


The Roles of Information Valence, Media Literacy and Perceived Information Quality on the Association Between Frequent Social Media Exposure and COVID-19 Vaccination Intention

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Abstract

Purpose: This study aimed to examine the associations between frequent exposure to positive/negative information about vaccine efficacy/safety on social media and intention of COVID-19 vaccination, and to test if media literacy and perceived information quality would moderate such associations.

Design: A multi-city cross-sectional survey.

Setting: At five universities in different regions of China.

Subjects: 6922 university students (a response rate of 72.3%).

Measures: frequency of exposure to social media information about COVID-19 vaccination, media literacy, perceived information quality, intention of COVID-19 vaccination, and sociodemographic characteristics.

Analysis: Logistic regression analysis was conducted to test main and interaction effects.

Results: Higher exposure to positive information about vaccine efficacy (adjusted odds ratio [AOR] = 1.30, $P < .001$) and vaccine safety (AOR = 1.27, $P < .001$) were positively associated with vaccination intention. No significant associations were shown between exposure to negative information about vaccine efficacy/safety and vaccination intention. Higher net exposure to negative vs positive information was negatively associated with vaccination intention (AOR = .82, $P < .001$). High media literacy was further found to attenuate the effect of negative information exposure and strengthen that of positive information exposure. Perceived information quality was not a significant moderator.

Conclusion: The valence of social media information regarding the efficacy and safety of COVID-19 vaccines and individuals' media literacy jointly shaped COVID-19 vaccination intention. The findings can inform the development of effective health promotion strategies for enhancing COVID-19 vaccination.

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Introduction

It has been more than 2 years since the World Health Organization declared COVID-19 a pandemic on 11 March 2020. The cumulative number of global cases has exceeded 500 million as of 1 May 2022, and the global incidence remains as high as over 3.8 million new cases per week.¹

Frequency and Valence of Social Media Exposure Shaping COVID-19 Vaccination Intention

According to the cultivation theory,² constant exposure to media messages shape how people view social reality. The more time spent on viewing media messages, the more likely the audience would align their perceptions of the real world with the media's portrayals.³ Social media serves as a powerful communication tool to inform the public about the development and rollout of COVID-19 vaccines.⁴ However, it has also created an 'infodemic' that boosts vaccine hesitancy through circulation of misleading facts, rumors, and conspiracy theories.⁵⁻⁷ Empirical studies have reported significant associations between frequency of social media exposure and adoption of COVID-19 preventive behaviors.⁸⁻¹⁰ Social media is frequently used by the majority of university students,¹¹ and it has been suggested to play a vital role in promoting young people's adoption of COVID-19 preventive measures.^{12,13} It is presumed that university students would be strongly influenced by social media when making decisions about COVID-19 vaccination.

Previous studies on COVID-19 vaccination focused on the impact of frequent social media use and did not consider the nature and content of the information.^{14,15} Valence is defined as the positive and negative nature of the information content,¹⁶ which may influence the effect of frequent media exposure on vaccination. In our case, valence refers to exposure to social media information supporting or rejecting COVID-19 vaccination, which may enhance or reduce vaccination intention, respectively. Conceptually, extant research has suggested that positive and negative information are processed differently.¹⁷ People exhibit a "positivity bias" when positive information outweighs negative information in terms of influences on perception formation, decision making, and evaluative judgment.^{16,18} Vice versa, a negativity bias involves greater influence of negative information over that of positive information. Empirically, anti-vaccine messages were found to attract higher public engagement than pro-vaccine ones on social media.^{19,20} Some other studies found that negative but not positive online information was associated with vaccination behavior and intention.^{21,22}

Furthermore, individuals are simultaneously affected by positive and negative messages about vaccination in real-world settings. It is hence warranted to ascertain the effect of the 'net valence' of information exposure, ie, whether individuals' relative exposure to negative vs positive social media information would be associated with vaccination intention. In addition, the content of relevant information also matters. An individual's vaccine acceptance/hesitancy is a potential outcome of a weighing up of benefit and risk.²³ Perceptions related to efficacy (eg, reduction of infection risk) and safety (eg, side-effects) of COVID-19 vaccines are important contents as they were found to be the strongest factors of intention of COVID-19 vaccination.²⁴⁻²⁶ There is a dearth of studies exploring how valence (positive/negative information) and content (information about vaccine efficacy/safety) of social media exposure would jointly shape intention of COVID-19 vaccination.

The Potential Roles of Media Literacy on COVID-19 Vaccination Intention

Media literacy is defined as an individual's ability to seek and utilize media information efficiently,²⁷ which emphasizes the importance of people's active information processing. At the heart of media literacy is critical assessment, understanding, and synthesis of the encountered information.²⁸ The fundamental goal of promoting media literacy is to develop scepticism toward the media representation of reality, so as to reduce the acceptance of messages opposing the advocated health behavior.^{27,28} During the COVID-19 pandemic, as there is a deluge of complex, conflicting, and false information disseminated via social media, adequate media literacy is necessary for individuals to make proper decisions and adopt preventive behaviors.²⁹ Some empirical studies have found positive associations between media literacy and engagement in COVID-19 preventive behaviors and vaccination intention.^{30,31}

Furthermore, people exposed to the same level of social media information may respond differently.³² As adequate media literacy can counteract the effect of negative information,²⁷ it is hypothesized that high media literacy would attenuate the effect of frequent negative information exposure on reducing COVID-19 vaccination intention. Moreover, a critical evaluation of the positive information about vaccination may reassure people about vaccine efficacy and safety, and reinforce the decision-making process.³³ It is also hypothesized that high media literacy would intensify the effect of frequent positive information exposure on increasing COVID-19 vaccination intention.

The Potential Roles of Perceived Information Quality on COVID-19 Vaccination Intention

Perceived information quality is a crucial factor influencing whether one would act upon the acquired information. Both the vaccine proponents and opponents are dedicated to improving information quality (eg, by using shared narratives, incorporating reliable information, and increasing readability) to convince and engage the public.^{5,34} The present study focused on two key types of information quality: (1) intrinsic quality, referring to the quality of information in its own right (eg, accuracy and reliability), and (2) representational quality, referring to the presentation of information in an usable form (eg, comprehensiveness and consistency).³⁵ The elaboration likelihood model of persuasion theorizes the role of subjective evaluation of information quality in fostering attitude changes.³⁶ It postulates that individuals would evaluate the merits of information that is relevant to them; high-quality information would persuade them to adopt related behaviors and attitudes accordingly.³⁷

Empirical evidence demonstrates that perceived good quality of online information can enhance trust and perceived usefulness of the information.³⁸ Hence, people would be influenced more strongly by positive information about COVID-19 vaccination if such information is perceived to be credible and usable. Another experimental study found that scientific-sounding negative information that questioned the effectiveness and safety of COVID-19 vaccines showed the strongest negative impact on vaccination intention among negative information of varying quality levels.⁶ It is thus hypothesized that high perceived information quality would intensify the effects of both positive and negative information exposure on COVID-19 vaccination intention.

The Present Study

To address the research gaps, the present study investigated factors of intention to take up COVID-19 vaccination among university students in China, including (a) frequent exposure to positive and negative information regarding efficacy and safety of COVID-19 vaccines on social media, (b) media literacy, and (c) perceived information quality. It also tested whether media literacy and perceived information quality would moderate the associations between frequent exposure to positive/negative information about vaccine efficacy/safety and COVID-19 vaccination intention.

Methods

Participant and Study Procedure

As detailed in a previously published paper,³⁹ students from five universities of five provinces (Zhejiang, Yunnan, Guangdong, Inner Mongolia, and Henan) in China participated in an online cross-sectional survey in November 2020.

During this period, the results of the human trials of multiple COVID-19 vaccine candidates were being announced to the public, but in the meantime, misinformation about the potential vaccines were being increasingly disseminated on social media.⁴ A total of 165 classes were selected across different grades and faculties of the participating universities using convenience sampling. All the students from these selected classes were invited to complete an online self-administered questionnaire via the existing WeChat (the most popular messaging and social media app in China) groups that were used for routine communications among students and teachers within a class. Eligible participants were full-time Chinese-speaking students at the participating universities. Participants were informed that the survey was voluntary and anonymous, and submitting the completed questionnaire implied informed consent. Of the 9593 invited students, 6940 returned their completed questionnaires (a response rate of 72.3%). After excluding those who had received any experimental COVID-19 vaccines prior to the survey ($n = 18$), the final sample size for data analysis was 6922. Ethical approval was obtained from relevant ethics committee.

Measures

A panel of epidemiologists, psychologists, and behavioral scientists was formed to develop the structured questionnaire. A pilot survey was conducted among 6 eligible students to determine if the item descriptions and response options were understandable and unambiguous. The survey instruments are detailed in [Appendix 1](#).

Intention of COVID-19 vaccination was measured by a single question: “What is your likelihood of taking up the COVID-19 vaccination within six months since free vaccines become available in China, assuming that such vaccines having 80% efficacy and rare mild side effects”. The “80% efficacy” was regarded as the baseline efficacy level that could largely extinguish a COVID-19 epidemic.⁴⁰ Participants were asked to rate on a 5-point Likert scale (1 = “definitely no” to 5 = “definitely yes”). The responses were further dichotomized to distinguish between those who had an intention of COVID-19 vaccination (1 = “definitely yes/probably yes”) and those who did not (0 = “definitely no/probably no”). A single-item Likert scale with categorical responses has been used in some well-designed survey studies to measure the levels of intention of COVID-19 vaccination.^{41,42}

Frequencies of exposure to information about COVID-19 vaccination on social media were measured by four items that combined valence and content. Participants were asked to rate the frequencies of being exposed to positive or negative information (two items each) about efficacy or safety of COVID-19 vaccines via some social media platforms (eg, Weibo and WeChat public accounts) in the past month on 5-point Likert scales (1 = “never” to 5 = “always”). A sample item was “How often have you been exposed to

positive information about the efficacy of COVID-19 vaccines on social media". In addition, a composite variable was created to represent the frequency of *net exposure to negative versus positive vaccine-related information*; it was formed by subtracting the average score of the two items about frequency of exposure to positive information about vaccine efficacy and safety (reliability $\alpha = .91$) from that of the two items about frequency of exposure to negative information (reliability $\alpha = .90$).

Media literacy was measured by four items that tapped orientations toward content and intent of media information.^{43,44} This measurement instrument was developed to operationalize the core concept of media literacy that comprises people's understanding of the information source's intent and their evaluation of the content present and absent in a given message.⁴³ The Chinese version of this tool has been applied to explore the role of media literacy in COVID-19 preventive behaviors (eg, mask wearing and handwashing).³⁰ Participants were asked to rate how much they endorsed the statements (1 = "strongly disagree" to 5 = "strongly agree"). A sample item was "I look for more information before I believe something I see in messages about COVID-19 vaccination". The item scores were summed up, with higher scores indicating higher media literacy (reliability $\alpha = .90$).

Perceived information quality of social media messages about COVID-19 vaccination was measured by four items. Participants were asked to rate the extent to which they perceived information about COVID-19 vaccination on social media as being accurate, credible, consistent, and easy to understand. These items were designed to capture the key attributes of intrinsic and representational quality of information.³⁵ Ratings were made on 5-point Likert scales (1 = strongly disagree to 5 = strongly agree). The item scores were summed up, with higher scores indicating higher perceptions of good information quality (reliability $\alpha = .91$).

A range of background variables were also measured, including age, sex, ethnicity, faculty, grade, and history of being mandatorily quarantined.

Statistical Analysis

Descriptive analyses were conducted. Univariate logistic regression analysis was used to examine the associations between the studied background variables and intention of COVID-19 vaccination; those yielding significant results were treated as potential confounders and controlled for in subsequent analysis. Adjusted odds ratios (AOR) and 95% confidence intervals (CI) were then estimated for the associations between the independent variables (those related to social media exposure)/moderators (media literacy and perceived information quality) and vaccination intention. To maximize the data interpretability, multinomial regression analysis was also conducted to determine the associations between the potential factors and uncertain vaccination status. Three of the original responses "probably no/neutral/probably

yes" were combined into one category "unsure". The ratios of the odds of having a vaccination intention ("definitely yes") and having no vaccination intention ("definitely no") relative to "unsure" status were estimated.

Hierarchical regression analysis was used to test the interactions between media literacy/perceived information quality and frequency of social media exposure. The first block contained one independent variable (eg, frequency of exposure to positive information about efficacy) and one moderator (eg, media literacy); the second block further added an interaction term [multiplication of the independent variable and the moderator (eg, 'frequency of exposure to positive information about efficacy' x 'media literacy')]. A total of 10 interaction models were fit. All the continuous variables (ie, independent variables, moderators, and interaction terms) were mean-centered. Logit estimates (ie, log odds ratios) and respective standard errors were reported. A two-tailed P value $<.05$ indicated statistical significance. SPSS Statistics 26 was used for analysis.

Results

Sample Characteristics

The mean (\pm standard deviation) age of the sample was 19.4 ± 1.5 years. The majority of the participants were females (63.6%) and Han people (86.8%). Faculties of the participants' studies comprised arts (12.9%), science (10.2%), engineering (11.8%) and medicine/pharmacy (50.9%). Approximately 13.7% of the participants reported a history of mandatory quarantine due to COVID-19. Around one quarter of the participants had relatively high exposure to positive information about efficacy (28.0%) and safety (24.7%), and smaller proportions had relatively high exposure to negative information about efficacy (9.1%) and safety (8.3%). The mean (\pm standard deviation) level was 14.6 ± 2.9 for media literacy (range = 4 to 20), and 11.2 ± 3.4 for perceived information quality (range = 4 to 20). The results are detailed in Table 1.

Prevalence and Factors of COVID-19

Vaccination Intention

Of the participants, 78.1% reported having an intention of COVID-19 vaccination within six months after the roll-out of COVID-19 vaccination, given the vaccines would have 80% efficacy and rare mild side effects. Older age (OR = .95, $P = .013$), male sex (OR = .86, $P = .015$), and experience of mandatory quarantine (OR = .73, $P < .001$) were significantly and negatively associated with intention of COVID-19 vaccination. Being a first-year student was positively associated with vaccination intention (OR = 1.17, $P = .008$). The crude associations of vaccination intention with the other background variables were statistically non-significant.

Adjusted for the significant background variables, (1) higher exposure to positive information about efficacy (AOR

Table 1. Distributions of the study variables (n = 6922).

Variables	n (%) or mean \pm standard deviation
Background characteristics	
Age (years)	19.4 \pm 1.5
Sex	
Male	2520 (36.4)
Female	4402 (63.6)
Ethnicity	
Han	6009 (86.8)
Others	913 (13.2)
Faculty	
Arts	896 (12.9)
Social sciences	363 (5.2)
Economics or management	378 (5.5)
Science	703 (10.2)
Engineering	819 (11.8)
Medicine or pharmacy	3525 (50.9)
Others	238 (3.4)
Grade	
First-year	2993 (43.2)
Second-year	1894 (27.4)
Third-year	1164 (16.8)
Fourth-year	562 (8.1)
Fifth-year	214 (3.1)
Master or above	95 (1.3)
History of being mandatorily quarantined due to COVID-19	
Yes	948 (13.7)
No	5974 (86.3)
Intention of COVID-19 vaccination	
If the vaccine was 80% effective, having mild side effects, and free of charge	
Probably yes/definitely yes	5404 (78.1)
Others (neutral/probably no/definitely no)	1518 (21.9)
Social media exposure to information about COVID-19 vaccination	
Frequency of exposure to positive information about efficacy	
Relatively high exposure (often/always)	1940 (28.0)
Relatively low exposure (never/seldom/sometimes)	4982 (72.0)
Frequency of exposure to negative information about efficacy	
Relatively high exposure (often/always)	629 (9.1)
Relatively low exposure (never/seldom/sometimes)	6293 (90.9)
Frequency of exposure to positive information about safety	
Relatively high exposure (often/always)	1712 (24.7)
Relatively low exposure (never/seldom/sometimes)	5210 (75.3)
Frequency of exposure to negative information about safety	
Relatively high exposure (often/always)	574 (8.3)
Relatively low exposure (never/seldom/sometimes)	6348 (91.7)
Frequency of net exposure to negative vs positive vaccine-related information (range -4-+4)	-1.3 \pm 2.0
Potential moderators	
Media literacy (range 5-20)	14.6 \pm 2.9
Perceived information quality (range 5-20)	11.2 \pm 3.4

= 1.30, $P < .001$) and safety (AOR = 1.27, $P < .001$) were significantly and positively associated with COVID-19 vaccination intention; (2) higher exposure to negative information about efficacy (AOR = .97, $P = .28$) and safety

(AOR = .95, $P = .06$) of COVID-19 vaccines were not significantly associated with vaccination intention; (3) higher 'net exposure' to negative vs positive information was significantly and negatively associated with

vaccination intention (AOR = .82, $P < .001$); 4) media literacy (AOR = 1.20, $P < .001$) and perceived information quality of related social media messages (AOR = 1.08, $P < .001$) were significantly and positively associated with vaccination intention. The results are detailed in Table 2. Furthermore, multinomial regression analysis found that compared to those with uncertain vaccination status, frequency of exposure to positive information about efficacy/safety, media literacy, and perceived information quality were significantly higher among those having an vaccination intention whereas lower among those having no vaccination intention (Appendix 2).

Moderation Effects of Media Literacy and Perceived Information Quality

Media literacy significantly moderated the associations between four of the five variables related to frequency of social media exposure and COVID-19 vaccination intention: (1) The positive effect of frequent exposure to positive information about safety was stronger among those with higher media literacy ($b = .18$, $SE = .04$, $P < .001$) than those with lower literacy ($b = .08$, $SE = .04$, $P = .04$); (2) the negative effect of frequent exposure to negative information about efficacy was stronger among those with lower media literacy ($b = -.17$, $SE = .04$, $P < .001$) than those with higher literacy ($b = .02$, $SE = .04$, $P = .74$); (3) the negative effect of frequent exposure to negative information about safety was stronger among those with lower media literacy ($b = -.21$, $SE = .04$, $P < .001$) than those with higher literacy ($b = -.00$, $SE = .04$, $P = .93$); (4) the negative effect of ‘net exposure’ to negative vs positive vaccine-related information was stronger among those with lower media literacy ($b = -.19$, $SE = .03$, $P < .001$) than those with higher literacy ($b = -.10$, $SE = .02$, $P < .001$). None of the interaction terms involving perceived information quality was statistically significant. The coefficients of the interaction effects are detailed in Table 3 and 4.

Discussion

The major findings of this study are that (1) more frequent exposure to positive but not negative information about vaccine efficacy and safety on social media was associated with increased COVID-19 vaccination intention, (2) higher net exposure to negative vs information was associated with decreased vaccination intention, (3) media literacy attenuated the negative effect of frequent negative information exposure whereas strengthened the positive effect of frequent positive information exposure.

Recent evidence derived from clinical trials and mass vaccination campaigns showed that the efficacies of the available Chinese COVID-19 vaccines (79-86% for Sinopharm-Beijing, 73% for Sinopharm-Wuhan, and 50-84% for CoronaVac) were comparable to that of the hypothetical situation specified in the present study (80% efficacy).⁴⁵

Hence, the findings could help indicate the potential effects of social media information on Chinese university students’ acceptance of available COVID-19 vaccines. Moreover, as COVID-19 resurgences continue to occur around the world, the effectiveness of current vaccines against new variants of SARS-CoV-2 (eg, the Omicron) is still being evaluated,^{46,47} and more advanced candidates that target new variants are being developed.⁴⁸ Hence, our findings on the impact of exposure to information about potential vaccines under development/test have important implications for the future development of communication campaigns.

Participants were more frequently exposed to positive than negative information related to COVID-19 vaccination on social media. Similarly, another study identified more positive messages than negative messages regarding side effects of COVID-19 vaccines on Chinese social media.⁴⁹ It was further found that only frequent exposure to positive information was a significant factor of COVID-19 vaccination intention. This finding corroborates another study conducted among Chinese factory workers, which reported that frequent exposure to positive information (eg, new clinical trial data) but not negative information (eg, concerns about vaccine efficacy) was associated with COVID-19 vaccination intention.⁵⁰ A possible explanation is that the cultivation effect of social media exposure on vaccination intention may depend on the overall ‘information environment’. A surveillance study investigating the global distribution of rumours and conspiracy theories regarding COVID-19 vaccination across 52 countries found that China was among the countries that reported the least amount of such negative information on their online platforms.⁴ It is imperative for health authorities and relevant stakeholders (eg, social media companies) to debunk and refute misinformation about COVID-19 vaccines in a prompt manner and prevent inadvertent sharing of conflicting information. Moreover, continuous efforts are warranted to efficiently communicate with the public about the updated information on COVID-19 vaccination. For example, during the Omicron waves, a flood of negative information on the reduced efficacy of current vaccines in preventing infections has emerged on social media, it is thus necessary to disseminate positive information on the vaccine efficacy in preventing severe illnesses and death and reassure people of the importance of taking up (booster) vaccination in time.

The significant association shown for the “net exposure” to negative information further highlights the importance of counteracting the negative effect of anti-vaccination messages by introducing more pro-vaccination messages. A high proportion of negative information about COVID-19 vaccination spreading through online social networks may create negative normative beliefs against vaccination and thus diminish people’s responsiveness to positive information.⁵¹ A recent study suggested that a higher proportion of positive information spread in a social network would significantly enhance individuals’ vaccination decision making, and continuous stimulation of new positive information is needed to achieve

Table 2. Logistic regression on the factors of intention of COVID-19 vaccination.

Variables	Odds ratio ^a	95% confidence intervals	P
Frequency of exposure to positive information about efficacy	1.30	1.23 - 1.37	<.001
Frequency of exposure to negative information about efficacy	.97	.91 - 1.03	.28
Frequency of exposure to positive information about safety	1.27	1.20 - 1.35	<.001
Frequency of exposure to negative information about safety	.95	.89 - 1.00	.06
Frequency of net exposure to negative vs positive vaccine-related information	.82	.80 - .85	<.001
Media literacy	1.20	1.17 - 1.22	<.001
Perceived information quality	1.08	1.06 - 1.10	<.001

^aAge, sex, grade, and history of COVID-19 quarantine were adjusted for in the regression analyses. Odds ratio represents the change of the odds of having an intention to take up COVID-19 vaccination for each one-unit increase in variable scores.

Table 3. The moderating effect of media literacy on the associations between frequent social media exposure and intention of COVID-19 vaccination.

	Models with main effects only ^a			Models with main and interaction effects ^b		
	b	standard error	P	b	standard error	P
IV: Frequency of exposure to positive information about efficacy						
IV	.15	.03	<.001	.15	.03	<.001
Media literacy	.16	.01	<.001	.17	.01	<.001
IV * Moderator	—	—	—	.01	.01	.251
IV: Frequency of exposure to negative information about efficacy						
IV	-.08	.03	.008	-.08	.03	.013
Moderator	.18	.01	<.001	.18	.01	<.001
IV * Moderator	—	—	—	.03	.01	.002
IV: Frequency of exposure to positive information about safety						
IV	.13	.03	<.001	.13	.03	<.001
Moderator	.17	.01	<.001	.17	.01	<.001
IV * Moderator	—	—	—	.02	.01	.045
IV: Frequency of exposure to negative information about safety						
IV	-.11	.03	.001	-.10	.03	.001
Moderator	.18	.01	<.001	.19	.01	<.001
IV * Moderator	—	—	—	.04	.01	.001
IV: Frequency of net exposure to negative vs positive vaccine-related information						
IV	-.15	.02	<.001	-.15	.02	<.001
Moderator	.16	.01	<.001	.15	.01	<.001
IV * Moderator	—	—	—	.02	.01	.009

Abbreviation: IV, independent variable.

^aMultivariable logistic regression was performed involving each type of social media exposure and media literacy, with age, gender, grade, and history of COVID-19 quarantine being adjusted for.

^bMultivariable logistic regression was performed involving each type of social media exposure, media literacy, and their product term, with age, gender, grade, and history of COVID-19 quarantine being adjusted for.

high vaccination coverage in the community.⁵² Hence, vaccine advocates are suggested to proactively disseminate evidence that supports the efficacy and safety of COVID-19 vaccines and develop information resources that can be easily shared on social media.^{5,19,53} Social media information on preventive measures has been found to constantly change as the COVID-19 situation evolved.⁵⁴ Our findings further indicate that it is necessary to carry out dynamic surveillance of the relative amount of positive and negative sentiments related to vaccines circulated on social media in the ongoing pandemic.²⁰

The effects of negative information exposure on COVID-19 vaccination intention were only found to be significant among individuals having lower media literacy. It is plausible that people having higher media literacy are more able to verify and scrutinize the negative information about vaccination and thus resist the persuasive attempts of the harmful contents.²⁸ Moreover, the effect of frequent exposure to positive information about vaccine safety was stronger among individuals having higher media literacy. A thorough critical evaluation of the encountered information may enable people

Table 4. The moderating effect of perceived information quality on the associations between frequent social media exposure and intention of COVID-19 vaccination.

	Models with main effects only ^a			Models with main and interaction effects ^b		
	b	standard error	P	b	standard error	P
IV: Frequency of exposure to positive information about efficacy						
IV	.19	.03	<.001	.19	.03	<.001
Moderator	.04	.01	<.001	.04	.01	<.001
IV * Moderator	—	—	—	-.00	.01	.882
IV: Frequency of exposure to negative information about efficacy						
IV	-.16	.03	<.001	-.17	.03	<.001
Moderator	.09	.01	<.001	.09	.01	<.001
IV * Moderator	—	—	—	.00	.01	.555
IV: Frequency of exposure to positive information about safety						
IV	.16	.03	<.001	.16	.03	<.001
Moderator	.05	.01	<.001	.05	.01	<.001
IV * Moderator	—	—	—	-.00	.01	.644
IV: Frequency of exposure to negative information about safety						
IV	-.21	.03	<.001	-.21	.04	<.001
Moderator	.10	.01	<.001	.10	.01	<.001
IV * Moderator	—	—	—	.00	.01	.617
IV: Frequency of net exposure to negative vs positive vaccine-related information						
IV	-.18	.02	<.001	-.18	.02	<.001
Moderator	.06	.01	<.001	.06	.01	<.001
IV * Moderator	—	—	—	.01	.01	.185

Abbreviation: IV, independent variable.

^aMultivariable logistic regression was performed involving each type of social media exposure and perceived information quality, with age, gender, grade, and history of COVID-19 quarantine being adjusted for.

^bMultivariable logistic regression was performed involving each type of social media exposure, perceived information quality, and their product term, with age, gender, grade, and history of COVID-19 quarantine being adjusted for.

to assimilate information into their belief structure efficiently.³³ Above all, the mean score of the media literacy scale was 3.6 (out of 5) in this sample, indicating the rooms for improvement. Similarly, a recent study revealed that a considerable proportion of university students had inadequate media literacy in relation to deciphering the veracity and purpose of COVID-19-related information on social media.⁵⁵ It is imperative to deliver media literacy interventions to empower university students to manage conflicting social media messages about COVID-19 vaccination. Relevant strategies may include increasing awareness of distorted media presentations, fostering sleuthing skills to recognize the intents and biased presentations of anti-vaccine messages, and providing basic knowledge needed to interpret information about vaccine efficacy/safety such as the difference between ‘seroconversion rate’ and ‘vaccine efficacy’.^{28,56} Moreover, as mentioned above, the information surrounding the performance of COVID-19 vaccines can change over time, the content of relevant media literacy interventions needs to be adapted correspondingly.

Unexpectedly, the hypothesized moderation effect of perceived information quality was not supported. This suggests that people might accept or reject COVID-19 vaccination after being repeatedly exposed to positive or negative

information about COVID-19 vaccines on social media, regardless of their perceptions of the information quality. A possible explanation is that when encountering a large amount of information, people may have limited cognitive capacity and motivation to fully evaluate the information quality; instead, they will adopt simpler strategies for decision making by aligning their attitudes and behaviors with those of social others.⁵⁷ It is speculated that people frequently exposed to positive or negative information in their online social networks might pay less attention to the information quality when making their vaccination decisions. Future studies are recommended to investigate how information quantity and quality interact to influence decision-making about vaccination during a public health emergency.

This study has some limitations. First, the cross-sectional study design limits the ability to make causal inference. It is possible that the participants who had higher vaccination intention would like to obtain more positive information about vaccines. Second, this study only tested one hypothetical scenario of vaccine efficacy and safety. The effect of social media exposure may be different under other scenarios. Third, the self-reported measures may be subject to social desirability bias and recalling bias. For example, participants might not accurately recall their information exposure over the 1-month

period. Fourth, general measures were used to assess participants' overall exposure to positive and negative information related to the efficacy and safety of COVID-19 vaccines on social media. Hence, it is impossible to indicate the exact positive/negative contents that participants referred to in the survey and differentiate the effects of exposure to information of varying levels of positivity/negativity on vaccination intention. Moreover, participants were asked to report the frequency of information exposure on 5-point Likert scales but not the exact number of times of information exposure, which reduces the interpretability of the data. Lastly, the study sample had a high education level and thus the generalization of our results to other population groups shall be cautiously made. Moreover, approximately half of the participants were students in medicine/pharmacy, which reduces the representativeness of the sample.

“SO WHAT?”

What is already known on this topic?

Frequent social media exposure can shape COVID-19 preventive behaviors.

What does this article add?

More frequent exposure to positive but not negative information about vaccine efficacy and safety on social media was associated with increased COVID-19 vaccination intention. Higher net exposure to negative vs information was associated with decreased vaccination intention. Furthermore, media literacy attenuated the negative effect of frequent negative information exposure whereas strengthened the positive effect of frequent positive information exposure.

What are the implications for health promotion practice or research?

The findings can inform the development of effective communication strategies to promote COVID-19 vaccination. It is imperative to increase the proportion of positive information about vaccines on social media and monitor the evolving information environment to counteract the effect of negative information. Media literacy interventions are also necessary to empower people to manage conflicting social media messages about vaccines.

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Meiqi Xin: Conceptualization, Methodology, Formal analysis, Writing- Original draft preparation. Sitong Luo: Methodology, Formal analysis, Project administration, Writing- Reviewing and Editing. Suhua Wang: Resources, Investigation, Writing- Reviewing and Editing. Junfeng Zhao: Resources, Investigation, Writing- Reviewing and Editing. Guohua Zhang: Resources, Investigation, Writing- Reviewing and Editing. Lijuan Li: Resources, Investigation, Writing- Reviewing and Editing. Liping Li: Resources, Investigation, Writing- Reviewing and Editing. Joseph Tak-fai Lau: Conceptualization, Supervision, Writing- Reviewing and Editing.

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Ethical Approval

This study was approved by the Survey and Behavioral Research Ethics Committee of The Chinese University of Hong Kong (No. SBRE-20-094).

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

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Supplemental Material

Supplemental material for this article is available online.

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