

## Clinical and Psychotherapy

# Exposure to COVID-19-related media content and mental health during the initial outbreak of COVID-19 in China

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Liu, T., Zhang, S. & Zhang, H. (2022). Exposure to COVID-19-related media content and mental health during the initial outbreak of COVID-19 in China. *Scandinavian Journal of Psychology*, 63, 283–289.

Exposure to disaster-related media content is closely related to mental health. This study aimed to explore the patterns of COVID-19-related media exposure and examine whether these patterns were associated with mental health. In total, 917 participants in this study completed the Media Exposure Questionnaire (MEQ), the Positive and Negative Affect Scale (PANAS), and the Depression Anxiety Stress Scale (DASS-21). Then latent class analysis and discriminant analysis were conducted to identify the patterns of media exposure. Finally, we tested how mental health was associated with such patterns. Four subtypes of media exposure were identified: the slightly exposed group, the lower-moderately exposed group, the higher-moderately exposed group, and the heavily exposed group. And there were significant differences in individuals' levels of positive and negative affect among different subtypes, but no difference in depression, anxiety, and stress. The results of the current study indicated that more COVID-19-related media exposure was related to increased positive and negative affect. And the current findings would help people to better understand the relationships between media exposure and mental health during a pandemic.

**Key words:** Media content, mental health, positive and negative affect, COVID-19, disaster.

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## INTRODUCTION

In early 2020, COVID-19 had spread throughout China. By 10 November 2021, over 126,000 cases were confirmed nationwide, and over 250 m cases were confirmed globally. According to the compensatory control theory, knowing nothing about the disease at the initial outbreak could decrease people's feeling of control (Kay, Gaucher, Napier, Callan & Laurin, 2008). Thus, they show a rising tendency to rely on the authorities to seek COVID-19-related information for increasing their feeling of control (Bao, Sun, Meng, Shi & Lu, 2020). Also, the development of communication technology makes massive media coverage about COVID-19 easily accessible to a vast number of people. Accordingly, it is essential to examine if exposure to COVID-19-related media is associated with positive or negative psychological outcomes.

Previous studies reported media exposure to natural disasters or terrorism was positively associated with several negative psychological outcomes, including depression (e.g., Ahern, Galea, S., Resnick, H., *et al.*, 2002), stress (e.g., Dougall, Hayward & Baum, 2005; Propper, Stickgold, Keeley & Christman, 2007), anxiety (e.g., Pfefferbaum, Newman, Nelson, Nitiéma, Pfefferbaum & Rahman, A., 2014) and negative affect (e.g., Pillow & Mcnaughton Cassill, 2001). For example, a cross-sectional study on the Boston Marathon bombing found that increased depression has been linked to exposure to media coverage of

terrorist attacks (Busso, McLaughlin & Sheridan, 2014). Furthermore, an experimental study also found that children who were shown the disaster media cues had significantly higher levels of anxiety than those shown the neutral weather film (Ortiz, Silverman, Jaccard & La Greca, 2011). According to the theory of protection motivation, individuals aware of the threat may experience anxiety (Rogers, 1983). What is more, the anxiety levels would be intensified with the increasing severity and relevance of the threatening event (Lazarus & Folkman, 1984; Slone & Shoshani, 2010). Therefore, disaster-related media exposure would communicate a sense of personal or community threat, which would provoke reactions such as anxiety, anger, and other forms of negative affect (Hopwood & Schutte, 2016).

However, the participants of the above studies were onlookers who were not directly involved in a terrorist attack or disaster. But COVID-19 put everyone's life in danger, which meant people would feel directly threatened after prolonged exposure to media. So far, there have been some studies that investigated participants involved in dramatic trauma events such as tsunamis (e.g., Hall, Xiong, Yip *et al.*, 2019; Lau, Lau, Kim & Tsui, 2006) and terrorist attacks (e.g., Ahern, Galea, Resnick & Vlahov, 2004; Holman, Garfin & Silver, 2014; Silver, Holman, Andersen, Poulin, McIntosh & Gil-Rivas, 2013). The focuses of these studies were post-traumatic stress disorder (PTSD) or post-traumatic stress (PTS). Obviously, the trauma events were over when participants were investigated. However, the COVID-19 pandemic is significantly distinguished from the previously mentioned trauma events in terms of lasting time and impacting

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**Section Editor:** Professor Sigurd Hystad

sphere; in other words, the impacts of pandemic-related media exposure are still on-going and would last for a long time.

And there was another issue ignored by most previous studies, which was that different media content could affect mental health differently (e.g., Gao, Zheng, Jia *et al.*, 2020). In a previous study, four stressful images about the September 11 Terrorist Attacks were presented to participants, but the results showed that only frequent viewing of the image about people falling or jumping from the towers of World Trade Center was strongly associated with depression and PTSD (Ahern *et al.*, 2002). This finding indicated that certain content could be more disturbing to people and contribute more to negative psychological outcomes. Another two recent studies also found that positive content like heroic acts was positively associated with positive psychological outcomes (Chao, Xue, Liu, Yang & Hall, 2020; Hall *et al.*, 2019). Just as Lazarus and Folkman's (1984) theory pointed out, the accumulation of contextual information would increase people's sense of control, thereby reducing the threat. In the disaster context, content like heroic acts and strong measures taken by the government to control damage could increase people's sense of mastery, which may reduce the fear of the disaster. Accordingly, it is worth examining how both negative content and positive content are associated with mental health during the outbreak of COVID-19 at the same time.

In the present study, person-level statistical methods could have more utility (Walrath, Petras, Mandell, Stephens, Holden & Leaf, 2004; Zhang, Li, Ren & Liu, 2021). Because, indeed, few people only viewed or listened to one kind of media content (Wang, Gao, Chen, Ying, Tan & Liu, 2020). Instead, variable-level methods utilized in previous studies cannot reveal the patterns of media exposure. In this context, person-level statistical methods seemed to be more feasible and advantageous. Therefore, the present study was organized as follow: First, latent class analysis (LCA) was conducted to identify subtypes of individuals' media exposure during the COVID-19 pandemic; then discriminant analysis was utilized to verify the accuracy of the results of LCA; finally, analysis of variance (ANOVA) was performed to determine statistically significant differences in mental health among different subtypes of media exposure. The present study combined the person-level method and the variable-level method, aiming at discovering different impacts of COVID-19-related media exposure on mental health.

## MATERIALS AND METHODS

### Participants

Our internet-based (wj.qq.com) investigation was conducted in January 2020, a week after the Chinese government said the novel coronavirus could spread person-to-person. In the beginning, the link of our questionnaire was shared by several teachers and students from Tianjin Normal University via WeChat Moments (a popular Chinese social media platform). People who saw the link were encouraged to complete the questionnaire and share this link with more people. Eventually, 917 participants (304 males, 613 females) from all over the country were involved in the further analyses. The average age of the participants was 28.6 ( $SD = 9.5$ , range = 17–70). All the participants had been given consent for using their data in the study, and this study received ethical approval by the ethics committee of Tianjin Normal University (code: XL2020-12).

### Instruments

**Media exposure questionnaire.** The MEQ was adapted from previous research (Hall *et al.*, 2019) to assess both positive and negative media content that individuals have viewed. It included six items, which were the severity of the outbreak, knowledge of the disease and prevention, speeches from experts and the authorities, information from acquaintances online (via WeChat, Microblog, and so on), reports from hospitals, and people being heroic. An example item was "How often did you view the content about knowledge of the disease and prevention last week?". Each item had five responses, scaling from 1 (never) to 5 (always). Higher sum scores of these six items indicated higher levels of media exposure.

**Positive affect and negative affect scale.** The PANAS, composed of two subscales with ten items in each, was to assess individuals' levels of positive and negative affect (Watson, Clark & Tellegen, 1988). Each item had five responses, from 1 (almost none) to 5 (extremely much). Its Chinese version was confirmed to be reliable and valid as well (e.g., Liang & Zhu, 2015; Xue, Liu, Chen, Liu & Chao, 2021). In the present study, the Cronbach's  $\alpha$  coefficients for positive and negative affect subscales were 0.84 and 0.90, respectively. With higher scores, people would experience more positive or negative affect.

**Depression, anxiety and stress scales (DASS-21).** DASS-21 included three subscales, which were depression, anxiety, and stress (Lovibond & Lovibond, 1995). Each subscale was measured by 7 items with four responses, from 1 (never) to 4 (always). The reliability and validity of its Chinese version were tested by other studies (e.g., Chao, Chen, Liu, Yang & Hall, 2020; Wang, Sh, Geng *et al.*, 2015). The Cronbach's  $\alpha$  coefficients for each subscale (i.e., depression, anxiety, and stress) in this study were 0.82, 0.78, and 0.83, respectively. The higher scores on the corresponding scales indicated that the person was more psychologically distressed.

### Data analysis

The data analysis in the present study proceeded in the following sequential steps. In the first step, LCA was conducted with *poLCA* package (Linzer & Lewis, 2011) in R (version 4.0.0) to explore the patterns of exposure to COVID-19-related media content. Since some responses of the MEQ were selected less than 30 times, we adjusted the responses by merging 1 and 2 into 1, 4 and 5 into 3, and changing the original 3 into 2. Since LCA was taken as an exploratory approach, a model with one single class was estimated first, and other models were estimated subsequently. The best model was chosen by comparing the Akaike information criterion (AIC) and the Bayesian information criterion (BIC). Then discriminant analysis was utilized (in IBM SPSS 25.0) to verify the accuracy of the results of LCA.

In the second step, results of Kolmogorov–Smirnov tests indicated that the answers to the six questions of MEQ were not normally distributed ( $p < 0.001$ ). Accordingly, Kruskal–Wallis H tests were conducted to examine whether there were significant differences among the subtypes in exposure to all six kinds of COVID-19-related media content. And the results of pair comparisons of Kruskal–Wallis H tests were summarized in six boxplots generated by the *ggplot* argument in *ggplot2* package in R.

In the third step, the chi-square test and ANOVA were used to examine whether the subtypes differed in gender composition and age. Then ANOVA was utilized to examine between-class differences for positive affect, negative affect, depression, anxiety, and stress. The last two steps were conducted in IBM SPSS 26.0.

## RESULTS

### Model selection

Model fit information was summarized in Table 1. AIC began to level off after the three-class solution, and the four-class solution showed the lowest BIC. Since AIC is a poor indicator of the true number of classes (Yang, 2006) and BIC is a better one (Nylund, Asparouhov & Muthén, 2007), we selected the four-class model

Table 1. Comparisons of different LCA models ( $n = 917$ )

Model	Log-likelihood	$\chi^2$	AIC	BIC
1-class	-4708.89	112314.30	9441.78	9499.63
2-class	-4257.43	3779.53	8564.86	8685.38
3-class	-4109.04	1142.86	8294.08	8477.28
4-class	-4059.16	1016.56	8220.33	8466.20
5-class	-4037.37	954.47	8202.74	8511.29
6-class	-4015.70	683.19	8185.40	8556.63
7-class	-4000.56	609.86	8181.12	8615.02

as the best fitting. Based on our aim, the four-class solution was more suitable to examine whether certain content contributed more to mental health.

#### Discriminant analysis

Discriminant analysis was utilized to verify the validity of the four-class model of LCA. Table 2 shows the comparison of the results of LCA and discriminant analysis. The values on the diagonal range from 83.94% to 98.03%, and the values off the diagonal were low, which indicated the good classifications.

#### Characteristics of different types of media exposure

The item probability distribution for each latent class is shown in Fig. 1. The results of Kruskal–Wallis H tests showed that there were significant differences among these four subtypes in exposure to all six kinds of pandemic-related media content (Table 3 and Fig. 2). Participants in Class 1 (6.87% of the participants assigned to this class) viewed the least pandemic-related information, so it was named the slightly exposed group. Class 2 (15.59% of the participants assigned to this class) and Class 3 (33.26% of the participants assigned to this class) were both named after “moderately exposed” because participants in these two classes viewed the pandemic-related information at medium levels. Since the results of pairwise comparisons showed that the viewing frequencies of the first four kinds of content of Class 2 were significantly lower than that of Class 3, Class 2 was called the lower-moderately exposed group and Class 3 was called the higher-moderately exposed group. Participants in Class 4 (44.28% of the participants assigned to this class) viewed the most pandemic-related information, so it was named the heavily exposed group. The results of pairwise comparisons showed that Class 3 was significantly different from Class 4 in the exposure to the last four kinds of content.

#### Differences among four types of media exposure

The first row of Table 4 displays the proportions of males belonging to each class. Results of the chi-square test showed that these four classes differed by gender. But there was no significant difference in age among these groups.

Results of ANOVA also showed that there were significant differences in positive and negative affect among different types of media exposure, but no significant difference in depression, anxiety, and stress (Table 4). Bonferroni post-hoc comparisons (Fig. 3) indicated that participants in the heavily exposed group

Table 2. The comparison of the results of LCA and discriminant analysis ( $n = 917$ )

LCA	Discriminant analysis				Total
	Class 1 (%)	Class 2 (%)	Class 3 (%)	Class 4 (%)	
Class 1	56 (88.89)	4 (6.35)	3 (4.76)	0 (0)	63
Class 2	10 (7.00)	123 (86.01)	9 (6.29)	1 (0.70)	143
Class 3	0 (0)	8 (2.62)	256 (83.94)	41 (13.44)	305
Class 4	0 (0)	2 (0.49)	6 (1.48)	398 (98.03)	406
Total	66	137	274	440	917

had a higher mean level of positive affect than those in the other three groups, and participants in the higher-moderately exposed group had a higher mean level of positive affect than those in the slightly exposed group. As for negative affect, the heavily exposed group was significantly higher than the other three groups, and the higher-moderately exposed group was significantly higher than the lower-moderately exposed group.

#### DISCUSSION

The present study aimed to explore the relationships between exposure to COVID-19-related media content and mental health. To achieve this purpose, we adopted LCA to identify the patterns of exposure to COVID-19-related media content and examine how these patterns were associated with mental health.

Based on the participants' viewing frequencies of pandemic-related information, four subtypes of pandemic-related media exposure were identified through LCA. The time of viewing the information decreased from the heavily exposed group to the slightly exposed group. Those patterns and characteristics found in the current study were in alignment with the results in previous research (Shensa, Sidani, Dew, Escobar-Viera & Primack, 2018).

The results of ANOVA showed that media exposure was associated with positive and negative affect, which was consistent with previous studies (Chen, Liu, Li, Wei & Chao, 2020; Pillow & McNaughton Cassill, 2001; Veitch & Griffith, 1976). Besides, there were more females in the higher-moderately exposed group and the heavily exposed group than males. The result of the independent  $t$ -test showed that females spent more time viewing COVID-19-related media content ( $t = -5.86, p < 0.001$ ), which was in line with previous research (Gao *et al.*, 2020). However, the differences between males and females in positive and negative affect were not significant ( $t_{\text{positive affect}} = 1.80, p = 0.07$ ;  $t_{\text{negative affect}} = -1.13, p = 0.26$ ). Thus, the differences of positive and negative affect between the higher-moderately exposed group and the heavily exposed group did not account for gender composition. Overall, increased positive and negative affect related to more media exposure.

It seems abnormal that positive and negative affect were increased at the same time. Indeed, many researchers believed that positive and negative affect are two independent processes (Grzybowski, Wyczesany & Kaiser, 2014; Watson & Tellegen, 1985), which are stimulated by different content or factors. For instance, Veitch and Griffith (1976) found that individuals who heard “bad” news reported more negative feelings than those who heard “good” news. A key message sent

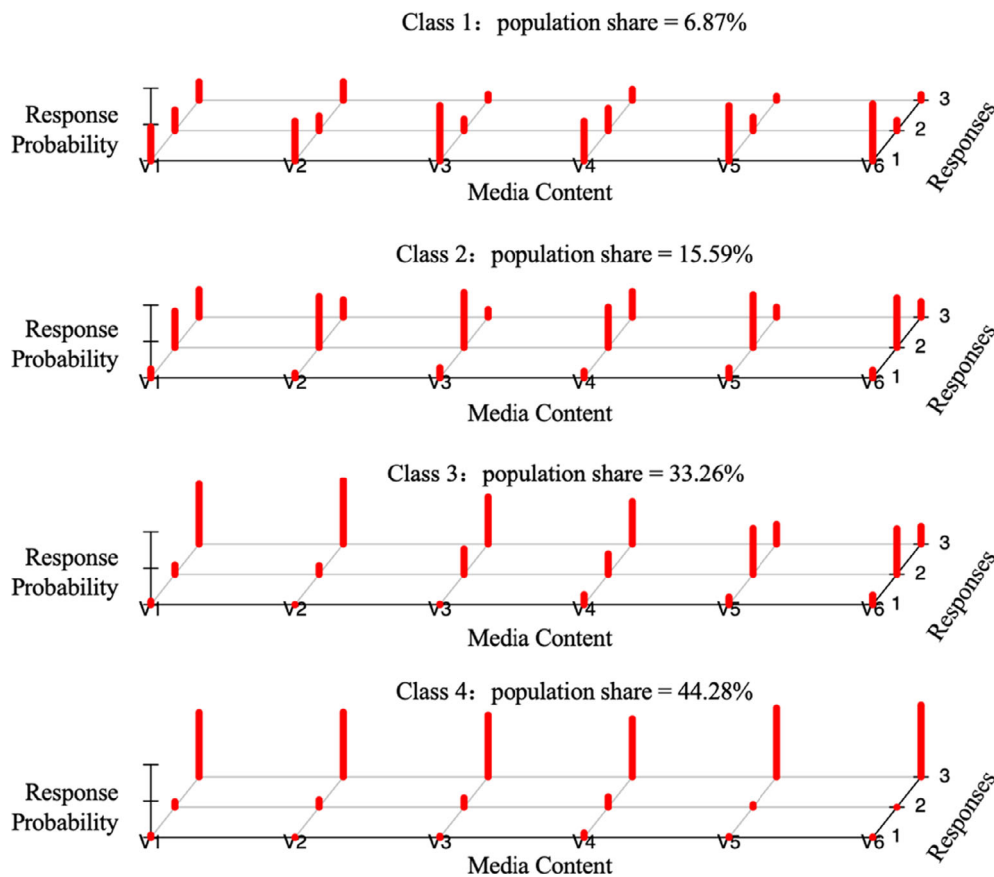


Fig. 1. Latent class profile plot for each class of media exposure ( $n = 917$ ). Note: V1 Severity of the outbreak; V2 Knowledge of the disease and prevention; V3 Speeches from experts and the authorities; V4 Information from acquaintances online; V5 Reports from hospitals; V6 People being heroic.

Table 3. Variable means (and standard errors) of different media content by different classes ( $n = 917$ )

Media content	Subtypes of media exposure				$\chi^2$	$p$	Effect size
	Slightly	Lower-moderately	Higher-moderately	Heavily			
1	2.68 (1.15)	3.29 (0.81)	4.10 (0.81)	4.24 (0.75)	205.84	<0.001	0.22
2	2.71 (1.14)	3.10 (0.52)	4.14 (0.55)	4.23 (0.63)	324.49	<0.001	0.35
3	2.11 (0.79)	2.87 (0.50)	3.81 (0.68)	4.14 (0.72)	377.76	<0.001	0.41
4	2.48 (0.95)	3.31 (0.77)	3.60 (0.89)	4.00 (0.86)	162.92	<0.001	0.18
5	2.17 (0.83)	2.94 (0.60)	3.15 (0.61)	4.27 (0.53)	562.23	<0.001	0.61
6	2.08 (0.75)	3.11 (0.64)	3.07 (0.68)	4.31 (0.46)	581.56	<0.001	0.63

Note: 1, Severity of the outbreak; 2, Knowledge of the disease and prevention; 3, Speeches from experts and the authorities; 4, Information from acquaintances online; 5, Reports from hospitals; 6, People being heroic.

from their study is that different news would elicit different affective responses. During a disease outbreak, those negative news (e.g., reports about running out of medical supplies and the severity of the outbreak) would probably be associated with the increase of negative affect, but at the same time, there were also many positive reports during the outbreak, such as reports about heroic acts and many effective control measures timely implemented by the Chinese government. According to Lazarus and Folkman's (1984) theory, viewing these kinds of media content would enhance people's sense of control and increase their confidence in overcoming this pandemic. Therefore, media coverage that is mixed itself would possibly increase both positive and negative affect at the same time.

In the present study, the differences between the lower-moderately exposed group and the higher-moderately exposed group manifested in the viewing frequencies of the content about the severity of the outbreak, knowledge of the disease and prevention, speeches from experts and the authorities, and information from acquaintances. At the same time, these two groups differed in negative affect. That meant these four kinds of content might be potentially related to negative affect. This assumption is supported by a previous study that found viewing content about the severity of the disaster was associated with negative affect (Ahern *et al.*, 2002). Unfortunately, the relationships between these kinds of content exposure and negative affect are not tested and revealed clearly in this study.

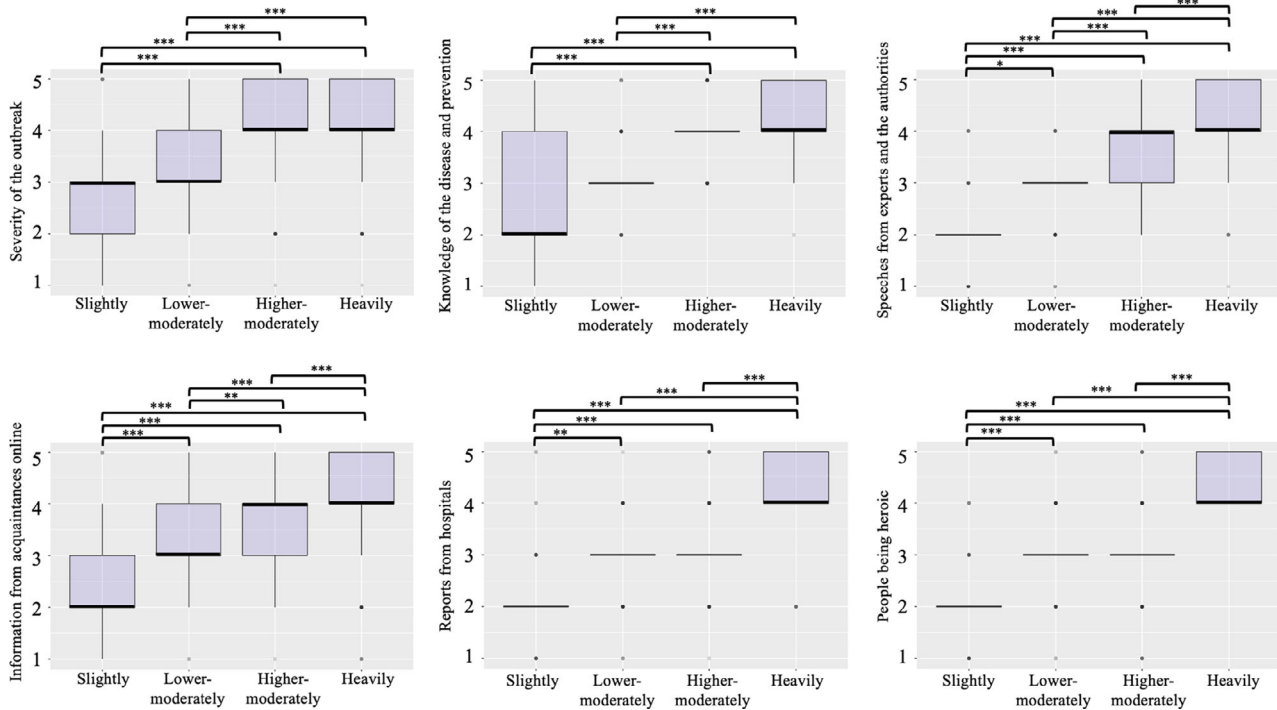


Fig. 2. Differences in viewing different kinds of media content among four groups ( $n = 917$ ). Note:  $*p < 0.05$ ,  $**p < 0.01$ ,  $***p < 0.001$ .

Table 4. Variable means (and standard errors) by different classes of media exposure ( $n = 917$ )

Variables	Subtypes of media exposure				$\chi^2/F$	$p$	Effect size
	Slightly	Lower-moderately	Higher-moderately	Heavily			
<b>Demographics</b>							
Gender (% males)	58.7%	46.9%	30.2%	26.6%	39.80	<0.001	–
Age	26.79 (6.19)	27.42 (8.79)	28.51 (8.74)	29.32 (10.49)	2.15	0.930	–
<b>Mental health</b>							
Positive affect	25.41 (7.54)	27.29 (5.80)	28.05 (5.42)	29.94 (5.94)	16.48	<0.001	0.05
Negative affect	20.17 (6.87)	20.52 (6.81)	22.50 (6.96)	24.49 (7.68)	14.87	<0.001	0.05
Depression	11.56 (4.00)	10.85 (3.49)	10.68 (2.90)	10.69 (3.32)	1.38	0.246	–
Anxiety	11.11 (3.07)	11.02 (3.30)	11.04 (2.71)	11.10 (3.13)	0.04	0.988	–
Stress	12.32 (3.66)	12.08 (3.40)	12.46 (3.16)	12.29 (3.65)	0.40	0.751	–

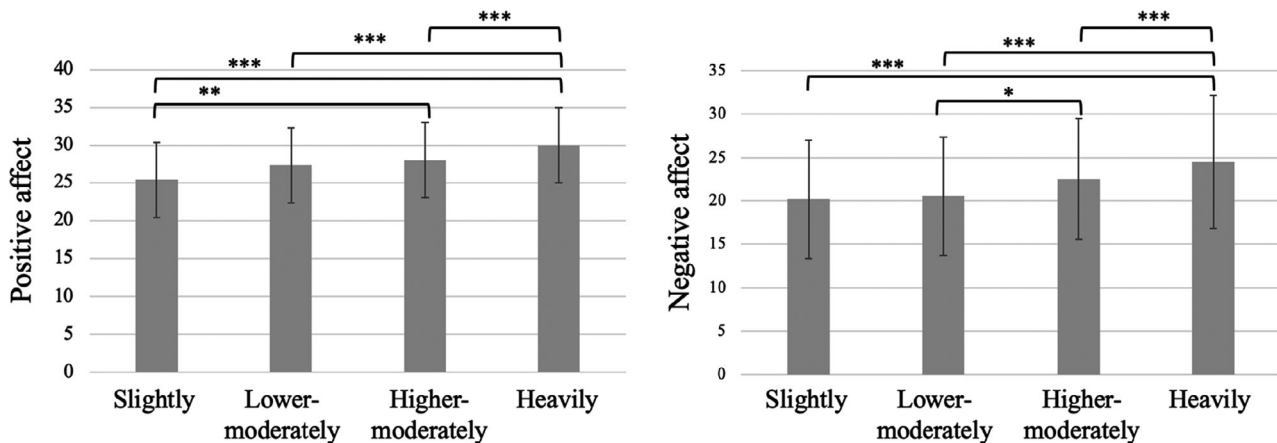


Fig. 3. Differences in positive and negative affect among four groups ( $n = 917$ ). Notes:  $*p < 0.05$ ,  $**p < 0.01$ ,  $***p < 0.001$ . Error bars represent one standard deviation of the means.



Moreover, compared to the heavily exposed group, the higher-moderately exposed group, on one hand, had less exposure to the content about speeches from experts and the authorities, information from acquaintances online, reports from hospitals, and people being heroic. Meanwhile, the higher-moderately exposed group had significantly lower levels in both positive and negative affect than the heavily exposed group. This coincidence might indicate that these four kinds of content are closely correlated with positive and negative affect. Hall *et al.* (2019) found that poor medical condition (e.g., shortage of medical supplies, patients cannot be admitted to hospital) was associated with negative psychological outcomes. Besides, they also suggested that viewing more images of heroic acts was associated with lower odds of PTSD. Thus, based on their arguments, it is possible that viewing reports from hospitals during the pandemic was related to increases of negative affect, while viewing the content about people being heroic was related to increases of positive affect. However, we cannot explore the relationship between each kind of media content and mental health one by one, due to the limitation of analysis methods utilized in this study.

Moreover, the results of ANOVA showed that there was no significant difference in depression, anxiety, and stress among the four subtypes. And there was no significant correlation between media exposure and the three negative psychological outcomes ( $r_{\text{depression}} = -0.06$ ,  $p = 0.07$ ;  $r_{\text{anxiety}} = 0.01$ ,  $p = 0.72$ ;  $r_{\text{stress}} = 0.02$ ,  $p = 0.50$ ). These results were inconsistent with previous studies (Busso *et al.*, 2014; Dougall *et al.*, 2005; Ortiz *et al.*, 2011; Propper *et al.*, 2007). This discrepancy might be explained by differences in media information that the participants viewed. In some research, only negative videos or news broadcasts were presented to the participants. The exposure of such negative information more probably led to negative psychological outcomes (Veitch & Griffitt, 1976). However, in our study, the results of LCA showed that most individuals viewed negative and positive information at the same time. The mixed exposure of media information might be the reason that we found no relationship between them, which is in conflict with previous research findings.

#### Limitations

There are several limitations of the current study. First, causal relationships could not be established by the cross-sectional design, so we did not know whether the media exposure caused individuals' positive and negative affect, or vice versa. Second, the increase of negative psychological outcomes might be affected by the number of confirmed cases in the city where the participants lived. But due to the small sample size of the current study, we did not take this into account when analyzing the data. Thirdly, the self-reported measure might be inaccurate for two reasons. One is people might overestimate the time they spent on social media (Junco, 2013). The other one is people of different psychological states might prefer recalling different kinds of media content. Finally, this study was conducted in the Chinese context, we were not sure if these results can be generalized to other countries.

Nevertheless, the current study found that exposure to COVID-19-related media content was associated with increased positive

and negative affect. Those findings in this study would provide guidance for clinical consultation and self-screening, in order to maintain people's mental health in this special time.

#### DATA AVAILABILITY STATEMENT

Data Availability Statement Research data are not shared.

#### FUNDING INFORMATION

This work was supported by the Ministry of Education of Humanities and Social Sciences project, Ministry of Education, China (18YJC190013) and Tianjin Normal University teaching reform project (JGYB01220015).

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Received 18 January 2021, Revised 15 November 2021, accepted 4 January 2022