



## Different impacts of COVID-19-related information sources on public worry: An online survey through social media



Hsing-Ying Ho<sup>a,1</sup>, Yi-Lung Chen<sup>a,b,1</sup>, Cheng-Fang Yen<sup>c,d,\*</sup>

<sup>a</sup> Department of Healthcare Administration, Asia University, Taichung, Taiwan

<sup>b</sup> Department of Psychology, Asia University, Taichung, Taiwan

<sup>c</sup> Department of Psychiatry, Kaohsiung Medical University Hospital & School of Medicine and Graduate Institute of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan

<sup>d</sup> School of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan

### ARTICLE INFO

#### Keywords:

COVID-19  
Information source  
Knowledge  
Public worry

### ABSTRACT

**Background:** The coronavirus disease 2019 (COVID-19) pandemic spread rapidly, as did COVID-19-related information on diverse media platforms. Excessive COVID-19-related information caused substantial mental distress among the public. Although most studies focused on the impact of information on individuals during the pandemic, they usually focused on information from internet sources, and few studies compared the impacts between different information sources. We examine the sociodemographic profiles of participants receiving different information sources and the impact of various COVID-19-related information sources on public worry. **Methods:** A cross-sectional online survey with a total of 2007 participants aged 20 years and above recruited anonymously was conducted during the COVID-19 pandemic. The sociodemographic data, frequencies at which participants received COVID-19-related information, the information sources (e.g., traditional media, interpersonal information exchange, and academic courses), and the levels of past, current, and anticipated worry about COVID-19 were assessed.

**Results:** The most common sources of COVID-19-related information were internet media (80.52%), traditional media (52.62%), family members (24.36%), coworkers (23.57%), friends (21.08%), academic courses (20.18%), and medical staff (19.03%). We found that the COVID-19-related information from traditional media, internet media, and friends was associated with higher current worry (the unstandardized regression coefficient, B, ranged from 0.27 to 0.30), and the information from friends was associated with higher past worry (B was 0.18). In contrast, participants who received information from academic courses had lower past worry and anticipated worry (B ranged from -0.15 to -0.17).

**Conclusions:** Academic courses may play a protective role in public worry during the pandemic. Therefore, academic courses and the information they provide may help facilitate public education and reduce public worry in cases of infectious disease outbreaks.

### 1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic spread rapidly, and news of the pandemic attracted the global public's attention and concern on diverse media platforms. Among the various platforms, the internet was the dominant media platform for the public during the COVID-19 pandemic (Ko et al., 2020). The worldwide search trends of COVID-19-related keywords increased unprecedentedly, and the most searched keywords on Google thus far have been COVID-19 symptoms, lockdown, and social distancing (Springer et al., 2020). Similarly,

COVID-19-related hashtags on Twitter continue to grow, and hashtags continue to garner attention (Chen et al., 2020). Meanwhile, the issue of accuracy of COVID-19-related information on YouTube, a video-sharing internet platform, was noticed. Evidence indicated that the accuracy of COVID-19-related information on YouTube was associated with video publishers. Videos published by official sources, such as governmental, professional, and educational organizations, were determined to be more accurate compared with those published by non-official sources. However, the number of videos and the number of views from official sources were significantly lower than those from

\* Corresponding author at: Department of Psychiatry, Kaohsiung Medical University, 100 Tzyou 1st Road, Kaohsiung 807, Taiwan.  
E-mail address: [chfaye@cc.kmu.edu.tw](mailto:chfaye@cc.kmu.edu.tw) (C.-F. Yen).

<sup>1</sup> Hsing-Ying Ho and Yi-Lung Chen contributed equally to this work as the first authors.

<https://doi.org/10.1016/j.invent.2020.100350>

Received 28 July 2020; Received in revised form 23 September 2020; Accepted 26 September 2020

Available online 12 October 2020

2214-7829/ © 2020 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

nonofficial sources. The noticeable proportion of misinformation (27.5%) on YouTube may have resulted in public panic (H.O. Li et al., 2020). In the United States, an online survey study that used convenience sampling reported that over two-thirds of the participants reported their worry about COVID-19, especially the concern about becoming infected with COVID-19 and the lack of medical sources should they be needed (Nelson et al., 2020). Furthermore, more than 95% of the participants changed their lifestyles, such as washing their hands more frequently, avoiding social gatherings, and stocking up on living supplies, to protect themselves from the COVID-19 pandemic (Nelson et al., 2020).

It has been observed that the fear and panic over COVID-19 was spread through many different outlets, especially through social media. It has been reported that the fear of COVID-19 negatively affected the mental health of approximately half of the social media users in Iraq (Ahmad et al., 2020). In addition, people who obtained COVID-19-related information from the internet had lower psychological well-being than those who received information from noninternet sources (Ko et al., 2020). Moreover, the effects of information exposure on mental health are dose-dependent; the longer the time over which users in China were exposed to COVID-19 information, the more anxiety and depression they reported (Yao, 2020).

Most research has focused on the impacts of internet information about COVID-19 while comparisons of the effects of different information sources about COVID-19 on public mental health have rarely been reported. Therefore, in this study, we examine the impacts of various COVID-19-related information sources (e.g., traditional media, the internet, interpersonal information exchange, and academic courses) on public worry, including past worry, current worry, and anticipated worry about COVID-19. In addition, we analyzed the sociodemographic profiles of the participants receiving information from different sources to determine the group characteristics.

## 2. Methods

### 2.1. Participants

The participants, who were 20 years of age or older, were recruited for this online survey through social media platforms, including Facebook (Facebook, Inc., United States), LINE (LINE Corporation, Korea), and the PTT Bulletin Board System (National Taiwan University, Taiwan) from March 20 to May 5, 2020. The participants were directed to the research website and responded to the questionnaire voluntarily and anonymously. To collect data from healthcare workers, we also posted the recruitment information of this research in healthcare workers groups on Facebook and LINE. This study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital.

### 2.2. Measures

#### 2.2.1. Sociodemographics

Sociodemographic data including participants' age, gender, education, and occupation were collected. Participants were classified as healthcare workers if they reported that they work in a healthcare institution. The education level of participants was classified into three groups: high school or below, bachelor's degree, and master's degree and above.

#### 2.2.2. COVID-19-related information sources

The frequency with which participants received COVID-19-related information was investigated as follows: internet media (e.g., Facebook, Twitter, blogs, and internet news), friends, traditional media (e.g., newspapers, television, and radio broadcasting), academic courses (e.g., online or in-person formal courses lectured by experts), medical staff in healthcare institutions, coworkers, and family members. The

participants were asked to respond to how often they receive information from each information source as never, sometimes, or always. The information sources were classified into low frequency (never and sometimes) and high frequency (always) groups because the sample sizes of the never group were too small for most information sources to be a separate group. In Taiwan, the academic courses related to COVID-19 are often organized by the Taiwan Centers for Disease Control (CDC) and healthcare institutions to improve public health education or to train healthcare workers.

#### 2.2.3. Worry about COVID-19

Past worry was measured by asking participants "In the past week, have you ever worried about catching COVID-19?" with a 5-point scale to rate their level of worry. Current worry was measured by asking participants "Please rate the current level of your worry toward COVID-19." with a rating scale from 1 (very mild) to 10 (very severe). The anticipated worry was measured by asking participants "If you were to develop COVID-19-like symptoms tomorrow, would you be..." with a 5-point scale for rating their level of worry (D.-J. Li et al., 2020). We used different scale-point designs (5-point scale and 10-point scale) to remind the respondents that these worry-related items measured different time scales (i.e., past, current, and anticipated), and we used a wider range scale (i.e., a 10-point scale) to capture the current worry for respondents deliberately reporting their status.

### 2.3. Statistical analysis

A minimum total sample size of 136 was estimated using G\*Power 3.1 (Faul et al., 2009) (90% power and two-sided 5% significance) to detect an  $R^2$  at 0.073 from the linear multiple regression model. The estimated effect size was guided using an existing study (Holman et al., 2019). The SAS 9.4 (SAS Institute Inc., Cary, NC) statistical computing software program was used to perform the statistical analysis in this study. To compare the differences in past worry, current worry, and anticipated worry between healthcare workers and nonhealthcare workers, independent *t*-tests were performed. To investigate the sociodemographic profiles of the participants receiving information from different sources and compare the sociodemographic profiles between the low frequency group and high frequency group of information sources, the likelihood ratio chi-squared and the Wilcoxon signed-rank tests were performed for categorical variables and continuous variables, respectively. To control for multiple comparisons of the seven sources of information, the Bonferroni method was applied with a *P*-value threshold set at 0.007 (0.05/7). To analyze the impacts of different information sources on worry about COVID-19, the general linear model (GLM) was applied with adjustment for sociodemographics (i.e., age, gender, education level, and healthcare workers) and the time period of participation (from the outbreak of COVID-19 on 21 January 2020 in Taiwan to the date of participation).

## 3. Results

A total of 2007 participants with an average age of 37.72 years were recruited in this study, and the sociodemographic data and measurement results are presented in Table 1. The average time period of participation was 76.70 days since the outbreak of COVID-19 in Taiwan (ranging from 59.79 to 105.14 days). Females were the dominant gender (66.18%) in this study, and most of the participants had a high level of education (89.03% had a bachelor's degree or above). Approximately one-third of the participants (32.49%) were healthcare workers, and their levels of worry were not different than those of nonhealthcare workers (*P*s > 0.05). Among healthcare workers, only physicians presented a higher level of anticipated worry compared to nonhealthcare workers (*P* < 0.01). The most common sources of COVID-19-related information were internet media (80.52%), traditional media (52.62%), family members (24.36%), coworkers

**Table 1**  
Sociodemographics and worry about COVID-19 in the online survey.

Variable	N = 2007	
	Mean ± SD, n (%)	Min–max
Age	37.72 ± 10.83	20–74
Gender		
Female	1325 (66.18)	–
Male	660 (32.97)	–
Transgender	17 (0.85)	–
Education levels		
High school or below	220 (10.97)	–
Bachelor's degree	1159 (57.81)	–
Master's degree and above	626 (31.22)	–
Healthcare workers		
No	1358 (67.73)	–
Yes	647 (32.27)	–
Physician	265 (40.96)	–
Nurse	123 (19.01)	–
Therapists	72 (11.13)	–
Others or unknown	187 (28.90)	–
Time period of participation (days)	76.70 (9.52)	59.79–105.14
COVID-19 information sources (high-frequency)		
Internet media	1616 (80.52)	–
Traditional media	1056 (52.62)	–
Family members	489 (24.36)	–
Coworkers	473 (23.57)	–
Friends	423 (21.08)	–
Academic courses	405 (20.18)	–
Medical staffs	382 (19.03)	–
Worry of infection		
Past worry	1.59 ± 1.00	0–4
Current worry	6.13 ± 2.25	1–10
Anticipated worry	2.93 ± 0.92	0–4

Abbreviations: SD, standard deviation; N, sample size. Healthcare workers contained two missing values.

(23.57%), friends (21.08%), academic courses (20.18%), and medical staff (19.03%).

The sociodemographic profiles of the groups who received COVID-19-related information from the various sources are presented in Table 2. We compared the differences in the sociodemographics between the low and high frequency groups for each information source. Age was significantly lower in the high frequency group of internet media whereas age was significantly higher in the high frequency groups of traditional media and academic courses. Females were dominant in all groups of information sources, especially in the groups of traditional media, family members, and coworkers. Because the number of transgender samples was small, we did not include these samples in the group comparisons. A higher education level was observed in the high frequency group of information from internet media. Healthcare workers were more dominant in the high frequency groups of information from coworkers, academic courses, and medical staff.

We further analyzed the impacts of COVID-19-related information sources on worry among the general public (Table 3). We found that COVID-19-related information from internet media, traditional media, and friends was associated with higher levels of current worry (unstandardized regression coefficient, B, ranged from 0.27 to 0.30). The COVID-19-related information from friends was also associated with a higher level of past worry (B was 0.18). In contrast, the COVID-19-related information from academic courses was associated with lower levels of past worry (B was -0.15,  $P = 0.04$ ) and anticipated worry (B was -0.17,  $P = 0.01$ ). In addition, this information was also negatively associated with current worry, although it was not statistically significant (B was -0.30,  $P = 0.07$ ).

## 4. Discussion

### 4.1. Key findings

In this study, we examined specific sociodemographic profiles of participants receiving information about the COVID-19 pandemic from different sources in Taiwan and how those sources were related to their level of worry about the pandemic. Most sources of information on COVID-19 were associated with higher levels of worry whereas information from academic courses was associated with lower levels of worry. Our findings provide insight into the relationship between sources of information on the pandemic and public worry and a possible strategy to reduce public worry during a new pandemic in the future.

During the investigation, we observed specific sociodemographic profiles among the participants receiving information from different sources. First, females were more likely than males to seek pandemic information from all sources. It is possible that females were more concerned about health-related information and more likely to seek health-related information than males (Manierre, 2015). Second, we observed that participants who sought COVID-19-related information frequently from internet media were younger whereas participants receiving information frequently from traditional media were older. This result may be due to younger people using the internet more frequently for information and social activities compared with older people (Trefflich et al., 2015). This age feature was also observed in a study regarding participant recruitment from traditional and internet media (Frandsen et al., 2016). Third, participants who frequently received COVID-19-related information from academic courses were older, and most were healthcare workers. A possible explanation is that healthcare institutions in Taiwan, by law, required employees to attend academic courses to improve their occupational safety. A knowledge survey during the Ebola pandemic was similar to our findings, where age was associated with a higher level of pandemic knowledge, and healthcare workers also had a higher level of pandemic knowledge than the general public (Schol et al., 2018).

We observed that participants receiving COVID-19-related information frequently from internet media, traditional media, and friends had higher levels of current worry after controlling for their sociodemographic profiles. Furthermore, those who received COVID-19-related information frequently from friends also had a higher level of past worry. There are some possible reasons for this phenomenon. First, the pandemic information from internet media, traditional media, and friends may not be very accurate and may be exaggerated. Some internet content containing misinformation has been reported with from 8.8% to 27.5% of the videos on YouTube (H.O. Li et al., 2020; D'Souza et al., 2020). Second, the general public may lack sufficient medical knowledge to determine the accuracy of information about COVID-19. A social media study indicated that the minority of videos (8.8%) containing misinformation had a similar viewership compared with the majority of videos (69.9%) containing accurate information on YouTube during the COVID-19 pandemic (D'Souza et al., 2020). Some content on Twitter was found to have been created with the intent to promote discord among readers (Sell et al., 2020). These results suggest that the public may be easily affected by misinformation and may not be able to distinguish between fact and fiction, thus increasing their psychological distress.

By contrast, academic courses usually provide comparatively accurate information endorsed by experts. We observed that only the information from academic courses was associated with lower levels of past worry and anticipated worry, even after adjusting for healthcare workers and other sociodemographic profiles. The results indicate that professional health-related knowledge may have played a protective role against the public worry during the COVID-19 pandemic. Knowledge has been reported to have protective effects during pandemics. For example, Huang and colleagues reported that knowledge about COVID-19 could mitigate generalized anxiety disorder in the

**Table 2**  
Sociodemographic profiles among groups receiving COVID-19 information from different sources.

Variable	Information sources													
	Internet media		Traditional media		Family members		Coworkers		Friends		Academic course		Medical staffs	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Mean (SD)	40.58	37.02	36.84	38.51	37.86	37.28	37.86	37.27	38.02	36.58	37.37	39.09	37.49	38.69
Age	(11.85)	(10.46) <sup>a</sup>	(11.11)	(10.51) <sup>a</sup>	(10.68)	(11.28)	(11.14)	(10.20)	(10.98)	(10.20)	(10.84)	(10.68) <sup>a</sup>	(11.00)	(10.05)
N (%)	236 (60.51)	1089 (67.56)	588 (62.09)	737 (69.86)	968 (63.94)	357 (73.16)	982 (64.18)	343 (72.67)	1039	286 (67.93)	1055	270 (66.83)	1061	264 (69.29)
Gender <sup>a</sup>														
Female	151 (38.72)	509 (31.58)	348 (36.75)	312 (29.57) <sup>a</sup>	530 (35.01)	130 (26.64) <sup>a</sup>	533 (34.84)	127 (26.91) <sup>a</sup>	527 (33.33)	133 (31.59)	530 (33.17)	130 (32.18)	548 (33.81)	112 (29.4)
Male	3 (0.77)	14 (0.87)	11 (1.16)	6 (0.57)	16 (1.06)	1 (0.2)	15 (0.98)	2 (0.42)	15 (0.95)	2 (0.48)	13 (0.81)	4 (0.99)	12 (0.74)	5 (1.31)
Education levels														
High school or below	60 (15.35)	160 (9.91)	90 (9.46)	130 (12.33)	153 (10.09)	67 (13.73)	167 (10.9)	53 (11.21)	178 (11.24)	42 (9.95)	186 (11.63)	34 (8.4)	184 (11.34)	36 (9.42)
Bachelor's degree	206 (52.69)	953 (59.05)	561 (58.99)	598 (56.74)	881 (58.08)	278 (56.97)	877 (57.25)	282 (59.62)	914 (57.74)	245 (58.06)	931 (58.19)	228 (56.3)	931 (57.36)	228 (59.69)
Master's degree and above	125 (31.97)	501 (31.04) <sup>a</sup>	300 (31.55)	326 (30.93)	483 (31.84)	143 (29.3)	488 (31.85)	138 (29.18)	491 (31.02)	135 (31.99)	483 (30.19)	143 (35.31)	508 (31.3)	118 (30.89)
Healthcare workers														
No	250 (63.94)	1103 (68.34)	647 (68.03)	706 (66.98)	1006	347 (71.11)	1127	226 (47.78)	1083	270 (63.98)	1213	140 (34.57)	1252	101 (26.44)
Yes	141 (36.06)	511 (31.66)	304 (31.97)	348 (33.02)	511 (33.68)	141 (28.89)	405 (26.44)	247 (52.22) <sup>a</sup>	500 (31.59)	152 (36.02)	387 (24.19)	265 (65.43) <sup>a</sup>	371 (22.86)	281 (73.56) <sup>a</sup>

Abbreviations: SD, standard deviation; N, sample size.

P-value threshold (0.007) was adjusted based on Bonferroni method for different information sources.

<sup>a</sup> P < 0.007.

<sup>a</sup> Due to the scarceness of transgender participants (n = 17), the analysis between gender and COVID-19 information sources did not include them.

**Table 3**  
Impacts of information sources on worry about COVID-19.

Information sources	Past worry	Current worry	Anticipated worry
	Regression coefficient (standard error)		
Internet media	0.06 (0.06)	0.27 (0.13)*	0.11 (0.05)
Traditional media	0.09 (0.05)	0.30 (0.11)**	0.05 (0.05)
Family members	0.01 (0.06)	0.18 (0.13)	0.04 (0.05)
Coworkers	0.05 (0.07)	0.16 (0.15)	0.04 (0.06)
Friends	0.18 (0.06)**	0.30 (0.14)*	0.04 (0.06)
Academic courses	-0.15 (0.07)*	-0.30 (0.16)	-0.17 (0.07)*
Medical staffs	0.04 (0.08)	0.05 (0.18)	-0.001 (0.07)

The general linear model is adjusted by age, gender, education levels, health-care workers, and time period of participation (days).

P value of academic courses to current worry was 0.07.

\*  $P < 0.05$ .

\*\*  $P < 0.01$ .

Chinese population (Huang and Zhao, 2020). Bults and colleagues reported that the knowledge of the 2009 pandemic influenza A (H1N1) increased people's willingness to adopt self-protective behaviors and to follow official advice for preventing H1N1 (Bults et al., 2011). Savas and colleagues also reported that the knowledge of H1N1 increased the vaccination rate in healthcare workers, especially when they considered that the H1N1 vaccine was safe for humans (Savas and Tanriverdi, 2010). Our findings provide a possible way to reduce public worry during the outbreak of COVID-19. Information from academic courses can also be shared on the internet with the hope of benefitting the public by increasing their knowledge on the prevention and treatment of the illness.

In Taiwan, the government implemented COVID-19-related information policies that may provide a reference for other countries worldwide (Taiwan Centers for Disease Control, 2020a). Official information on COVID-19 was frequently and widely covered in Taiwan. A COVID-19 press conference was held daily by the Taiwan CDC to deliver local epidemic and health education information (Taiwan Centers for Disease Control, 2020i; Taiwan Centers for Disease Control, 2020g). The official pandemic information was also released on traditional media and internet media, especially on some social media such as Facebook, Twitter, Instagram, YouTube, and LINE (Taiwan Centers for Disease Control, 2020e; Taiwan Centers for Disease Control, 2020c; Taiwan Centers for Disease Control, 2020d; Taiwan Centers for Disease Control, 2020f; Taiwan Centers for Disease Control, 2020g). The PTT Bulletin Board System also played an important role in warning functions due to its rapid dissemination of COVID-19-related information in Taiwan (Hsiao, 2020). The guidelines including daily prevention (e.g., wash hands frequently, use a mask, avoid gatherings, and keep a safe social distance), measures to take when sick, and travel notices were part of the official information (Taiwan Centers for Disease Control, 2020b). A policy against disinformation was also in effect during the COVID-19 pandemic (Taiwan Centers for Disease Control, 2020j). In addition, the Taiwan CDC provided free online academic courses with lectures by physicians from divisions of infectious disease (Taiwan Centers for Disease Control, 2020h). Based on our findings, online academic courses are worth promoting to facilitate public education and reduce public worry during infectious disease outbreaks in the future (Basch et al., 2020). Although the academic courses lectured by experts are published by official sources, it is possible that some information provided by this source is considered inaccurate or incorrect afterwards because of the lack of knowledge on a new disease. Considering the preference of information sources in the general public, the utility of academic courses published online on social media is worth investigating in the future.

## 4.2. Limitations

Several limitations existed in this study. First, because of the cross-sectional design of this study, no causal inference can be affirmed; thus, more studies on this topic would be worthwhile. Second, the data were collected starting on March 20, 2020; and, thus, the data did not cover the entire pandemic, which was first reported on January 21, 2020. Third, the participants were recruited from Facebook, LINE, and the PTT Bulletin Board System, which may not completely represent the general population in Taiwan.

## 5. Conclusions

Most information sources about COVID-19 were associated with higher levels of worry whereas academic courses were associated with lower levels of worry. People who received COVID-19-related information frequently from internet media, traditional media, and friends had higher levels of current worry; and those who received COVID-19-related information frequently from friends also had higher levels of past worry. In contrast, people who received COVID-19-related information frequently from academic courses had lower levels of past worry and anticipated worry, indicating that professional health-related knowledge may have played a protective role against public worry during the COVID-19 pandemic. Based on these findings, online academic courses are worth promoting to facilitate public education and reduce public worry during future infectious disease outbreaks.

## Funding

This work was supported by the Ministry of Science and Technology, Taiwan [grant number MOST109-2314-B-468-001-MY2].

## Declaration of competing interest

None.

## Acknowledgments

None.

## Ethics approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the Institutional Review Board of Kaohsiung Medical University Hospital and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## References

- Ahmad, A.R., Murad, H.R., M, R. G., 2020. The impact of social media on hyped panic during the COVID-19 pandemic: the Iraqi Kurdistan case. *J. Med. Internet Res.* <https://doi.org/10.2196/19556>.
- Basch, C.H., Mohlman, J., Hillyer, G.C., Garcia, P., 2020. Public health communication in time of crisis: readability of on-line COVID-19 information. *Disaster Med Public Health Prep* 1–10. <https://doi.org/10.1017/dmp.2020.151>.
- Bults, M., Beaujean, D.J., De Zwart, O., Kok, G., Van Empelen, P., Van Steenberghe, J.E., Richardus, J.H., Voeten, H.A., 2011. Perceived risk, anxiety, and behavioural responses of the general public during the early phase of the influenza A (H1N1) pandemic in the Netherlands: results of three consecutive online surveys. *BMC Public Health* 11, 2. <https://doi.org/10.1186/1471-2458-11-2>.
- Chen, E., Lerman, K., Ferrara, E., 2020. COVID-19: a public coronavirus twitter dataset tracking social media discourse about the pandemic. *JMIR Public Health Surveill.* <https://doi.org/10.2196/19273>.
- D'Souza, R.S., D'souza, S., Strand, N., Anderson, A., Vogt, M.N.P., Olatoye, O., 2020. YouTube as a source of medical information on the novel coronavirus 2019 disease (COVID-19) pandemic. *Glob. Public Health* 1–8. <https://doi.org/10.1080/17441692.2020.1761426>.
- Faul, F., Erdfelder, E., Buchner, A., Lang, A.-G., 2009. Statistical power analyses using G\*Power 3.1: tests for correlation and regression analyses. *Behav. Res. Methods* 41,

- 1149–1160. <https://doi.org/10.3758/BRM.41.4.1149>.
- Frandsen, M., Thow, M., Ferguson, S.G., 2016. The effectiveness of social media (Facebook) compared with more traditional advertising methods for recruiting eligible participants to health research studies: a randomized, controlled clinical trial. *JMIR Res. Protoc.* 5, e161. <https://doi.org/10.2196/resprot.5747>.
- Holman, E.A., Garfin, D.R., Lubens, P., Silver, R.C., 2019. Media exposure to collective trauma, mental health, and functioning: does it matter what you see? *Clin. Psychol. Sci.* 8, 111–124. <https://doi.org/10.1177/2167702619858300>.
- Hsiao, S., 2020. Virus outbreak: PTT post rang alarm over virus: CDC's Lo. *Taipei Times* Apr 17, 2020, Available: <https://www.taipetimes.com/News/front/archives/2020/04/17/2003734771>.
- Huang, Y., Zhao, N., 2020. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Res.* 288, 112954. <https://doi.org/10.1016/j.psychres.2020.112954>.
- Ko, N.-Y., Lu, W.-H., Chen, Y.-L., Li, D.-J., Wang, P.-W., Hsu, S.-T., Chen, C.-C., Lin, Y.-H., Chang, Y.-P., Yen, C.-F., 2020. COVID-19-related information sources and psychological well-being: an online survey study in Taiwan. *Brain Behav. Immun.* 87, 153–154. <https://doi.org/10.1016/j.bbi.2020.05.019>.
- Li, D.-J., Ko, N.-Y., Chen, Y.-L., Wang, P.-W., Chang, Y.-P., Yen, C.-F., 2020a. Confidence in coping with COVID-19 and its related factors among the public in Taiwan. *Psychiatry Clin. Neurosci.* <https://doi.org/10.1111/pcn.13128>.
- Li, H.O., Bailey, A., Huynh, D., Chan, J., 2020b. YouTube as a source of information on COVID-19: a pandemic of misinformation? *BMJ Glob. Health* 5. <https://doi.org/10.1136/bmjgh-2020-002604>.
- Manierre, M.J., 2015. Gaps in knowledge: tracking and explaining gender differences in health information seeking. *Soc. Sci. Med.* 128, 151–158. <https://doi.org/10.1016/j.socscimed.2015.01.028>.
- Nelson, L.M., Simard, J.F., Oluyomi, A., Nava, V., Rosas, L.G., Bondy, M., Linos, E., 2020. US public concerns about the COVID-19 pandemic from results of a survey given via social media. *JAMA Intern. Med.* <https://doi.org/10.1001/jamainternmed.2020.1369>.
- Savas, E., Tanriverdi, D., 2010. Knowledge, attitudes and anxiety towards influenza a/H1N1 vaccination of healthcare workers in Turkey. *BMC Infect. Dis.* 10, 281. <https://doi.org/10.1186/1471-2334-10-281>.
- Schol, L.G.C., Mollers, M., Swaan, C.M., Beaujean, D., Wong, A., Timen, A., 2018. Knowledge, perceptions and media use of the Dutch general public and healthcare workers regarding Ebola, 2014. *BMC Infect. Dis.* 18, 18. <https://doi.org/10.1186/s12879-017-2906-7>.
- Sell, T.K., Hosangadi, D., Trotochaud, M., 2020. Misinformation and the US Ebola communication crisis: analyzing the veracity and content of social media messages related to a fear-inducing infectious disease outbreak. *BMC Public Health* 20, 550. <https://doi.org/10.1186/s12889-020-08697-3>.
- Springer, S., Menzel, L.M., Zieger, M., 2020. Google Trends provides a tool to monitor population concerns and information needs during COVID-19 pandemic. *Brain Behav. Immun.* <https://doi.org/10.1016/j.bbi.2020.04.073>.
- Taiwan Centers for Disease Control. 2020a. Coronavirus disease 2019 (COVID-19). Taiwan. Available: <https://www.cdc.gov.tw/en/Disease/SubIndex/> (Online).
- Taiwan Centers for Disease Control. 2020b. Guidelines for COVID-19. Taiwan. Available: <https://www.cdc.gov.tw/En/Category/MPage/G8mN-MHF7A1t5xfRMduTQQ> (Online).
- Taiwan Centers for Disease Control. 2020c. Official account of Taiwan Centers for Disease Control on Facebook. Taiwan. Available: <https://www.facebook.com/TWCDC> (Online).
- Taiwan Centers for Disease Control. 2020d. Official account of Taiwan Centers for Disease Control on Instagram. Taiwan. Available: <https://www.instagram.com/taiwandcc/> (Online).
- Taiwan Centers for Disease Control. 2020e. Official account of Taiwan Centers for Disease Control on LINE. Taiwan. Available: <https://page.line.me/taiwandcc> (Online).
- Taiwan Centers for Disease Control. 2020f. Official account of Taiwan Centers for Disease Control on Twitter. Taiwan. Available: [https://twitter.com/Taiwan\\_CDC](https://twitter.com/Taiwan_CDC) (Online).
- Taiwan Centers for Disease Control. 2020g. Official account of Taiwan Centers for Disease Control on Youtube. Taiwan. Available: [https://www.youtube.com/channel/UCyh91eTE9jA3ykg8W3\\_v3DQ](https://www.youtube.com/channel/UCyh91eTE9jA3ykg8W3_v3DQ) (Online).
- Taiwan Centers for Disease Control. 2020h. Online courses of COVID-19. Taiwan. Available: <https://www.cdc.gov.tw/Category/Page/8rZJtd4HgGx65T43EgQiAg> (Online).
- Taiwan Centers for Disease Control. 2020i. Press releases for COVID-19. Taiwan. Available: <https://www.cdc.gov.tw/En/Category/NewsPage/tov1jahKUv8RGSbvmzLwFg> (Online).
- Taiwan Centers for Disease Control. 2020j. Prevention and control of COVID-19 in Taiwan. Taiwan. Available: [https://www.cdc.gov.tw/En/Category/Page/0vq8rsAob\\_9HCi5GQ5jH1Q](https://www.cdc.gov.tw/En/Category/Page/0vq8rsAob_9HCi5GQ5jH1Q) (Online).
- Trefflich, F., Kalkkreuth, S., Mergl, R., Rummel-Kluge, C., 2015. Psychiatric patients' internet use corresponds to the internet use of the general public. *Psychiatry Res.* 226, 136–141. <https://doi.org/10.1016/j.psychres.2014.12.037>.
- Yao, H., 2020. The more exposure to media information about COVID-19, the more distressed you will feel. *Brain Behav. Immun.* <https://doi.org/10.1016/j.bbi.2020.05.031>.