

Maladaptive coping with the infodemic and sleep disturbance in the COVID-19 pandemic

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Abstract

COVID-19 is caused by a novel virus with an unknown aetiology. People across the globe are dealing with not only a health crisis but also an 'infodemic', a term coined by the World Health Organization to refer to the avalanche of contradictory information that is arousing widespread confusion and anxiety. This study aimed to examine the prevalence of anxiety and sleep disturbance at the early stage of the pandemic, and unveil the information coping process underlying differential susceptibility to COVID-19 infection anxiety and sleep disturbance. The participants were 1,270 adults (47% men, $M_{\text{age}} = 42.82$) from the UK and US who completed initial (Time 1) and follow-up (Time 2) surveys from 16 to 22 March and 18 to 24 May 2020, respectively. The prevalence of probable clinically relevant anxiety was 61% and 45% at the first and second time points, and more than half of the participants in this anxiety group also reported mild to severe sleep disturbance. Moreover, 41% of the participants perceived themselves as not having enough COVID-19-related information and reported higher levels of COVID-19 infection anxiety and sleep disturbance over time than those who perceived themselves as having enough of such information. Moderated mediation analysis identified two groups who were more vulnerable to both psychological problems: high blunterners who sought COVID-19-related information online more frequently and high monitors who sought such information offline less frequently. These findings highlight the importance of a good match between information coping style and strategy deployment in dealing with an infodemic surrounding a novel disease.

KEYWORDS

epidemic, mental health, outbreak, psychological distress, sleep health

1 | INTRODUCTION

The ongoing coronavirus disease-2019 (COVID-19) pandemic is a global health crisis. The disease is highly infectious, with the possibility of asymptomatic human-to-human transmission (e.g., Park et al., 2020). An alarming 35.3 million people worldwide have contracted the disease since January 2020 (Johns Hopkins Coronavirus Resource Center; 8 October 2020). While the number of confirmed cases continues to soar, COVID-19 infection anxiety is intensifying. As COVID-19 is caused by a novel virus with unknown aetiology and

treatment when it was first detected (e.g., Park et al., 2020), studies have shown anxiety to be a common psychological reaction to the pandemic that is related to a range of sleep problems amongst patients, healthcare providers, quarantined individuals and the general public (e.g., Cellini et al., 2020; Voitsidis et al., 2020; Xiao et al., 2020; Zambrelli et al., 2020).

The uncertainty theory of anxiety was adopted as a framework for analysing the general public's anxiety responses to this unknown disease in the present research. The theory postulates that anxiety stems from subjective appraisals of a lack of both epistemic and

pragmatic control (Miceli & Castelfranchi, 2005). Epistemic control refers to the perceived availability and adequacy of information for predicting future threats and their consequences. In the absence of credible evidence regarding the aetiology and treatment of COVID-19, the knowledge vacuum has been filled by poor-quality (deficient, contradictory or even false) information that is being widely disseminated. Recent Twitter research found 25% of COVID-19-related tweets to contain misinformation and 18% to contain unverifiable information (Kouzy et al., 2020). The Director General of the World Health Organization has described this phenomenon as an 'infodemic' that is eliciting widespread public confusion and anxiety during the pandemic (Depoux et al., 2020).

Pragmatic control refers to the ability to respond to a threatening situation to minimize or eliminate its adverse impacts. Studies have identified two information coping styles – monitoring and blunting – that explicate individual differences in dealing with health threats (e.g., Loisel, 2019; Roussi et al., 2016). High monitors (information seekers) are more prone to maintaining constant vigilance regarding the danger cues embedded in threatening environments than are low monitors (information avoiders), whereas high blunters (distracters) have a greater tendency to avoid sources of threat-related information than low blunters (non-distracters).

There were many unknowns at the early stage of the COVID-19 pandemic, and the residents of affected regions were thus likely to search for COVID-19-related information in an attempt to cope with the anxiety regarding COVID-19 infection. However, the coping response of seeking out COVID-19 information may not be beneficial for everyone. According to the goodness-of-fit hypothesis (e.g., Cheng et al., 2014; Miller, 1996), coping effectiveness is a function of the extent to which a coping response deployed in a stressful encounter matches the individual's coping style. In this light, we predicted that frequent COVID-19 information searches would be pernicious for high blunters, as this coping response would heighten their COVID-19 infection anxiety. Further, the effort these individuals expended pondering anxiety-provoking issues would in turn disrupt their sleep quality (e.g., Takano et al., 2012). In contrast, we predicted that frequent such searches would be beneficial for high monitors because obtaining information about an unknown disease would bolster their sense of epistemic and pragmatic control.

In the cyber era, information is available from both offline and online sources. The quality of information tends to differ vastly between the two modes of information sources, with the credibility and accuracy generally higher for information disseminated through offline than online sources (e.g., Martens et al., 2018). Disinformation, often presented in a highly sensational manner, has been found to compromise the mental health of information consumers (Bratu, 2020). In light of the individual differences in information coping style (e.g., Loisel, 2019; Roussi et al., 2016), we predicted that such adverse impact would be more prominent among high blunters, who tended to be more uncomfortable and anxious with online threatening cues, but there would be less impact on high monitors, who were highly motivated to attend to as many cues as possible, especially threatening ones. Therefore, it was proposed that the mode of searching for

information on COVID-19 was a moderator and its interaction with information coping style should be scrutinized.

The prospective study reported herein had two aims. The first aim was to estimate the prevalence of clinically relevant anxiety and sleep disturbance in March 2020, when the unprecedented stay-at-home orders were first announced and implemented in the countries under study, and then again in May 2020, when those orders were gradually eased. The second aim was to test the goodness-of-fit hypothesis by examining the interplay of information coping style and COVID-19 information-search frequency and their conjoint effect on COVID-19 infection anxiety and sleep disturbance.

2 | METHOD

2.1 | Sample

Participants were recruited through a large online crowdsourcing website, with only those residing in the UK or US included. The first assessment (Time 1) was administered from 16 to 22 March 2020. At Time 1, 647 adults from the UK and 623 adults from the US completed the survey. A follow-up assessment (Time 2) was administered from 18 to 24 May 2020, with the Time 1 participants invited to take part again. At Time 2, 573 UK participants (attrition rate = 11%) and 475 US participants (attrition rate = 24%) completed the survey.

Table 1 presents the demographic characteristics of the UK and US samples at both time points. There were few differences between the two, except the UK sample reported lower annual household income levels and contained more participants who were married or partnered than the US sample ($p < .001$). Of the various study variables, the two samples differed only in the level of COVID-19 infection anxiety assessed at Time 1, with the UK participants generally giving higher scores than their US counterparts ($t(1,268) = 3.34$, $p = .001$). All of the main statistical analyses were thus performed on the pooled sample, which comprised both UK and US participants.

2.2 | Measures

Sleep disturbance was measured by the PROMIS™ Sleep Disturbance short form (version 1.0 8b; Yu et al., 2011). Participants rated each of the instrument's eight items on a 5-point scale. Using the PROMIS™ scoring scheme, the composite score was then converted into a T-score, with a value of 50 indicating the estimated mean of the general population. The recommended T-score cut-off was 55, and sleep disturbance was thus categorized as follows: none to slight (<55.0), mild (55.0–59.9) and moderate to severe (≥ 60).

Generic state anxiety was assessed by the state scale of the State-Trait Anxiety Inventory-Form Y1 (STAI-Y1; Spielberger, 1983). This scale has been extensively validated, and is the most popular self-report psychometric tool for assessing generic anxiety (e.g., Ekkekakis & Zenko, 2016). STAI-Y1 comprises 20 items, with participants asked to report the intensity of their current anxiety

TABLE 1 Demographic characteristics and severity of sleep disturbance by sample and time

Variable	Time 1 (16–22 March 2020)				Time 2 (18–24 May 2020)			
	UK sample (n = 647)		US sample (n = 623)		UK sample (n = 573)		US sample (n = 435)	
	n	%	n	%	n	%	n	%
Sex								
Female	347	54	321	52	312	55	252	53
Male	299	46	298	48	260	45	221	47
Education level								
Degree holder	384	60	328	53	343	60	253	53
Non-degree holder	258	40	294	47	227	40	221	47
Employment status								
Full-time	310	48	303	49	268	47	226	48
Part-time	143	22	107	17	134	23	78	16
Not working	194	30	213	34	171	30	171	36
Household income (in US dollars)								
<\$20,000	131	20	84	13	116	20	63	13
\$20,000–\$39,999	174	27	118	19	159	28	86	18
\$40,000–\$59,999	120	19	116	19	102	18	83	17
\$60,000–\$79,999	75	12	99	16	66	12	74	16
≥\$80,000	147	23	206	33	130	23	169	36
Have enough information about COVID-19								
Yes	380	59	366	59	n/a	n/a	n/a	n/a
No	267	41	257	41	n/a	n/a	n/a	n/a
Probable clinically relevant anxiety ^a								
Presence	378	61	358	60	255	46	191	42
Absence	239	39	258	40	302	54	269	58
Sleep disturbance ^b								
None to slight	347	54	366	59	337	59	278	58
Mild	150	23	132	21	114	20	84	18
Moderate to severe	149	23	125	20	121	21	113	24

Abbreviation: n/a, data not available.

^aAssessed by state anxiety scale of the State-Trait Anxiety Inventory–Form Y1 (Spielberger, 1983).

^bAssessed by PROMIS™ Sleep Disturbance short form (version 1.0 8b; Yu et al., 2011).

experience on a 4-point scale. A higher total score indicates greater state anxiety in general. The cut-off point for clinically significant anxiety was ≥ 40 based on the widely recognized community adult norms in the STAI manual (Spielberger, 1983).

COVID-19 infection anxiety was measured using a scale adapted from the SARS infection anxiety scale developed and validated during the outbreak of SARS (Cheng & Ng, 2006), a disease belonging to the same atypical coronavirus spectrum as COVID-19 (e.g., Knisely et al., 2020). The scale's items were adapted from the state anxiety scale of the State-Trait Anxiety Inventory Form X1 (Spielberger et al., 1970) to refer to an epidemic context. Participants rated each item on a 4-point scale. A higher composite score indicated greater anxiety over COVID-19 infection.

The information coping styles of monitoring and blunting were assessed using the abbreviated version of the Miller Behavioral Style

Scale (Stephens, 1989), which contains two hypothetical threatening vignettes. Participants were asked to indicate their degree of deployment of four monitoring and four blunting strategies in each vignette. The scores were summed to yield a composite score for the monitoring and blunting subscales, with a higher subscale score representing stronger endorsement of the respective coping style (Miller, 1987).

Information coping behaviour was measured by two items extracted from the coping with SARS outbreak scale (Cheng & Ng, 2006). Participants were asked to report on a 4-point scale the frequency with which they had sought COVID-19-related information through both online (i.e., the Internet) and offline (i.e., newspaper, television and/or radio) channels in the past week. A higher score indicated more frequent information searches for COVID-19-related information via the channel in question.

To check whether participants' epistemic needs were being fulfilled at the time of the study, the participants were asked whether they considered themselves to have enough information about COVID-19. Their answers were given in a dichotomous (yes/no) format. In addition, several potentially confounding variables were statistically controlled during hypothesis testing: sex, age, country, self-reported health status and salary change since pandemic onset.

All of the aforementioned measures have been validated in general populations (e.g., Buysse et al., 2010; Cheng & Cheung, 2005; Spielberger, 2010; van Almen & van Gerwen, 2013). The measures were all administered at Time 1 in the current study, with the sleep disturbance, generic state anxiety and COVID-19 infection anxiety measures administered again at Time 2.

2.3 | Procedures

The anonymous online survey administered at both time points was hosted by Qualtrics. All of the participants had to give informed consent before completing the survey and they were paid at the standard rate upon survey completion. Prior ethical approval was obtained from the ethical review board of the principal author's institution.

3 | RESULTS

According to Spielberger's recommended threshold value, the prevalence of probable clinically relevant anxiety was very high at both Time 1 and Time 2: 61% (bias-corrected and accelerated percentile bootstrap 95% CI: 58%–64%) and 45% (42%–48%), respectively. According to the PROMIS™ criteria, 22% (20%–25%) and 19% (17%–21%) of the participants were characterized as having mild sleep disturbance at Time 1 and Time 2, respectively, with 22% (19%–24% at Time 1; 20%–25% at Time 2) diagnosed with moderate-to-severe sleep disturbance at both time points. Table 2 summarizes the descriptive statistics of the major variables amongst the groups with varying levels of sleep disturbance. Both the mild and moderate-to-severe sleep disturbance groups had an average generic anxiety score that exceeded the threshold of clinically relevant anxiety at the two time points.

The generic state anxiety scores were strongly correlated with the COVID-19 infection anxiety scores at both time points ($r_s = 0.41$ and 0.35 , $p_s < 0.0001$). Participants with (vs. without) probable clinically relevant anxiety consistently reported significantly higher (vs. lower) levels of both COVID-19 infection anxiety and sleep

Variable	Sleep disturbance					
	None to slight (<i>n</i> = 712)		Mild (<i>n</i> = 282)		Moderate to severe (<i>n</i> = 274)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Monitoring coping style	5.13 ^a	1.37	5.13 ^a	1.27	5.04 ^a	1.34
Blunting coping style	3.48 ^a	1.54	3.68 ^a	1.49	3.67 ^a	1.53
Online COVID-19 information-search frequency	1.90 ^a	0.86	1.94 ^a	0.86	1.99 ^a	0.88
Offline COVID-19 information-search frequency	2.26 ^c	0.90	2.09 ^b	0.93	1.89 ^a	1.07
Self-rated health status	3.67 ^c	0.75	3.41 ^b	0.87	3.09 ^a	1.07
T1 Generic state anxiety	40.52 ^a	12.66	46.95 ^b	13.05	51.53 ^c	14.12
T2 Generic state anxiety	35.85 ^a	11.57	41.10 ^b	12.66	47.23 ^c	14.33
T1 COVID-19 infection anxiety	6.73 ^a	2.43	7.19 ^b	2.50	7.89 ^c	2.79
T2 COVID-19 infection anxiety	7.07 ^a	2.57	7.52 ^a	2.55	8.03 ^b	2.81
T1 Sleep disturbance (T-score)	47.25 ^a	6.11	57.10 ^b	4.43	64.97 ^c	4.29
T2 Sleep disturbance (T-score)	47.43 ^a	8.27	55.89 ^b	6.60	62.41 ^c	7.45

TABLE 2 Descriptive statistics of variables amongst groups with different degrees of sleep disturbance at Time 1

Note: Means in the same row that do not share the same subscripts differ at $p < .05$ in post hoc Bonferroni tests ($c > b > a$). T1 = Time 1 (16–22 March 2020); T2 = Time 2 (18–24 May 2020). SD = standard deviation.

disturbance at the two time points (t_s ranging from 6.37 to 15.50, $p_s < 0.0001$).

Table 3 reports the descriptive statistics of the study variables for the participants who did and did not perceive themselves as having enough information about COVID-19. The former group reported lower levels of both COVID-19 infection anxiety and sleep disturbance at both time points than the latter. All of these findings provide support for the relevance of the uncertainty theory of anxiety as a conceptual framework for explaining individual differences in the psychological process underlying coping with COVID-19, a hitherto unknown disease.

In testing the goodness-of-fit hypothesis, COVID-19-related information-search frequency was predicted to moderate the association between information coping style (monitoring and blunting) and COVID-19 infection anxiety, the latter of which was in turn predicted to relate to sleep disturbance reported at the follow-up assessment. This moderated mediation model was tested using Hayes' (2018) PROCESS macro for SPSS (Model 7) with a bias-corrected bootstrap procedure based on 10,000 samples.

TABLE 3 Descriptive statistics of variables of participants who reported having enough and not enough information about COVID-19

Variable	Enough information about COVID-19 (n = 746)		Not enough information about COVID-19 (n = 524)	
	M	SD	M	SD
Monitoring coping style	5.08 ^a	1.38	5.15 ^a	1.28
Blunting coping style	3.54 ^a	1.50	3.60 ^a	1.57
Online COVID-19 information-search frequency	1.98 ^a	0.86	1.89 ^a	0.87
Offline COVID-19 information-search frequency	2.10 ^a	0.97	2.18 ^a	0.95
T1 Generic state anxiety	42.00 ^a	13.36	47.53 ^b	13.87
T2 Generic state anxiety	37.65 ^a	12.27	42.12 ^b	14.13
T1 COVID-19 infection anxiety	6.75 ^a	2.51	7.56 ^b	2.58
T2 COVID-19 infection anxiety	7.06 ^a	2.61	7.82 ^b	2.63
T1 Sleep disturbance (T-score)	52.10 ^a	8.68	54.93 ^b	8.87
T2 Sleep disturbance (T-score)	51.43 ^a	9.60	54.19 ^b	10.13

Note: Means in the same row that do not share the same subscripts differ at $p < .05$ in post hoc Bonferroni tests ($b > a$). T1 = Time 1 (16–22 March 2020); T2 = Time 2 (18–24 May 2020).SD = standard deviation.

The hypothesized moderated mediation effect was deemed to be present if two conditions were met: (a) the association between information coping style and COVID-19 infection anxiety was moderated by a particular mode of COVID-19 information-search frequency, and (b) the partial effect of COVID-19 infection anxiety on the subsequent level of sleep disturbance was significant. Time 1 sleep disturbance was entered as a covariate to control for the baseline effect. To control for other potential confounding effects, sex, age, country, self-rated health and salary change during the COVID-19 pandemic were also entered as covariates.

The hypothesized moderated mediation effect was found to be significant for the blunting coping style when online COVID-19 information-search frequency was the moderator (see Figure 1 for the full model). As shown in Figure 1, the interaction effect between the blunting coping style and COVID-19 infection anxiety was significant. The significant interaction was then unpacked using the simple slopes method (Aiken & West, 1991) and is displayed graphically in Figure 2. For higher online COVID-19 information-search frequency, high blunters reported greater COVID-19 infection anxiety than low blunters. For such lower frequency, the level of COVID-19 infection anxiety was generally lower regardless of the blunting scores. The first condition of the moderated mediation effect was thus fulfilled. Figure 1 further shows a significant positive association between Time 1 COVID-19 infection anxiety and Time 2 sleep disturbance, indicating that the second condition was also fulfilled.

Although the moderated mediation effect was non-significant for the monitoring coping style when online COVID-19 information-search frequency was the moderator, that hypothesized effect was significant for the monitoring style when the moderator was offline COVID-19 information-search frequency (see Figure 3 for the full model). The simple slopes plot is depicted in Figure 4. For lower frequency of offline COVID-19 information searching, the high monitors reported greater COVID-19 infection anxiety than the low monitors. For such higher frequency, however, no such individual differences were found. The first condition for the moderated mediation effect was thus met. In addition, Figure 3 reveals a significantly positive association between Time 1 COVID-19 infection anxiety and Time 2 sleep disturbance, indicating that the second condition was also met. However, the hypothesized moderated mediation effect did not hold for the blunting coping style when the moderator was offline COVID-19 information-search frequency.

4 | DISCUSSION

The present study examined the prevalence of clinically relevant anxiety and sleep disturbance at the initial stage of the COVID-19 pandemic, a novel disease with unknown aetiology and treatment when it was first detected (e.g., Park et al., 2020). When the World Health Organization declared the COVID-19 outbreak a pandemic in mid-March 2020, more than 60% of the participants were characterized as having probable clinically relevant anxiety, and more than

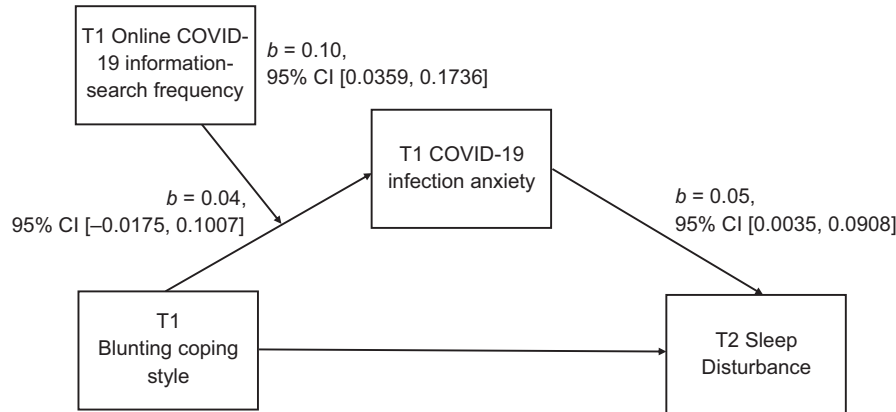


FIGURE 1 Moderated mediation analysis for the indirect effect of Time 1 blunting coping style on Time 2 sleep disturbance mediated by Time 1 COVID-19 infection anxiety and moderated by Time 1 online COVID-19 information-search frequency ($n = 1,041$). The estimations were statistically controlled for Time 1 sleep disturbance, sex, age, country, self-rated health and salary change during the COVID-19 pandemic. Bootstrapping with 10,000 samples was adopted to compute a 95% confidence interval (CI) around the indirect effect. T1 = Time 1 (16–22 March 2020); T2 = Time 2 (18–24 May 2020)

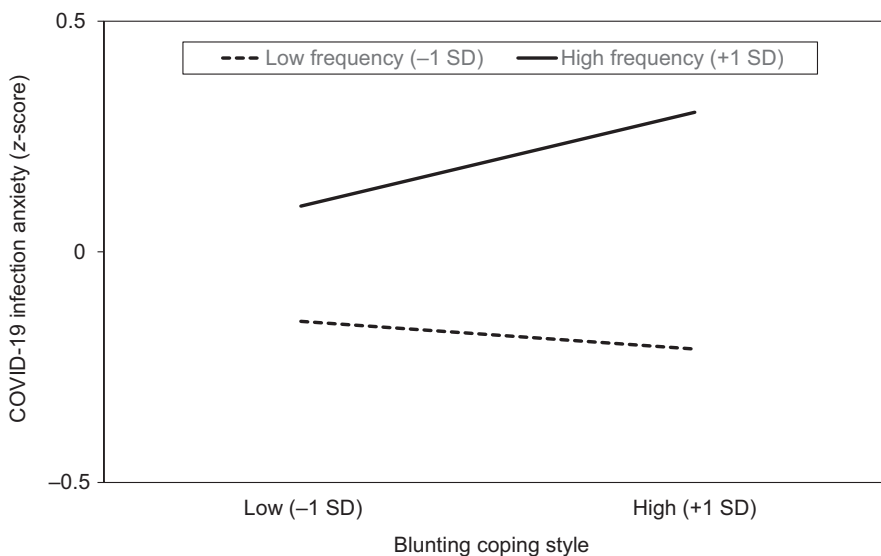


FIGURE 2 Simple slopes plot for the moderation of blunting coping style and online COVID-19 information-search frequency. SD = standard deviation

half of those participants in the anxiety-present group also reported mild to severe sleep disturbance.

A strong positive correlation is also observed between generic state anxiety and COVID-19 infection anxiety. Unlike the trait anxiety measure, which reflects an individual's general tendencies and predispositions, the measure of generic state anxiety (i.e., STAI-Y1) involves assessment of a 'state', which refers to a contemporaneous transitory emotional and/or cognitive condition experienced during a particular period (e.g., Spielberger, 2010). Given that generic state anxiety is measured in a pandemic context in our study, the strong association observed between such anxiety and COVID-19 infection anxiety supports the use of a context-specific scale to assess the latter type of pandemic anxiety.

More importantly, our study further investigates the interplay of information coping style and information coping response and their conjoint effect on COVID-19 infection anxiety and sleep disturbance during the pandemic. Two groups of participants are identified as being particularly susceptible to these emotional and sleep

problems: high blunters (distracters) who search for COVID-19 information via online channels more frequently, and high monitors (information seekers) who search for such information via offline channels less frequently. These intricate findings highlight the need to consider both information coping style and COVID-19 information-search frequency in understanding the mechanisms of how individuals are dealing with COVID-19, which has triggered not only a pandemic but also an infodemic. Our findings further highlight the need for researchers and practitioners to distinguish between online and offline media, both of which are popular sources of information in the digital era.

Our study has generated new findings in showing more frequent searches for COVID-19 information through online media to be related to higher levels of both COVID-19 infection anxiety and sleep disturbance. A recent study indicates that both problems may be more attributable to information-seeking behaviour than to the credibility of information sources on the Internet (Wang et al., 2019). Although both fake news and reliable news content are prevalent on websites,

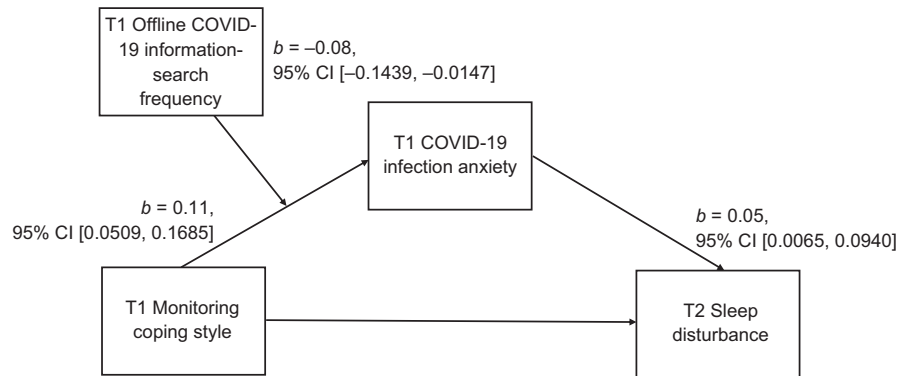
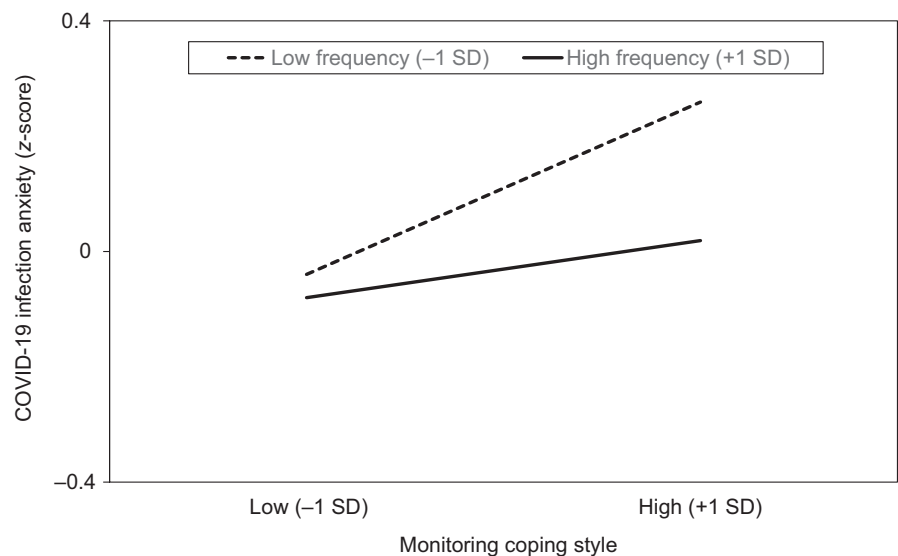


FIGURE 3 Moderated mediation analysis for the indirect effect of Time 1 monitoring coping style on Time 2 sleep disturbance mediated by Time 1 COVID-19 infection anxiety and moderated by Time 1 offline COVID-19 information-search frequency ($n = 1,041$). The estimations were statistically controlled for Time 1 sleep disturbance, sex, age, country, self-rated health and salary change during the COVID-19 pandemic. Bootstrapping with 10,000 samples was adopted to compute a 95% confidence interval (CI) around the indirect effect. T1 = Time 1 (16–22 March 2020); T2 = Time 2 (18–24 May 2020)

FIGURE 4 Simple slopes plot for the moderation of monitoring coping style and offline COVID-19 information-search frequency. SD, standard deviation



the participants in that study are found to be more likely to expose themselves to the former type of online news (Wang et al., 2019). This finding can be explained by cultural attraction theory (Scott-Phillips et al., 2018), which highlights the tendency to be attracted by sensational cues in information processing. Health-related fake news tends to contain threat-related content that is highly engaging and appealing to information consumers (Acerbi, 2019; Berriche & Altay, 2020). When facing a health threat, some individuals tend to worry that undesirable outcomes are likely to occur in the future, and thus pay attention to danger cues because of the greater benefit and lower cost of over-detecting (vs. under-detecting) the dangers in terms of disease prevention (Blaine & Boyer, 2018).

Owing to the low cost of distribution and extremely rapid rate of information transmission via the Internet, many news generators today prefer to convey information through online rather than offline platforms (Martens et al., 2018). The availability of a multiplicity of online news sources can generate a cacophony of contradictory information that in turn elicits considerable confusion and stress, and this is particularly likely to hold true in the context of the current

pandemic, as medical scientists and government officials alike knew very little about COVID-19 when the disease first appeared. The cost of disseminating information via offline media, in contrast, is much higher (Martens et al., 2018), thus discouraging many uncommitted news writers and fake news peddlers from utilizing offline platforms to spread their dubious information. Accordingly, seeking health-related information through offline (vs. online) media may be relatively less distressing and confusing.

Our study has further specified that the adverse impact of frequent exposure to online COVID-19-related information is particularly salient for high blunterners. Although such individuals generally prefer to avoid threatening cues, we found that some of them have frequently sought COVID-19-related information during the pandemic. Studies have shown that people tend to search for threat-related health information and include health-threatening words in their transmission of information regardless of their coping style (Zhang, 2013). However, instead of gaining both epistemic and pragmatic control through such behaviour, as predicted by the uncertainty theory of anxiety (Miceli & Castelfranchi, 2005), our findings

indicate that frequent exposure to online COVID-19 information is associated with greater COVID-19 infection anxiety and sleep disturbance for high blunters.

The pattern of findings is very different for high monitors. For that group, infrequent searches for COVID-19 information offline are related to greater COVID-19 infection anxiety and sleep problems, probably because of high monitors' stronger need for information being left ungratified. These findings are in line with those summarized in a review of cancer patients, which indicates that high monitors tend to experience greater psychological distress and depressive symptoms than high blunters when scant health information is available (Roussi & Miller, 2014). Given the alarmingly high number of confirmed COVID-19 cases and the escalating death toll (e.g., Jordan et al., 2020), infrequent searches for COVID-19 information via offline media may make high monitors perceive themselves to have little control over protecting themselves and their family members from the risks of COVID-19 infection. Taken together, these findings thus support the goodness-of-fit hypothesis, which highlights coping effectiveness as a function of the extent to which one's coping style matches the actual strategies one deploys in an attempt to cope with the infodemic.

The present findings further show that the participants who perceived themselves to have sufficient information on the ongoing pandemic tended to report lower levels of both COVID-19 infection anxiety and sleep disturbance than those who did not. These new findings imply that the perception of having sufficient information plays a crucial role in mental and sleep health during a pandemic that is also an infodemic. The findings also suggest that the infodemic phenomenon may overwhelm some individuals and increase their anxiety levels owing to constant exposure to poor-quality online information that fails to gratify their epistemic needs. Other individuals, in contrast, may deploy the information coping strategy more effectively to deal with the infodemic by seeking credible information via offline media, resulting in the acquisition of knowledge about COVID-19 that fulfils their epistemic needs. These individuals are more likely to sleep well because gaining a sense of both epistemic and pragmatic control puts their minds at ease (Miceli & Castelfranchi, 2005).

Our findings are in line with contemporary theories of coping which posit that no single coping theory or strategy is inherently adaptive or maladaptive (e.g., Endler et al., 2000), with coping effectiveness depending largely on the fit between the strategy's characteristics and an individual's coping style. In this light, COVID-19 information-seeking can be adaptive if the strategy's deployment mitigates mental health and sleep problems. The constant seeking of COVID-19 information through offline media is beneficial for high monitors because such information can bolster their sense of epistemic and pragmatic control. However, constant seeking of COVID-19 information through the Internet can be debilitating for high blunters, as such behaviour is associated with higher levels of COVID-19 infection anxiety and sleep disturbance over time.

A previous study indicated the need for the two strategies to be combined for effective coping to take place (Bar-tal & Spitzer, 1999):

when faced with a multitude of assorted information, monitoring is useful for scanning and attending to the credible, good-quality information generally found in offline media, whereas blunting is beneficial for filtering out the irrelevant and poor-quality information that is more prevalent in online media. These findings highlight the importance of public education on news/media literacy to foster people's ability to discern information of varying quality, as well as the need for the flexible deployment of information coping strategies to effectively cope with an infodemic (e.g., Cheng, Kogan, & Chio, 2012).

Mental health promotion programmes should thus focus not only on building skills to improve mood and sleep but also on enhancing news/media literacy. Programme participants should be alerted to recent empirical evidence revealing the low degree of credibility and high degree of cross-website inconsistency associated with free online information resources (Ferreira et al., 2019). Seeking information from credible sources, such as scholars from academic institutions and officials from public health organizations, is thus essential to mitigate anxiety during the current infodemic. Programme participants should be equipped with skills enabling them to distinguish between good- and poor-quality information and to debunk fake news. After boosting their news/media literacy, individuals should be able to deploy the monitoring strategy optimally to gain useful knowledge about COVID-19 without increasing their pandemic-related anxiety levels and to deploy the blunting strategy instead when they feel bombarded by information. The optimal joint deployment of credible information monitoring and fake news avoidance may thus bolster both mental and sleep health during the COVID-19 infodemic.

Before concluding, it is necessary to consider some caveats when interpreting the present findings. Specifically, the study was conducted in a non-clinical sample in which slightly more than half of the participants reported no to slight sleep disturbance. The findings may not be generalizable to adults diagnosed with clinical sleep disorders. Also, the participants were from two individualist countries with a high national income. Previous multinational research reveals considerable variations in psychological well-being among countries with diverse cultural values and extents of socioeconomic development (Cheng et al., 2016), and different patterns of findings may be obtained in samples from countries with dissimilar cultural and socioeconomic backgrounds. Finally, it is noteworthy that this study focused only on deliberate information search. Information consumers may also be overwhelmed by constant exposure to unsolicited information, such as a flood of newsfeeds and pop-up news notifications from social networking sites and applications. Future research should expand the scope by investigating the potential impact of unsolicited information on mental and sleep health to allow for a comparison with that of information derived from a deliberate search.

In summary, this study advances scholarly understanding of the deployment of information strategies to cope with the current COVID-19 infodemic, and demonstrates the interplay of information coping style and information coping strategies in association with COVID-19 infection anxiety and sleep disturbance. Constant seeking of COVID-19 information through the Internet is related to anxiety

and sleep problems for high blunterners, whereas seeking COVID-19 information through offline media is psychologically beneficial for high monitors. Our novel findings shed light on the design of intervention programmes to sharpen news/media literacy and the optimal deployment of information coping strategies that fit one's information coping style, with the ultimate goal of improving the mood and sleep problems that are prevalent during the current infodemic.

CONFLICT OF INTEREST

The funders had no role in study design and administration, data analysis or interpretation, manuscript writing, or the decision to submit the paper for publication. All authors declare that they have no conflicts of interest.

AUTHOR CONTRIBUTIONS

Cecilia Cheng was the principal author of this article. She conceptualized the study, supervised the project, coordinated the data collection process, conducted the literature review, performed data analysis and interpreted the findings. She also wrote the first draft of the article and revised it based on the reviewers' input. Omid Ebrahimi conducted the literature review and interpreted the findings, wrote parts of the article, and worked with the principal author in revising the article in response to the reviewers' comments. Yan-ching Lau conducted the literature review, assisted in data collection, wrote parts of the article, and worked with the principal author in revising the article in response to the reviewers' comments.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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