

# Media Exposure to COVID-19 Information, Risk Perception, Social and Geographical Proximity, and Self-Rated Anxiety in China

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## Research article

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# Abstract

## Background

A novel coronavirus named COVID-19 is an emerging infectious disease confronting the world. The lack of effective antiviral drugs and vaccines, along with the relative high death rate and high contagiousness, has raised strong public concerns over COVID-19, especially for those people who live in the most severely affected areas. This study aims to clarifying the factors that influence anxiety level of Chinese people during the COVID-19 pandemic, with particular focus on exposure to different COVID-19 information in media.

## Methods

4991 respondents were randomly recruited from a national online panel from February 12, 2020 to February 14, 2020, during which period of time the number of COVID-19 cases surpassed 10,000 in a single day and the total cases in China reached to 63940. Measures assessed respondents self-rated anxiety, media exposure of COVID-19 information, social and geographical proximity to COVID-19, and perceived risk.

## Results

Media exposure to COVID-19 information was differently associated with anxiety. Anxiety was found to be high in respondents who personally know someone infected with COVID-19 or living in an area that has reported cases. Respondents perceived more risks also reported higher level of anxiety.

## Conclusions

This study highlighted the role of media exposure in influencing individuals' anxiety level during a global pandemic. Government and health professionals are recommended to adopt effective risk communication strategy to improve citizens' mental health during the pandemic.

## Background

A novel coronavirus named COVID-19 is an emerging infectious disease confronting China and quickly spread across the world. Since the outbreak began in Wuhan in December 2019, more than 80,000 cases have been recorded so far. The newly-found diseases have killed more than 4000 people in China, exceeded the 776 who died in the 2003 SARS outbreak. According to World Health Organization (WHO), COVID-19 is related to the SARS-associated coronavirus (SARS-CoV) that caused an outbreak of severe acute respiratory syndrome (SARS) in 2002–2003 [1]. The typical symptoms of viruses include cough, fever, and shortness of breath. People who are infected with COVID-19 can transmit the virus to others

even when they do not display any symptoms[2]. On January 30, 2020, WHO declared the outbreak a public health emergency of international concern [3]. Due to its high infectiousness and “no symptom” characteristic, COVID-19 has raised great anxiety and panic among Chinese people.

Information disseminated by media has played a crucial role in influencing the public’s risk perception and anxiety during a pandemic [4]. At the beginning of the COVID-19 outbreak, the public were not very much concerned about the severity of the new coronavirus as they were misguided by the information “there has been no evidence of human-to-human transmission” released by Wuhan Municipal Health Commission [5] that was widely circulated on both mass media and social networking site. The turning point of public awareness about the seriousness of COVID-19 is that when Zhongnanshan, the head of the National Health Commission's team, appeared in the state-owned media and confirmed human-to-human transmission of the novel coronavirus on January 20, 2020. Since then, COVID-19 quickly became a national health emergency with infections spread to every province in less than two weeks. Wuhan, the epicenter of the new coronavirus outbreak that has more than 11 million people, was shut down on 23 January 2020, marking the biggest government intervention to stop the spread of COVID-19. Soon after that, nearly all the Chinese people were quarantined at home. During the outbreak of COVID-19, Chinese people received tons of information about COVID-19 through various outlets.

Up until now, COVID-19 vaccine is still underway. The lack of effective antiviral drugs and vaccines, along with the relative high death rate and infectiousness, has raised strong public concerns, especially for those people who are in the most severely affected areas. During the quarantine period, there are considerable fear and anxiety over the COVID-19 pandemic, as well as panic over scarce resources. Exposure to COVID-19 information in media inevitably influence the public’s responses to the pandemic considering media serve as the main information source during the quarantine period. Dissemination of accurate and credible information about a pandemic could effectively slow down the spread of the virus and decrease associated apprehension in the population. Previous research has generated different findings on the effect of media on anxiety during the outbreak of a pandemic. For example, one study found that the media created little anxiety among Canadian college students after a few months of SARS outbreak[6]. Another study, however, revealed that high level of television exposure is related to higher level of anxiety during H5N1 across the European Union [7]. Therefore, it is too simplistic to generalize the effect of media exposure on individual’s psychological responses, such as anxiety.

A handful of research has been conducted to study the public’s anxiety level during the pandemic, such as ebola [8], H7N9 [9] SARS [6], H5N1[10]. These studies have generally found that the outbreak of an epidemic is associated with higher level of anxiety among the public. Understanding the psychological factors that predict anxiety during an outbreak of a pandemic is important because for certain people health anxiety could lead to clinically significant distress (e.g., anxiety and fear), worry, and excessive preventative behaviors such as excessive hand washing, repeatedly seeking reassurance from medical professional [11].

To date, there is not many studies focusing on the effect of media exposure to different content on anxiety level during a global pandemic. Elucidating the factors that contribute to anxiety during a pandemic is valuable in understanding the public responses to a health emergency of international concern more generally and identify possible maladaptive responses of individuals [3]. Thus, the present research is conducted to identify the factors associated with anxiety during the outbreak of COVID-19, with particular focus on the effect of media exposure.

## Methods

Because landline telephone only covered 182 million households in China [12], there are a large amount of population which cannot be accessed using traditional landline-lined based telephone surveys, while there are 854 million Chinese people get access to Internet in 2019 [13], we chose to use an online sample in the present study. Upon IRB approval, 4991 respondents were randomly recruited from a national online panel that consists of 1,075,809 Chinese adults from February 12, 2020 to February 14, 2020, during which period of time the number of the new coronavirus cases surpassed 10,000 in a single day and the total cases in China reached to 63940.

All the respondents completed informed consent form before filling out the survey. After data cleaning procedure, a total of 4991 respondents were included in the final sample. Table 1 shows the demographic characteristics and anxiety level of the respondents. Of the respondents, 18% had high school education or lower, 31.9% had associate degree, 47% had college degree, 5% had graduate degree. 49.6% were male and 50.4% were female. A majority of the respondents have a monthly income below 5,000 rmb.

Table 1  
 Respondents' characteristics, perceived knowledge, social and geographical proximity, anxiety level (*N*= 4991)

<b>Demographics</b>	<b>N</b>	<b>%</b>
Gender		
Female	2514	50.4%
Age		
18–30 years	3203	64.2%
31–40 years	1246	25.0%
41–50 years	399	8.0%
51–60 years	126	2.5%
≥ 61 years	17	0.3%
Education		
Primary or secondary school	800	16.0%
Associate degree	1585	31.8%
College	2356	47.2%
Graduate degree	250	5.0%
Monthly Income		
≤ 1000 rmb	929	18.6%
1001–2000 rmb	361	7.2%
2001–5000 rmb	1707	34.2%
5001–8000 rmb	1498	30.0%
8001–15000 rmb	411	8.2%
≥ 15001 rmb	85	1.7%
Anxiety Level		
Normal (< 50)	3963	79.4%
Mild to moderate anxiety levels (50–59)	699	14%
Moderate to severe levels (60 to 69)	256	5.1%
Severe anxiety levels (> 70)	73	1.5%
Social Proximity		

Demographics	N	%
Yes	293	5.9%
Geographical Proximity		
Yes	1608	32.2%
Perceived Knowledge of COVID-19		
Do not know COVID-19 at all	22	0.4%
Know a little bit	209	4.2%
Know some	2193	43.9%
Know fair amount	2035	40.8%
Know a great deal	532	10.7%

**Risk perception.** Respondents were asked to assess their perceived risk of “being affected by the new coronavirus” and “being affected by the new coronavirus compared to others,” which was measured on 5-point Likert-type scale ranging from 1 = very unlikely to 5 = very likely.

**Anxiety level** was measured by Chinese version of Zung Self-Rating Anxiety Scale (SAS-20)[14] that consisted 20 questions. Respondents were asked to estimate their anxiety level within a period of one or two weeks prior to taking the test. Sample items include: I feel afraid for no reason at all; I can feel my heart beating fast; I have nightmares. Responses was rated on a four-point Likert-type scale anchored at 1 (never or very rare), 2 (sometimes), 3 (often), and 4 (very often or always). The total SAS score may vary from 20 (no anxiety at all) to 80 (severe anxiety). Zung recommended converting the raw score to Index Scores (ranged between 25 and 100) by multiplying the raw score by 1.25. The cut-off points were used: an index score of 50 and above. The internal reliability (Cronbach alpha) is .84 ( $M = 42.05$ ,  $SD = 10.07$ ).

**Social proximity** was measured with the dichotomous question “Is there someone you know who contracted the new coronavirus,” with (0 = No; 1 = Yes). **Geographical proximity** was measured with direct dichotomous (yes/no) question “Are there reported cases of infection in your neighborhood or in your town?”

**Media exposure.** In order to assess the amount of media exposure to different COVID-19-related content, we synthesized 10 categories of COVID-19 information that have been frequently appeared in mass media and social media. Respondents were asked to indicate how much attentions they paid to the each of following information in media, including “how to prevent the new coronavirus,” “the number of cases of infection,” “news coverages of patients,” “news coverage of doctors and nurses,” “news coverages of government officials,” “news coverages of scientists,” “donation information,” “life of ordinary people during the COVID-19 outbreak,” “information about returning to work/school,” and “analysis of the pandemic” (1 = Do not pay any attention at all; 5 = Pay a lot of attention).

# Dada Analyses

The data was analyzed using SPSS version 25. Pearson correlation was conducted to examine the relationship between predictors and outcome. The level of significance was set at  $p < 0.05$ . Hierarchical ordinary least squares (OLS) regression analysis was used to assess the associations between anxiety, media exposure, social proximity, geographical proximity, and risk perceptions, adjusting for age, sex, education, and income.

## Results

As shown in Table 2, respondent's media exposure is generally medium to high. Among 4991 respondents, only a small number of respondents (5.87%) reported they know someone who contracted COVID-19 personally. 32.2% indicated there are reported cases in the area where they live. Only 22 respondents (0.4%) do not know COVID-19 at all. Of the total respondents, 48.1% "know a little bit" or "know some" and 51.5% "know fair amount" or "know a great deal." 5.9% of the respondents perceived their likelihood of "acquiring COVID-19" as high or very high. Over half of the respondents rated their risks of acquiring COVID-19 as low. Most respondents' anxiety level fall in normal range ( $M = 42.05$ , range 25–100). 14% reported mild to moderate anxiety level. 5.1% of the respondents experienced moderate to severe levels. Only 1.5% of the respondents reported severe anxiety levels. Table 3 shows the correlations between demographic variables, social and geographical proximity, perceived risks, and anxiety. The results revealed that self-rated anxiety is significantly associated with most independent variables.

Table 2  
Exposure to different coronavirus-related information

Information exposure	M(SD)
How to prevent the new coronavirus infection	4.00(.88)
The number of cases of infection	4.06(.92)
News coverages of patients	3.71(.99)
News coverages of doctors and nurses	3.71(.99)
News coverages of government officials	3.46(1.07)
News coverages of scientists	3.68(1.05)
Donation information	3.33(1.02)
Life of ordinary people during the COVID-19 outbreak	3.61(.99)
Information about returning to work/school	3.84(1.08)
Analysis of the pandemic	3.91(.99)

Table 3

Pearson correlations between perceived risks, perceived knowledge, social and physical proximity to COVID-19, self-rated anxiety

	1	2	3	4	5	6	7	8
1. Gender								
2. Age	-.002							
3. Education	-.03*	.05*						
4. Income	.12**	.44**	.32**					
5. Perceived risk	-.004	-.03	.04*	.01				
6. Perceived risk compared to others	-.03	-.01	.05**	-.01	.65**			
7. Social proximity	.003	.07**	.05**	.06**	.12**	.14**		
8. Geographical proximity	-.02	-.05**	-.07**	-.07**	.18**	.19**	.20**	
9. Self-rated anxiety	.03	-.12**	.03	.004	.22**	.20**	.14**	.09*
* $p < .05$ ** $p < .01$								

Table 4 shows the results from regression analysis predicting self-rated anxiety. Demographic variables including sex, age, gender, education were entered in the first block, followed by social proximity and geographical proximity, perceived risk and perceived risk compared to others were entered in the third block, exposure to different COVID-19 information in the fourth block. Among demographic variables, the results showed that education had statistically significant association with perceived anxiety ( $\beta = .04$ ,  $p < .01$ ), with respondents who have higher education reported more anxiety. Age was found to be negatively associated with perceived anxiety ( $\beta = -.14$ ,  $p < .001$ ), with older respondents experienced higher level anxiety than younger respondents. Gender and income were not significantly associated with anxiety. Taken together, the demographic variables accounted for 2.1% of the variance.

Table 4  
 Ordinary least squares regression analysis predicting self-rated anxiety

Variable	Self-rated Anxiety			
	Model 1	Model 2	Model 3	Model 4
	beta	beta	beta	beta
Demographic				
Gender	.02	.03	.03	.01
Age	-.14***	-.14***	-.14***	-.11
Education	.05**	.05*	.04*	.04**
Income	.03	.03	.03	.04**
Proximity				
Social Proximity		.14***	.12***	.11***
Geographical Proximity		.05**	.02	.02
Perceived risk				
Perceived risk			.13***	.12***
Perceived risk compared to others			.07***	.08***
Information exposure				
How to prevent COVID-19				-.13***
The number of cases of infection				-.09***
News coverages of patients				.01
News coverage of doctors and nurses				.02
News coverages of government officials				.003
News coverages of scientists				-.03
Donation information				.12***
Life of ordinary people during the COVID-19 outbreak				.08***
Returning to work/school				-.08***
Analysis of the pandemic				-.08***
Adjust R squared	.02	.05	.08	.14

Self-rated Anxiety				
ANOVA	$F(4,4990) = 24.88$	$F(4,4990) = 35.71$	$F(4,4990) = 34.49$	$F(4,4990) = 41.24$
* $p < .05$ ** $p < .01$ *** $p < .001$				

The results indicated that after controlling for demographic variables, social proximity and geographical proximity were positively associated with self-rated anxiety,  $\beta = .14, p < .001$  and  $\beta = .05, p < .001$ , separately. Respondents who personally know someone infected by the COVID-19 or living in a neighborhood that has reported cases of COVID-19 experienced higher level of anxiety. Social proximity and geographical proximity accounted for an additional 2.3% of the variance.

Results indicated that perceived risk of COVID-19 ( $\beta = .13, p < .001$ ) and perceived risk of COVID-19 compared to others ( $\beta = .08, p < .001$ ) were both positively associated with perceived anxiety. The perceived risks accounted for an additional 3.2% of the variance.

For the relationship between media exposure of COVID-19 information and self-rated anxiety, our result revealed that information about “how to prevent the new coronavirus,” “the number of cases of infection,” “information about returning to work/school,” and “analysis of the epidemic” were negatively associated with self-rated anxiety. “Donation information” and “life of ordinary people during the outbreak” were positively associated with self-rated anxiety. “News coverage of patients,” “News coverage about doctors and nurses,” “news coverage about patients,” and “news coverage about scientists” were not significantly associated with self-rated anxiety. Together, media exposure accounted for 5.1% of the variance in self-rated anxiety.

## Discussion

This study offers the preliminary research on the public’s anxiety level during the outbreak of COVID-19 in China, which is one of the biggest infectious disease outbreaks in China’s history. One notable strength of the present study is that the data was collected at the peak of COVID-19 outbreak in China. Thus, the public responses to COVID-19 were recorded in a more accurate manner compared to retrospective reporting. Generally, it is found that most of the respondents’ anxiety level were normal during the outbreak of COVID-19. Even though the study was conducted at the peak of the pandemic, a majority of respondents reported low to medium level of perceived risks. One explanation for these findings is that most people were required to be quarantined at home, which could lower their risk perceptions and anxiety of getting COVID-19 infection. Most respondents consider themselves know COVID-19 fairly well.

Media play a particular important role in influencing public responses to COVID-19 as nearly all people around the country were quarantined at home to prevent the possible spread of the virus during the outbreak, thus making them spend a large amount of time on media. Previous research has generally found that increased exposure to pandemic-related information leads to higher level of anxiety[11]. These

studies commonly measured media exposure by assessing the amount of information a person exposed to during the pandemic, while little is known about what specific type of information increase or decrease anxiety. The current study focuses on the effect of media exposure to information about COVID-19 on anxiety. National media, social media, as well as China CDC and government authorities, disseminate information in a timely manner to make people stay informed during the pandemic. It is virtually impossible for people not exposing themselves to any COVID-19 information at all. The main finding of the present study is that media exposure to different COVID-19 information influenced people's self-rated anxiety in distinct ways. The results showed that some COVID-19 information increased person's anxiety while others decreased it. For example, it is found that donation information and the life of ordinary people were positively with self-rated anxiety. One possible explanation is that donation information is a signal that the hospitals were in shortage of protective equipment, which may therefore increase people's anxiety level. During the pandemic, most news coverage about the life of ordinary people are negative-valanced, focusing on the stories of people who is infected with or died of the new coronavirus. Therefore, exposure to information about the life of ordinary people increased one's anxiety level. Information about returning to work/school were negatively associated with anxiety level because it suggests that the pandemic is under control and quarantine will soon be over. Interestingly, information about the number of reported cases of COVID-19 and the analysis of the COVID-19 pandemic were negatively associated with anxiety. We reasoned that knowing the number of reported cases and deaths could actually lower the uncertainty level of the public because uncertainty often arises with lack of information and "uncertainty is experienced subjectively as anxiety"[15]. Compared to not knowing the real situation of the pandemic, people are likely to feel less anxious when they get to know more information about the seriousness of the pandemic through media. Not surprisingly, information about how to prevent COVID-19 was negatively associated with the level of anxiety because having more knowledge about prevention of COVID-19 could lower people's anxiety over contracting the new coronavirus.

Overall, more educated and younger respondents experienced relatively higher level of anxiety. The results were generally consistent with the previous research suggesting that younger people were more likely to be anxious than older adults [16]. Gender and income do not have significant associations with anxiety level.

Another important finding generated from the present study is that both social proximity and geographical proximity to COVID-19 were positively associated with anxiety. Because COVID-19 is a highly communicable virus, people who know someone was affected by COVID-19 personally will especially susceptible to anxious thoughts than others. Living in an area that has reported cases is significantly associated with anxiety. The results were consistent with the previous study showing that shorter distance to the risk result in higher risk perception[17]. Moreover, individuals perceived more risks reported higher level of anxiety compared to those who perceived less risks. It is possible that who have higher risk perception overestimate their risk of contracting COVID-19 and therefore feel more anxious. Nevertheless, to better understand the relationship between anxiety and risk perception, longitudinal studies are recommended to be conducted.

Our study has several limitations that are worth noting. Our results may suffer from generalizability problem. Online panel inherently comes with sample selection bias. The respondents are generally younger and more educated in our sample, and may therefore not be representative of rural populations in China. Even though a majority of Chinese citizens now can get access to Internet, there are still people who are unable to access to Internet, especially older people or those in the economically disadvantaged area. Moreover, since this is a cross-sectional study, we are unable to explore how the level of anxiety fluctuates throughout the COVID-19 pandemic and make strong causal inference.

This study raises important implications. Government and public health practitioners could take prevention-focused approach to promote citizens' mental health during the pandemic. If the public psychological well-being cannot be ensured, heightened emotions such as anxiety could lead to detrimental social effects. For example, one study found that increased anxiety may lead to shortage of medical supplies such as face masks [9].

## Conclusions

In conclusion, our study suggested that anxiety level was differently associated with media exposure of COVID-19. The anxiety level was also explained by social proximity and geographical proximity to COVID-19, as well as perceived risk. Since the narratives of media play a major role on the public responses to COVID-19, government and media professionals are recommended to deliver balanced information about the pandemic instead of overemphasizing the negative information, which could fuel the panic and uncertainty among the public. Dissemination of certain type of information in media, such as infection prevention of the new coronavirus, could be effective anxiety management tools. Overall, the present study adds great value in understanding the public responses to a serious illness threat in a media-saturated age.

## Abbreviations

COVID-19

Coronavirus disease 2019

WHO

World Health Organization

SARS

Severe acute respiratory syndrome

China CDC

China Centers for Disease Control and Prevention

Ebola

Ebola Virus Diseases

H7N9

Asian lineage avian influenza A

H5N1

## **Declarations**

### **Consent for publish**

All authors have read and approved the final manuscript.

### **Ethics approval and consent to participate**

The study received ethical approval from the Institutional Review Board (IRB) (Beijing Normal University Research Committee, School of Journalism and Communication) at Beijing Normal University.

### **Availability of data and materials**

The dataset used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### **Competing interests**

The authors declare that they have no competing interests.

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### **Authors' contributions**

HZ: participated in data collection and preparation of the manuscript

ML: participated in data collection and preparation of the manuscript

HH: participated in preparation of the manuscript

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