent with their prior attitude.

Mann–Whitney U test shows that prior attitude significantly influences the differences between time spent reading attitude-consistent and attitude in-consistent articles ($U = 74.0$, $p = 0.029$). Participants with a negative attitude towards COVID-19 vaccination spent significantly more time reading attitude-consistent articles than attitude-inconsistent articles, so they have stronger confirmation bias (see Table 3).

The participants' recall was measured immediately after the experiment and tested again after one day. Compared with the results of the questionnaire completed immediately after

Table 1. Means and standard deviations *for numbers of articles read*

Prior attitude	No. of positive articles		No. of negative articles		Confirmation bias	
	M	SD	*M*	SD	*M*	SD
Positive attitude ($N = 25$)	3.44	2.61	3.48	2.00	−0.04	1.84
Negative attitude ($N = 11$)	2.36	2.33	4.09	2.21	1.73	1.85

Table 2. Means and standard deviations for *numbers of articles included in the report*

Prior attitude	No. of positive articles		No. of negative articles		Confirmation bias	
	M	SD	*M*	SD	*M*	SD
Positive attitude ($N = 25$)	1.80	1.26	1.88	1.27	−0.08	1.96
Negative attitude ($N = 11$)	0.82	0.87	2.64	0.81	1.82	1.40

the experiment, more than 80% of the participants' scores were the same score or decreased after one day, which is in line with the basic rules of memory.

Table 4 shows the recall scores of positive articles, the recall scores after one day of negative articles and confirmation bias (recall scores of attitude-consistent-articles-recall scores of attitude-inconsistent-articles).

One-way ANOVA test shows that prior attitude significantly influences confirmation bias in the after-one-day recall scores. Specifically, participants with a negative attitude ($F = 9.128$, $p = 0.005$) are likely to have stronger confirmation bias, that is, they remember more information of consistent-attitude-articles than inconsistent-attitude-articles after one day. Therefore, H2a is supported.

One-way ANOVA test shows that threat level does not seem to have any impact on the number of attitude-consistent and attitude-inconsistent articles read ($F = 1.836$, $p = 0.160$) or included in the report ($F = 2.106$, $p = 0.119$). Table 5 shows the confirmation bias in recall scores one day after the experiment across the four groups. The perceived threat level has a significant impact on the difference in recall score of attitude-consistent articles than attitude-inconsistent articles ($F = 3.107$, $p < 0.05$). H2b is partially supported.

One-way ANOVA test shows that information limit does not seem to have any impact on the number of attitude-consistent and attitude-inconsistent articles ($F = 0.246$, $p = 0.623$). H2c is not supported. Therefore, H2 is also partially supported.

4.3 Change of attitude

To examine whether participants changed their attitudes after the information search, we counted the number of participants with positive and negative attitudes in their decision

Table 3.
Medians for *time reading (in seconds)* positive and negative articles

Prior attitude	Medians of positive articles	Medians of negative articles	Medians of confirmation bias
Positive attitude ($N = 25$)	113.00	103.00	−2.00
Negative attitude ($N = 11$)	53.00	206.00	124.00

Table 4.
Means and standard deviations for *recall scores one day after the experiment*

Prior attitude	Recall scores of positive articles		Recall scores of negative articles		Confirmation bias	
	M	SD	*M*	SD	*M*	SD
Positive attitude ($N = 25$)	2.20	1.29	1.92	1.35	0.28	2.09
Negative attitude ($N = 11$)	1.55	1.37	3.64	1.29	2.09	2.34

Table 5.
Means and standard deviations for *recall scores one day after the experiment*

Perceived threat level	Recall scores of positive articles		Recall scores of negative articles		Confirmation bias	
	M	SD	*M*	SD	*M*	SD
Low ($N = 9$)	2.00	1.23	1.78	1.09	0.22	1.64
Medium-low ($N = 10$)	1.50	1.35	2.70	1.34	0.80	2.30
Medium-high ($N = 10$)	2.40	1.71	2.40	2.27	2.40	2.63
High ($N = 7$)	2.14	0.69	3.00	0.82	−0.57	1.40

report. Table 6 shows the distribution of participants' prior attitudes and attitudes in the final decision report.

A chi-square test shows that there is a significant correlation between the prior attitude and the decision attitude ($\chi^2 = 10.506$, $p = 0.001$). Participants' prior attitude influences the final decision: 28 (77.8%) participants choose to stick with their prior attitude, while 8 (22.2%) participants changed their attitudes. Six participants who were supportive of vaccination decided not to get vaccinated, while two participants who were opposing vaccination decided to get vaccinated. Chi-square tests show that perceived threat level has no effect on the change of attitude ($\chi^2 = 5.253$, $p = 0.154$), and information limit also has no effect on participants' attitude change ($\chi^2 = 0.643$, $p = 0.423$).

To explore whether there is a significant influence of what the participants read on whether or not they changed, we compared the participants who changed their attitudes with those who did not change attitudes. We conducted independent sample *T*-tests to compare confirmation bias in reading and reporting and recall across the two groups. Results show that there is no significant difference in confirmation bias in articles read across the two groups. However, participants who changed their attitude included more attitude-inconsistent articles in their report ($t = 2.874$, $p = 0.007$) and recalled attitude-inconsistent articles more accurately ($t = 2.795$, $p = 0.008$). H3 is partially supported.

Table 7 summarizes the hypotheses tested and statistical tests used in the above analysis.

The hypotheses in the table correspond to different research questions. First, selective exposure occurs partly during the information seeking for making COVID-19 vaccination decisions. Participants recall attitude-consistent articles more accurately than attitude-inconsistent articles (RQ1). Prior attitude influences selective exposure to COVID-19 vaccination information significantly, while information limit does not have influence on it. Confirmation bias of recall scores after-one-day is positively associated with the perceived severity of the health threat. However, the perceived health threat level has no effect on selective exposure in reading and reports (RQ2). Finally, nearly a quarter of the participants changed their attitudes when making decisions. Participants who changed their attitude included more attitude-inconsistent articles in their report and recalled attitude-inconsistent articles more accurately. Attitude change is related to more balanced information seeking (RQ3).

4.4 Motivations for participants' information selection

To further understand the participants' motivations for seeking and selecting information, we analyzed the interviews to identify expressions of defense motivation and accuracy motivation. Some participants showed typical defense motivation to choose articles that were consistent with their prior attitudes to support their judgment. For example, "I looked for articles that can support my original idea, and I did not choose articles that were contrary to my idea or had nothing to do with it." (Participant #26).

Some participants would like to read more balance information to gain more accurate information. For example, Participant #3 stated "I started by looking for two articles that are relevant and consistent with my previous intentions. As far as vaccines are concerned, I now

Prior attitude	Attitude in the decision report: Positive	Negative	Total
Positive attitude ($N = 25$)	19	6	25
Negative attitude ($N = 11$)	2	9	11
Total	21	15	36

Table 6. The crosstab of *prior attitude* and *attitude in the decision report*

	Hypothesis		Test	Statistics	*P*	Result
H1a	Participants select more attitude-consistent articles than attitude-inconsistent articles		One-sample *T*-test	$t = 1.505$	0.141	Reject
H1b	Participants include more attitude-consistent articles in their reports than attitude-inconsistent articles		One-sample *T*-test	$t = 1.505$	0.141	Reject
H1c	Participants recall attitude-consistent articles more accurately than attitude-inconsistent articles		One-sample *T*-test	$t = 2.175$	0.036*	Accept
H2a	Confirmation bias is positively associated with prior attitude	Number of articles to read	One-way ANOVA	$F = 7.045$	0.012*	Accept
		Number of articles included in the report	One-way ANOVA	$F = 8.395$	0.007**	
		Time spent reading articles	Mann–Whitney U	$U = 74.0$	0.029*	
		Recall scores after-one-day	One-way ANOVA	$F = 9.128$	0.005**	
H2b	Confirmation bias is positively associated with the perceived severity of the health threat	Number of articles to read	One-way ANOVA	$F = 1.836$	0.160	Partially accept
		Number of articles included in the report	One-way ANOVA	$F = 2.106$	0.119	
		Recall scores after-one-day	One-way ANOVA	$F = 3.107$	0.040*	
H2c	Confirmation bias is positively associated with the presence of an information limit		One-way ANOVA	$F = 0.246$	0.623	Reject
H3	Attitude change is negatively associated with selective exposure	Prior attitude × decision attitude	chi-square	$\chi^2 = 10.506$	0.001**	Partially accept
		Perceived threat level × attitude change	chi-square	$\chi^2 = 5.253$	0.154	
		Information limit × attitude change	chi-square	$\chi^2 = 0.643$	0.423	
		Number of articles included in the report	*T*-test	$t = 2.874$	0.007**	
		Recall scores after-one-day	*T*-test	$t = 2.795$	0.008**	

Note(s): *$p < 0.05$, **$p < 0.01$

Table 7.
Summary hypothesis testing results

feel like I might be less likely to get them if I do not have to. So I first read two articles about the side effects, including ones that questioned the effectiveness. But they may not be enough for me to comprehend the whole situation. So I found two more supporting articles and I read them." He paid more attention to the comprehensiveness of information, so he took the initiative to read articles inconsistent with his prior attitude. For another example, Participant #40 said, "I tried to read *both* benefical and harmful information to make sure I was not swayed by the initial judgment."

Some participants purposefully sought attitude-inconsistent information. For example, Participant #33 stated, "I tried to read articles opposite to my view because I am afraid that when people were talking about something, they might be very attached to their points and there might be points that were ignored in those articles." She pointed out that she looked for information that contradicts her view to avoid clinging to an idea and ignoring other aspects.

In addition, one participant mentioned the comparison of information between the two opposing attitudes. He said, "I noticed positive and negative information. I read the articles about vaccine failure, and then I read the articles about vaccine effectiveness. And I compared the two sides." (Participant #44).

Finally, we examined why some participants changed their attitudes. Participant #11 had a strong positive attitude before the experiment. After reading the articles, his final attitude changed to a weak negative attitude. He read a total of four articles, including three negative ones and one positive one. He read more articles inconsistent with his prior attitude, and in the final report, he only included attitude-inconsistent articles. The original views of Participant #11 were affected after he read the articles which were opposite to his prior opinion. It led to a directional change of attitude. For another example, Participant #16 had a negative prior attitude about getting vaccinated. He expressed accuracy motivation before the experiment: "on the one hand, I want to know if it (the vaccine) has side effects. On the other hand, I want to how effective it is." In the process of reading, he read two positive articles and two negative articles. The relatively balanced reading changed his attitude to a positive attitude toward vaccination after weighing the pros and cons.

5. Discussion

Our findings confirm the existence of selective exposure to COVID-19 vaccination information during decision-making driven by defense motivation, especially for people with a negative prior attitude and higher perceived threat level. Participants read and included more attitude-consistent articles in their report and recalled more attitude-consistent information one day after the experiment (Loken and Hoverstad, 1985). Selective exposure to information is a complex behavior. Some argue that is driven by a selective approach to attitude-consistent information and selective avoidance of attitude-inconsistent information, and the selective approach dominates selective avoidance (Wagner, 2017; Lipsey and Shepperd, 2019). Others find that information evaluation bias leads individuals to selectively expose themselves, and the effect may depend on factors such as perceived information novelty (Bardin *et al.*, 2018).

There has not been any previous research suggesting that people with a negative attitude are more prone to selective exposure to information. Our study found that people with a negative attitude toward vaccination read and include more attitude-consistent articles in the report and recall more attitude-consistent information the day after the experiment. This confirms the challenge health campaigns often face: to reach audiences who often tend to hold inconsistent prior attitudes and thus are more likely to avoid the campaign messages (Hong, 2014; Howell and Shepperd, 2013). When the experiment was conducted, information about COVID-19 vaccination has been available in the news for a while, and campaigns have been launched to get more people vaccinated in China. People who were against vaccination may be a minority opinion and felt that they needed more confirmation.

Our findings suggest that selective recall of attitude consistent information increased as the level of perceived health threat increased. The explanation may be that uncertainty motivates people to seek attitude-confirming information (Sawicki *et al.*, 2011, 2013). Attitude strength may also be a factor indicating uncertainty (Knobloch-Westerwick *et al.*, 2009; Brannon *et al.*, 2007). However, we do not have enough data to examine attitude strength. This needs further investigation.

Information limit had no significant effect on the elective exposure and recall of participants, including the difference of articles read and the difference of articles in the report. It had also no significant effect on participant's attitude change.

Defense motivation seems to drive the participants' selective exposure to attitude-consistent information to feel validated. Many participants also chose to read the articles inconsistent with their prior attitudes while reading the articles consistent with their prior

attitudes, resulting in more balanced information seeking driven by accuracy motivation (Hart *et al.*, 2009). Some also purposefully seek inconsistent information or negativity bias (Wu, 2013; Van Der Meer *et al.*, 2020).

Health decisions are very complicated, especially for a developing situation such as the COVID-19 pandemic. People are making decisions as the vaccines are developing and new information is released on a daily and sometimes hourly basis. It would be interesting to examine how the information seeking and decision-making processes evolve. Research suggested that to certain information and avoidance of other information is often associated with emotions, in the need to alleviate negative feelings such as regret and rumination or to obtain positive feelings such as relief and achieving closure (Shani and Zeelenberg, 2012). It would also be interesting to compare the information seeking post-decisions.

People should be properly informed to make better health decisions. Previous research found asking people to justify their decision to seek or avoid knowledge increases information search (Howell and Shepperd, 2013). It is important to find ways to promote more balanced information seeking and to encourage people to be exposed to information that is uncongenial to their prior attitude and belief. Information professionals such as librarians could play an important role in promoting health literacy for balanced information seeking and decision-making (Butler, 2019; Vraga and Tully, 2019).

6. Limitation and future research

Our study was conducted during December 2020 and January 2021 when the pandemic was ongoing and vaccination efforts and campaigns just started. There was abundant information about vaccines in the news and on social media. Subjects might have encountered or sought COVID-19 before the experiments, which could affect the selection and recall of the materials. Although we told participants after the experiment session not to seek information about vaccines until they filled out the recall questionnaire after one day of the experiment, we cannot ensure that they all follow the instructions. This could affect the recall scores if they learn more about the information presented in the experiment.

Source selection is also a very important aspect of health information seeking (Chi *et al.*, 2020). Health campaigns may be more effective in targeting people through their preferred sources. In this research, although some participants mentioned that they prefer social media sources because they wanted to learn about first-hand experiences with the vaccines instead of official data and statistics (Vraga and Tully, 2019), we did not find any significant difference in the preference in news sources or social media sources for the articles read or included in the report. Future research could further examine the interaction between source selection and selective exposure.

7. Conclusion

This is the first paper to explore selective exposure to COVID-19 vaccination information. We found that people with a negative attitude are more prone to selective exposure, which was not found in previous research. We also found that selective recall does not appear immediately, and participants with a negative attitude and higher perceived health threat level show stronger selective recall behavior after one day. It suggests that vaccination campaigns should focus on reaching people with negative attitudes and higher perceived health threat levels who are more prone to selective exposure to encourage them to seek more balanced information.

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