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The relationship between perceived stress and emotional distress during the COVID-19 outbreak: Effects of boredom proneness and coping style

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ABSTRACT

The outbreak of a novel coronavirus (COVID-19) pandemic was a great threat to the physical and mental health of the general population. Our research aimed to investigate the relationship between perceived stress and emotional distress during the initial outbreak. Furthermore, potential risks and protective factors, i.e., coping and boredom proneness, of stress-related emotional distress were also explored. Data from 3233 participants in China were collected through an online survey platform during the initial outbreak of the COVID-19 from January 31 to February 9 in 2020. Results showed that higher perceived stress was associated with more emotional distress including depression, fear, compulsion-anxiety, neurasthenia, and hypochondria. Boredom proneness significantly and positively mediated the relationship between perceived stress and emotional distress. Moreover, coping style moderated the stress-emotional distress relationship, i.e., individuals who mainly adopted positive coping strategies suffered fewer symptoms of depression, compulsion-anxiety, and neurasthenia under stress, while negative coping strategies aggravated emotional distress. These results from the present study provide practical value for mental health intervention during the emergent public health events.

1. Introduction

Since the end of 2019, China has experienced a dramatic outbreak of the COVID-19, which had rapidly spread in China and abroad. Wuhan, the center of the pandemic, and many other regions in China initiated first-level responses to this major public health emergency to curtail further disease transmission. Pandemics can induce high levels of stress and measures taken to curtail infection such as quarantine and social distancing can further damage mental health. The observations of other epidemics or pandemics (e.g., the 2003 Severe Acute Respiratory Syndrome (SARS), the 2009 H1N1 pandemic, and the 2014 Ebola epidemic) showed a significant adverse impact on mental health among a large population (Blakey, Reuman, Jacoby, & Abramowitz, 2015; Bonanno et al., 2008; Cowling et al., 2010; Wu et al., 2009). Similarly, after the outbreak of the COVID-19, the level of anxiety was raised with the increase of pandemic-related news and the number of infection cases reported (Lima et al., 2020). An increase in psychological problems including anxiety and depression was observed during the COVID-19 pandemic (Duan & Zhu, 2020). A recent online survey found that moderate-to-severe stress, anxiety, and depression were noted in 8.1 %, 28.8 %, and 16.5 %, respectively, of the general population (Wang et al., 2020c). Moreover, during the outbreak of the pandemic, more than 70 % of 1060 participants investigated in China had a reported moderate-to-severe levels of psychological symptoms including obsessive compulsion, interpersonal sensitivity, phobic anxiety, and psychoticism (Tian et al., 2020). As such, there is an urgent need to understand the relevant mechanisms that may pose a threat to mental health as well as mechanisms that protect individuals from developing psychological problems in the background of the COVID-19 outbreak.

In this paper, we first present a brief literature review of the relationship between perceived stress and emotional distress. In addition, we further propose the potential mediating role of boredom proneness and the moderating role of coping style on the stress-emotion relationship under the COVID-19 pandemic.

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1.1. Relations between perceived stress and emotional distress

The pandemic outbreak constitutes an acute, large-scale, and uncontrollable stressor with a long-term impact. For example, compared to the stress levels before the previous SARS epidemic and the pandemic, the levels of perceived stress during SARS (Yu, Ho, So, & Lo, 2005) and in COVID-19 (Wang et al., 2020a) elevated profoundly. Perceived stress reflects a global subjective evaluation of the stress level experienced by individuals to an objective event and their subjective appraisal to it (Cohen, Kamarck, & Mermelstein, 1983). Stressor appraisals result in a series of emotional distress reactions when individuals assess that they have no control or inadequate resources to deal with the challenge (Lazarus & Folkman, 1984). Numerous research evidence has linked high perceived stress not only to emotional disturbances such as anxiety (Besharart, Khadem, Zarei, & Momtaz, 2020; Shi, Huang, Jia, & Yang, 2020), depression (Spada, Nikčević, Moneta, & Wells, 2008), and post-traumatic stress disorder (Wang, Xu, Ren, Wang, & Wang, 2019) but also to adverse physical health including a higher risk of cardiovascular disease and stroke (Booth et al., 2015; Wright, Hanlon, Lozano, & Teitelman, 2019).

However, few studies explored the relationship between perceived stress related to the current pandemic and emotional distress.

1.2. The mediating effect of boredom proneness

Boredom was considered as one of the most relevant stressors in those who had experienced isolation during the pandemic (Presti, McHugh, Gloster, Karekla, & Hayes, 2020). The tendency to experience boredom or boredom proneness might be one of the potential variables that explain emotional distress during lockdown time. Boredom was defined as a state that relates too low arousal with dissatisfaction due to perceived monotony and repetition (Mikulas & Vodanovich, 1993). It was proposed that disengagement from the environment is a key contributor to the boredom feeling (Eastwood et al., 2012). Boredom proneness refers to the propensity toward experiencing boredom, and it will vary across individuals (Farmer & Sundberg, 1986). Individuals with high scores on the boredom proneness scale (trait boredom) were likely to report more frequent boredom experience (state boredom) (Mercer-Lynn, Hunter, & Eastwood, 2013).

Previous studies indicated that boredom proneness was related to higher stress levels (Elhai et al., 2018; Lee & Zelman, 2019; Wang, 2015). Boredom proneness had also been demonstrated to be associated to emotional distress including depression, anxiety, and fear (Farmer & Sundberg, 1986; Leong & Schneller, 1993; LePera, 2011). Similarly, Sommers and Vodanovich (2000) found that individuals with a higher level of boredom proneness reported higher scores on the Hopkins Symptom Checklist (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974) including obsessive-compulsive, somatization, anxiety, interpersonal sensitivity, and depression. People who scored higher on boredom proneness felt less control of themselves and thus persist disengagement from their environment (Eastwood et al., 2012; Isacescu, Struk, & Danckert, 2017). In turn, uncontrollability and disengagement might lead to an emotional response to a demanding situation. Therefore, boredom proneness might play a mediating role in individuals' perceived stress to the COVID-19 pandemic and their emotional response to it.

1.3. The moderating effect of coping style

One of the factors which had been demonstrated in the effectiveness of mitigating the relationship between stress and mental health was coping style (Coiro, Bettis, & Compas, 2017; Wood & Bhatnagar, 2015). Derived from the transactional model of stress, coping referred to "behavioral and cognitive efforts to reduce or tolerate the internal and external demands that were appraised as exceeding the person's resources" (Lazarus & Folkman, 1984). In terms of its influence on physical and mental health, the coping style was divided into positive and negative (Berman, Kurtines, Silverman, & Serafini, 1996; Xie, 1998). Positive coping is associated with better mental health outcomes while negative coping is related to worse mental problems (Mark & Smith, 2012a, 2012b). Positive coping styles, such as problem-solving efforts, seeking information and social support, focus on active attempts to deal with stress and change the problematic situation. The characteristic items of negative coping styles include avoidance, wishful thinking, and substance use. Negative coping focuses on stressor-elicited emotion rather than the stressor itself (Nowack, 1989).

There was convergent and abundant evidence for a crucial role of coping style under stress. Maladaptive or negative coping predicted a higher level of depression and anxiety (Doering et al., 2004; Dyson & Renk, 2006; Mahmoud, Staten, Hall, & Lennie, 2012). Adaptive emotion regulation, such as positive refocusing and appraisal, acted as a possible buffer between the subjective perception about the pandemic and the current virus anxiety (Jungmann & Witthöft, 2020). Differences in how individuals coped with events made some more susceptible to the negative consequences of stress (Vollrath & Torgersen, 2000). For example, the influence of negative life events on depression was greater among those who took more negative coping strategies, such as worrying about problems instead of solving them (Sawyer, Pfeiffer, & Spence, 2009). Similarly, among females who adopted more negative coping strategies like passive acceptance and wishful thinking, high negative life events scores implicated significant increases in depressive and anxiety symptoms (Blalock & Joiner, 2000). Yu et al. (2016) also found that soldiers who tended to use more negative strategies and less positive strategies had higher levels of anxiety and depression during their recruit training. Recently, a web-based survey of mental health during the COVID-19 pandemic demonstrated that coping style was one of the influencing factors of psychological distress, i.e., participants with negative coping styles had higher levels of psychological distress, such as being nervous, hopeless and restless (Wang et al., 2020b). Therefore, coping style might moderate the relationship between perceived stress and emotional distress during the outbreak of the COVID-19 pandemic.

1.4. The present study

This study aimed to explore (a) whether the level of perceived stress to the COVID-19 pandemic would link with emotional distress (i.e., depression, fear, compulsion-anxiety, neurasthenia, and hypochondria), (b) whether boredom proneness would mediate the relationship between perceived stress and emotional distress, (c) and whether the direct path between perceived stress and emotional distress would be moderated by individuals' coping style.

As an integrated model (see Fig. 1), the present study was guided by the following hypotheses:

H1. Perceived stress would positively associate with emotional distress during the COVID-19 pandemic.

H2. Boredom proneness would mediate the relationship between perceived stress and emotional distress.

H3. The coping tendency would moderate the relationship between perceived stress and emotional distress.

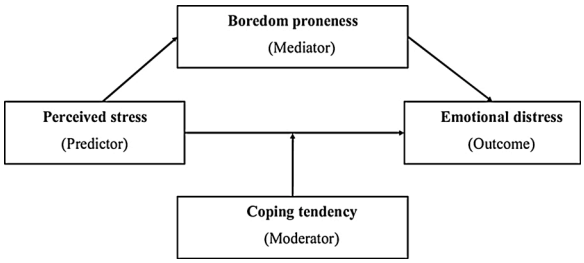

Fig. 1. Conceptual framework of perceived stress and emotional distress with boredom proneness as a mediator and coping tendency as a moderator.

2. Methods

2.1. Participants

3233 Chinese respondents participated in this study and filled in the whole questionnaires. The sample had a moderately wide range in age, education, and monthly income (see Table 1).

2.2. Procedures

The COVID-19 pandemic was declared as an international public health emergency on January 30, 2020, by the World Health Organization (WHO). Questionnaires were randomly distributed nationwide in China through a web-based survey company ('SurveyStar', Changsha Ranxing Science and Technology, Shanghai, China) from January 31 to February 9 in 2020 in this cross-sectional study. As of February 9th, there were about 37,198 confirmed cases, 28,942 suspected cases, 2649 recovered cases, and 811 dead cases in the whole country. The respondents were paid 20 RMB as compensation to fill in the questionnaires. This study was approved by the Ethics Committee of Peking University. Written informed consent was obtained from the participants. Participants were informed that their personal information and responses would be anonymous and confidential.

2.3. Measures

2.3.1. Perceived stress scale 10-item version (PSS10)

The PSS10 is a 10-item scale to assess the respondents' perceived stress related to the COVID-19 pandemic. This scale was originally compiled as a global measure of stress (Cohen et al., 1983) and the revised Chinese version had been demonstrated to have good reliability and validity (Yang & Huang, 2003). Items are rated from 1 (not at all) to 5 (very much). Participants were asked to respond according to their feelings or thoughts of the COVID-19 for the past month. The higher the score, the more stressful the respondents. The PSS10 demonstrated good internal consistency ($\alpha = .801$) in the current sample.

2.3.2. Psychological questionnaire for emergent events of public health (PQEEPH)

The emotional distress to the COVID-19 pandemic was measured by the PQEEPH. The PQEEPH was adapted from the SARS Psychological Behavior Questionnaire (SARS-PBQ) (Gao, Xu, Yang, & Yao, 2004). There are 22 items in the PQEEPH which are divided into five dimensions: depression, fear, compulsion-anxiety, neurasthenia, and hypochondria. Considering that some items of SARS-PBQ were designed specifically for SARS, we made appropriate changes to adapt to the current COVID-19 background. For example, the item "when I think about something related to SARS, I have no intention to do anything else anymore" was revised into "when I think about something related to the COVID-19, I have no intention to do anything else anymore". In this study, the internal consistency coefficients of the five dimensions (depression, fear, compulsion-anxiety, neurasthenia, and hypochondria) were .809, .722, .714, .722, and .656, respectively.

Table 1
Demographic characteristics of the respondents (n = 3233).

Variable	Mean (SD) or number (%)
Gender	
Male	1475 (45.62 %)
Female	1758 (54.38 %)
Age (Years)	31.71 (9.78)
Education	
Middle school or below	204 (6.31 %)
High school	496 (15.34 %)
Training college	592 (18.31 %)
Undergraduate college	1673 (51.75 %)
Master or above	268 (8.29 %)
Monthly income (RMB)	
< 2000	735 (22.73 %)
2001-5000	798 (24.68 %)
5001-10000	1102 (34.09 %)
10001-20000	459 (14.20 %)
20001-50000	111 (3.43 %)
>50000	28 (0.87 %)

2.3.3. Short boredom proneness scale (SBPS)

The SBPS (Struk, Carriere, Cheyne, & Danckert, 2017) is an 8-item short version of the original BPS created by Farmer and Sundberg (1986). The scale used here was translated into Chinese and tested among Chinese college students (Peng et al., 2020). Their results from factor analysis suggested that SBPS has one dominant factor with excellent validity and reliability (Peng et al., 2020). An exemplary item is "many things I have to do are repetitive and monotonous". The scale contains 8 items, and each item is rated from 0 = highly disagree to 7 = highly agree, with a higher score indicating greater boredom proneness. The internal consistency of SBPS for the current research was .882.

2.3.4. Simplified coping style questionnaire (SCSQ)

The SCSQ includes two dimensions, i.e., negative and positive coping styles (Xie, 1998). The individual coping tendency is calculated by the standard score of positive coping minus the standard score of negative coping. If the value is greater than 0, indicates that the individuals' coping tendency is mostly positive (for example, "ask friends and family for advice"); if the value is less than 0, indicates that the individual mainly uses negative coping strategy (for example, "try to forget the whole thing"). In our study, the internal consistency coefficients of the positive and negative coping style subscale were .797 and .637, respectively.

2.4. Statistical analyses

All the analyses were implemented by IBM SPSS Statistics, version 24.0 (IBM Corp., Armonk, NY). The analyses of the hypothetical mediating role of boredom proneness and the moderating role of coping tendencies were conducted by Hayes (2017) PROCESS macro (Model 4 and Model 5). All continuous variables were standardized and the interaction effects were computed from these standardized scores. The bootstrapping method produces 99 % bias-corrected confidence intervals of these effects from 5000 resamples of the data. Confidence intervals that do not include zero indicate significant effects (Hayes & Scharkow, 2013). Before testing the models in PROCESS macro, the Scatter Plot of the standardized residuals showed that our data violated the homoscedasticity assumption as "the residuals roughly rectangularly distributed, with most of the scores concentrated in the center (along with the 0 points)" (Pallant, 2011). Therefore, the HC3 heteroscedasticity-consistent standard error estimator proposed by Davidson and MacKinnon (1993) was applied for regressions in the current study, since HC3 was recommended (Hayes & Cai, 2007) and confirmed as the most reliable estimator (Cribari-Neto, Ferrari, & Oliveira, 2005). This estimator was also proposed to keep the test size at the nominal level regardless of the presence or absence of heteroscedasticity (Long & Ervin, 2000).

3. Results

3.1. Descriptive statistics and correlations between variables

Means and standard deviations (SD) for scores of all the questionnaires are presented in Table 2. Pearson correlations between variables are shown in Table 3. The results demonstrated that individuals who experienced greater perceived stress about the COVID-19 pandemic reported more emotional distress measured by PQEEPH including depression, fear, compulsion-anxiety, neurasthenia, and hypochondria.

Table 2
Mean and standard deviation for scores of all the questionnaires.

Variables	PSS10	Depression	Fear	Compulsion-anxiety	Neurasthenia	Hypochondria	Boredom proneness	Coping tendency
Mean	2.486	1.489	2.335	1.397	1.599	1.678	3.400	.000
SD	.601	.501	.653	.420	.590	.680	1.301	1.228

Table 3
Pearson correlations between variables (n = 3233).

Variables	1	2	3	4	5	6	7	8
PSS10	1							
Depression	.406***	1						
Fear	.446***	.390***	1					
Compulsion-anxiety	.538***	.637***	.553***	1				
Neurasthenia	.499***	.604***	.454***	.736***	1			
Hypochondria	.305***	.280***	.527***	.439***	.340***	1		
Boredom proneness	.383***	.387***	.273***	.376***	.411***	.194***	1	
Coping tendency	−.381***	−.269***	−.113***	−.301***	−.334***	−.037*	−.347***	1

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Likewise, individuals with higher boredom proneness had stronger emotional distress. Additionally, individuals who mainly adopted negative coping would experience more emotional distress as well.

3.2. Mediating role of boredom proneness

Correlation analysis showed significant and positive correlations among perceived stress, boredom proneness, and emotional distress, which provided a precondition for testing the mediating effect of boredom proneness. Firstly, to examine Hypothesis 1, a general linear model was built in which PSS10 was treated as a predictor, emotional distress as outcome variables, boredom proneness as a mediator, and demographic variables (i.e., gender, age, education, and monthly income) as covariates. The indirect and direct path between perceived stress and emotional distress are presented in Table 4. As displayed in Table 4A (direct path), the results demonstrated that PSS10 positively explained depression ($\beta = .399$, $p < .001$), fear ($\beta = .437$, $p < .001$), compulsion-anxiety ($\beta = .526$, $p < .001$), neurasthenia ($\beta = .493$, $p < .001$), and hypochondria ($\beta = .294$, $p < .001$) after controlling the effects of demographic variables. These results supported our Hypothesis 1 that higher perceived stress was associated with greater emotional distress during the outbreak of the COVID-19 pandemic.

A mediation model was built using the PROCESS macro (Model 4) developed by Hayes and Scharkow (2013) with the above covariates (i.e., gender, age, education, and income). As displayed in Table 4B (indirect path), after we added boredom proneness into the regression models, PSS10 was positively linked with boredom proneness ($\beta = .367$, $p < .001$). Furthermore, boredom proneness still positively related with depression ($\beta = .278$, $p < .001$), fear ($\beta = .126$, $p < .001$), compulsion-anxiety ($\beta = .206$, $p < .001$), neurasthenia ($\beta = .255$, $p < .001$) and hypochondria ($\beta = .088$, $p < .001$). Additionally, as shown in Table 5, the Bootstrap 99% confidence intervals of the indirect effect of boredom proneness did not include zero. This provided further evidence that boredom proneness partially mediated the relationship between PSS10 and emotional distress, as the direct path of boredom proneness and distress was still significant. Therefore, Hypothesis 2 was supported that boredom proneness mediates the relationship between perceived stress and emotional distress.

3.3. Moderating effect of the coping tendency

The PROCESS macro (Model 5) by Hayes and Scharkow (2013) was used to test the moderated mediation model. As demonstrated in Table 6, the interaction effect of PSS10 and coping tendency negatively and significantly explained depression (β=- .047, $p < .01$), compulsion-anxiety (β=- .083, $p < .001$) and neurasthenia (β=- .100, $p < .001$). However, the interaction did not significantly associate with fear ($\beta = .003$, $p > .05$) and hypochondria ($\beta = .013$, $p > .05$). Hypothesis 3 was largely supported that coping tendency moderates the relationship between perceived stress and emotional distress including depression, compulsion-anxiety, and neurasthenia.

To further explain the interaction effect, we plotted PSS10 against emotional distress (i.e., depression, compulsion-anxiety, and neurasthenia), separated for low (M - SD) and high (M + SD) levels of coping tendency.

The results showed that as the coping tendency moved from positive to negative, the interpretative effect of perceived stress on the depression was gradually strengthened, and β increased from .220 ($p < .001$) to .314 ($p < .001$) (see Fig. 2. A); β increased from .333 ($p < .001$) to .498 ($p < .001$) for compulsion-anxiety (see Fig. 2. B); β increased from .250 ($p < .001$) to .449 ($p < .001$) for neurasthenia (see Fig. 2. C). These results indicated that, compared with the positive coping tendency, when participants tended to adopt more negative coping, perceived stress might lead to higher levels of depression, compulsion-anxiety, and neurasthenia.

In summary, boredom proneness mediated the relationship between perceived stress and emotional distress (i.e., depression, compulsion-anxiety, and neurasthenia), and participants' coping tendency moderated the stress-distress relationship.

4. Discussion

The current cross-sectional study explored the relationship between stress perception and emotional distress during the outbreak of the COVID-19 pandemic in China, and the mediating effect of boredom proneness as well as the moderating effect of coping style on the stress-emotion relationship. The results showed that participants with a higher level of perceived stress reported a higher degree of emotional disturbance, including depression, fear, compulsion-anxiety, neurasthenia, and hypochondria. Moreover, the mediation model indicated that perceived stress may exert influence on emotional distress through boredom proneness of individuals. Furthermore, the relationship of perceived stress and emotional distress was moderated by coping styles, i.e., when perceiving the same level of stress, individuals with more negative coping styles tend to experience a higher level of emotional distress including depression, compulsion-anxiety, and neurasthenia.

Individuals that perceived higher stress related to the COVID-19 pandemic reported higher severity of emotional distress. The COVID-19 at the initial outbreak constituted an uncontrollable and unpredictable stressor due to the high risk of contagion and the shortage of

Table 4
The mediation model of boredom proneness between perceived stress and emotional distress.

(A)

Predictors	Depression				Fear				Compulsion-anxiety				Neurasthenia				Hypochondria			
	β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI	
			LLCI	ULCI			LLCI	ULCI			LLCI	ULCI			LLCI	ULCI			LLCI	ULCI
Gender	−.087**	.033	−.172	−.003	−.028	.033	−.112	.055	−.042	.031	−.121	.036	.003	.032	−.079	.084	−.025	.034	−.113	.063
Age	−.003	.002	−.008	.002	−.006**	.002	−.011	−.002	−.005**	.002	−.010	−.001	−.007***	.002	−.011	−.002	−.012***	.002	−.017	−.007
Education	.054**	.017	.012	.097	.017	.017	−.027	.061	.045**	.015	.006	.083	−.012	.016	−.053	.029	−.022	.018	−.067	.024
Income	−.006	.015	−.045	.032	.055***	.014	.020	.090	.030	.014	−.006	.065	−.004	.014	−.040	.033	.083***	.015	.045	.121
PSS10	.399***	.019	.351	.447	.437***	.017	.394	.479	.526***	.017	.483	.570	.493***	.017	.449	.537	.294***	.018	.247	.341
F(HC3)	102.205***				165.075***				217.573***				185.079***				69.416***			
R	.413				.454				.544				.504				.328			
R^2	.171				.206				.296				.254				.108			

(B)

Predictors	BP				Depression				Fear				Compulsion-anxiety				Neurasthenia				Hypochondria			
	β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI		β	SE (HC3)	99 % CI	
			LLCI	ULCI			LLCI	ULCI			LLCI	ULCI			LLCI	ULCI			LLCI	ULCI			LLCI	ULCI
Gender	−.061	.033	−.145	.024	−.071	.032	−.152	.011	−.021	.032	−.104	.062	−.030	.030	−.106	.046	.018	.030	−.061	.096	−.020	.034	−.107	.068
Age	−.017***	.002	−.022	−.012	.002	.002	−.003	.006	−.004	.002	−.009	.001	−.002	.002	−.006	.003	−.002	.002	−.007	.002	−.011***	.002	−.016	−.006
Education	−.007	.017	−.052	.037	.056***	.016	.016	.097	.018	.017	−.025	.061	.046*	.015	.008	.084	−.010	.015	−.049	.029	−.021	.018	−.066	.024
Income	−.053***	.014	−.089	−.016	.008	.014	−.029	.045	.062***	.014	.027	.097	.040*	.013	.006	.075	.010	.014	−.026	.045	.088***	.015	.049	.126
PSS10	.367***	.017	.323	.410	.297***	.019	.248	.346	.391***	.018	.345	.436	.451***	.018	.404	.497	.399***	.018	.354	.445	.262***	.020	.211	.314
BP					.278***	.019	.230	.326	.126***	.018	.079	.172	.206***	.017	.161	.251	.255***	.017	.211	.299	.088***	.020	.035	.140
F(HC3)	144.513***				129.099***				147.551***				209.264***				197.912***				60.812***			
R	.434				.483				.468				.574				.554				.337			
R^2	.189				.233				.219				.330				.307				.114			

Note. Bootstrap sample size = 5000; PSS10 = Perceived stress; BP = Boredom proneness. * $p < 0.05$, ** $p < .01$., *** $p < .001$.

Table 5
Total effect and indirect effect of perceived stress on emotional distress in the mediating model.

Outcome variables	Total effect	Indirect effect	Relative effect	Boot SE	Boot · 99 % CI of the indirect effect
Depression	.399	.102	25.56 %	.008	[.081, .125]
Fear	.437	.046	10.53 %	.007	[.028, .065]
Compulsion-anxiety	.526	.075	14.26 %	.008	[.057, .096]
Neurasthenia	.492	.093	18.901 %	.008	[.074, .113]
Hypochondria	.294	.032	10.88 %	.008	[.014, .053]

effective timely treatment and medical resources (Xiao, Zhang, Kong, Li, & Yang, 2020). Furthermore, the obligation to quarantine (Zhang et al., 2020), the media use related to the pandemic outbreak (Chao, Xue, Liu, Yang, & Hall, 2020; Mertens, Gerritsen, Duijndam, Salemink, & Engelhard, 2020), the uncertainty and novelty of the virus (Asmundson & Taylor, 2020) as well as the evidence of possible fatality (Onder, Rezza, & Brusaferro, 2020), and the repeated exposure to media reports of increased casualty/infected cases (Lima et al., 2020) might aggravate individuals' stress levels. Previous studies showed that exposure to uncontrollable or unpredictable disasters (e.g., earthquake, tsunamis, etc.) contributed to various negative emotional outcomes including depression, loneliness, fear, irritability, and anxiety (Raj & Subramony, 2008; Wheaton, Abramowitz, Berman, Fabricant, & Olatunji, 2012; Xiang, Wang, Jiang, & Mo, 2016). Similarly, in the current study, the high level of perceived stress related to the COVID-19 pandemic was found to be associated with more severity of depression, and anxiety in the general population. Additionally, perceived stress was also related with more severity of neurasthenia. Neurasthenia typically presents with fatigue and is frequently accompanied by a series of physical and psychological symptoms, including inattention and poor memory, irritability, excitability, or insomnia (Zheng et al., 1997). Nowadays, this psychiatric concept is mostly used in Asian countries, which might attribute to the differences in cultural and social contexts between Western and Eastern cultures. Depression is phenomenologically different in Chinese culture. Recently, an epidemiological study in China showed that although there was some overlap between depression and neurasthenia such as low mood, the differences in prevalence rates, the presence of their differential correlates and the cultural acceptance suggested the utility of neurasthenia as a distinct disorder (Hall et al., 2018). Meanwhile, depressive patients showed more severe impairment in coping flexibility while neurasthenia patients were only partially impaired (Gan, Zhang, Wang, Wang, & Shen, 2006).

Except for emotional distress, higher perceived stress was also related to more symptoms of hypochondria. Hypochondria (i.e., physical concerns) is common in public health emergencies. For instance, people tended to pay more attention to their body temperature during SARS (Luo & Wang, 2009). It should be noted that physical concerns are normal reactions to a public health event, as they can make people alert to the possible infection. However, dysfunctional preoccupation with physical symptoms might lead to a psychiatric condition, as a one-case study showed a diagnosis of somatic symptom disorder triggered by excessive concerns of being infected by the COVID-19 (Colizzi et al., 2020). These emotional distress and physical concerns are also in accord with COVID Stress Syndrome, such as stress symptoms, contamination fears, and obsessive checking (Taylor et al., 2020b).

Under the situation of lockdown during corona time, boredom proneness was discovered to play a partially mediating role in the relationship between perceived stress and emotional distress, i.e., individuals with a propensity to experience boredom were more likely to report greater emotional distress. It was proposed that individuals with higher boredom proneness might focus on themselves or their internal states, and further tend to have more awareness of existing psychological symptoms (Sommers & Vodanovich, 2000). Meanwhile, they were

Table 6
The moderated mediation model of coping tendency between perceived stress and emotional distress.

Predictors	Depression				Fear				Compulsion-anxiety				Neurasthenia				Hypochondria			
	β	SE (HC3)	99 % CI LLCI	ULCI	β	SE (HC3)	99 % CI LLCI	ULCI	β	SE (HC3)	99 % CI LLCI	ULCI	β	SE (HC3)	99 % CI LLCI	ULCI	β	SE (HC3)	99 % CI LLCI	ULCI
Gender	−.072	.031	−.153	.009	−.021	.032	−.103	.062	−.032	.029	−.108	.044	.016	.030	−.062	.093	−.019	.034	−.106	.068
Age	.001	.002	−.003	.006	−.004	.002	−.008	.001	−.002	.002	−.006	.002	−.003	.002	−.007	.002	−.010***	.002	−.015	−.005
Education	.058***	.016	.017	.098	.018	.017	−.026	.061	.048**	.015	.011	.086	−.007	.015	−.046	.032	−.022	.018	−.067	.023
Income	.012	.014	−.025	.048	.057***	.014	.022	.092	.043**	.013	.009	.078	.015	.014	−.020	.050	.082***	.015	.044	.121
PSS10	.267***	.019	.217	.316	.419***	.018	.372	.466	.415***	.018	.370	.461	.350***	.018	.305	.395	.298***	.021	.244	.351
BP	.261***	.019	.212	.311	.148***	.018	.100	.195	.191***	.018	.145	.237	.232***	.018	.187	.277	.114***	.021	.060	.167
CT	−.079***	.018	−.125	−.032	.094***	.018	.046	.141	−.079***	.016	−.121	−.037	−.119***	.017	−.161	−.076	.113***	.019	.064	.161
PSS10×CT	−.047**	.015	−.086	−.008	.003	.015	−.035	.041	−.083***	.014	−.118	−.047	−.100***	.013	−.133	−.067	.013	.015	−.027	.053
F(HC3)	111.532***				117.379***				181.997***				174.841***				50.684***			
R	.491				.475				.586				.575				.352			
R^2	.241				.226				.343				.330				.124			

Note. Bootstrap sample size = 5000; PSS10 = Perceived stress; BP = Boredom proneness; CT = Coping tendency. * $p < .05$, ** $p < .01$., *** $p < .001$.

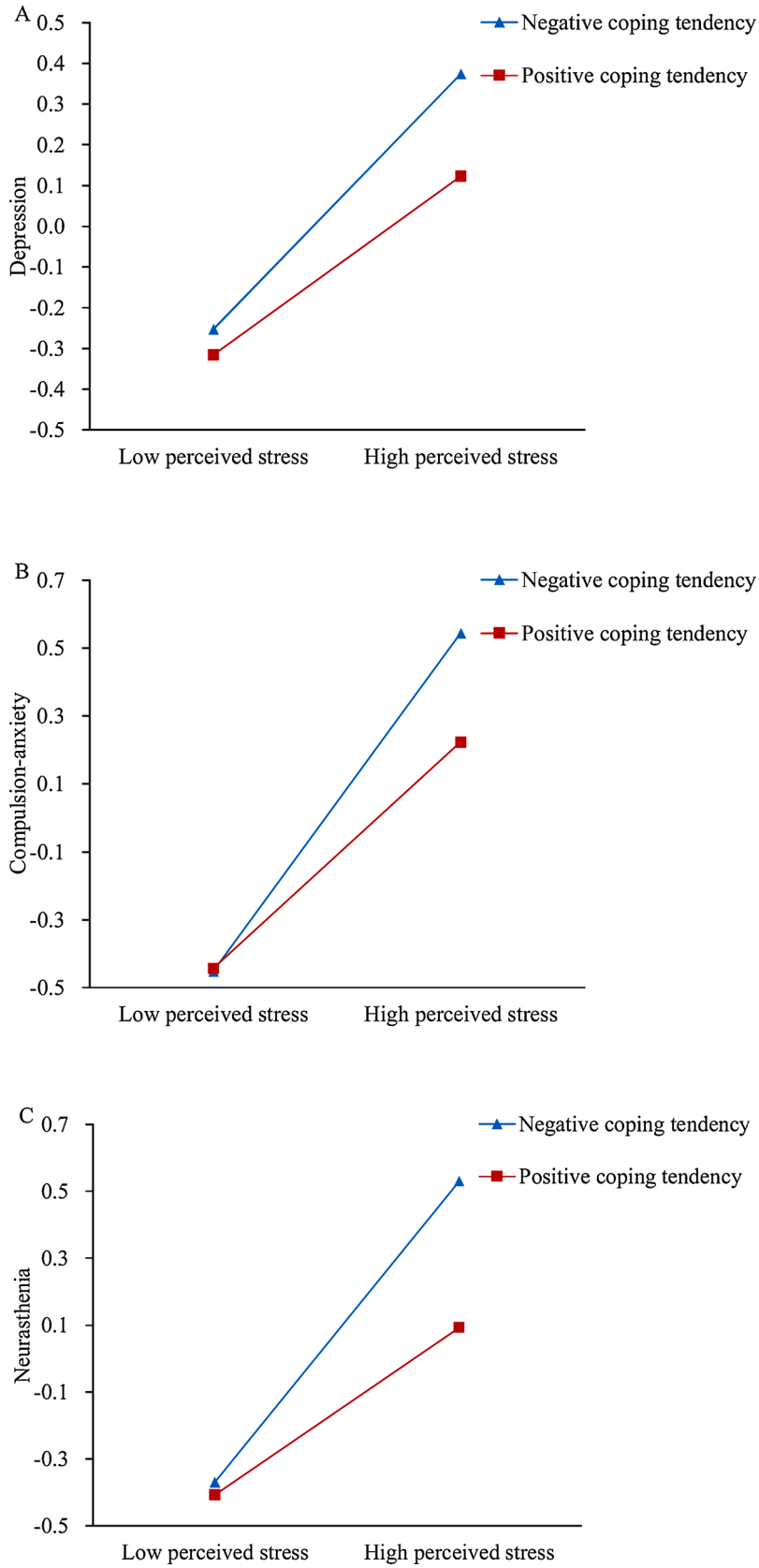

Fig. 2. Coping tendency moderates the relationship between perceived stress and depression (A), compulsion-anxiety (B), neurasthenia (C).

less able to regulate their emotion when experiencing a high level of stress (Culp, 2006). Therefore, this high emotional awareness and low regulation ability might be the underlying mechanism of the relationship between perceived stress and emotional distress. Furthermore, people who scored higher on boredom proneness felt less control of and thus persistent disengagement from their environment (Isacescu et al., 2017, Eastwood et al., 2012). In turn, uncontrollability and disengagement might also lead to emotional distress in a demanding situation. For example, low perceived control caused more worry about personally salient events, but at the same time, this concern was considered as a failed coping attempt due to the lack of any practical measures (Chapman, Kertz, & Woodruff-Borden, 2009). A recent study revealed that individuals with high boredom proneness preferred rule-breaking of social isolation, including less time in social isolation or poor adherence to social distancing (Danckert, Boylan, Seli, & Scholer, 2020). Additionally, for adolescents with high levels of trait boredom proneness, there was a strong association between state boredom and substance use (Weybright, Caldwell, Ram, Smith, & Wegner, 2015). Boredom proneness was also found related to a series of negative consequences due to the intense and frequent boredom experience. More specifically, high boredom prone individuals showed cognitive and affective dysregulation (Isacescu et al., 2017) and suffered from more symptoms of depression and anxiety (Goldberg, Eastwood, LaGuardia, & Danckert, 2011; Vodanovich, Verner, & Gilbride, 1991). Accordingly, individuals with highly boredom proneness also tended to deal with their boredom through pathological gambling, drug abuse, and alcohol use (Blaszczynski, McConaghy, & Frankova, 1990; Iso-Ahola & Crowley, 1991; Orcutt, 1984). Furthermore, higher boredom proneness was associated with less capability to control anger and aggression (Dahlen, Martin, Ragan, & Kuhlman, 2004; Isacescu & Danckert, 2018). In this light, during the COVID-19 isolation and lockdown, high boredom prone people might be more vulnerable to suffer from adverse circumstances due to risk-taking behaviors or negative coping strategies. It should be noted that, for the relationship between perceived stress and emotional distress, boredom proneness is only a partial mediator in the current study. In other words, there might be other important variables which were not included in our study and these variables might also play an important role in the stress-distress relationship. For example, Havnen et al. (2020) found that psychological resilience was a key mediator between stress and depression and anxiety symptoms in the COVID-19 pandemic.

Although emotional distress arose, we noticed that when encountering disasters, most people were resilient and did not develop psychological symptoms. Indeed, our results revealed that the relationship between stress and emotional distress could be influenced by the coping strategies individuals selected. Positive coping was a problem-focused coping including seeking social support for instrumental reasons, cognitive restructuring, and planning. Negative coping is emotion-focused, passive, or avoidant coping. Examples of negative coping include denial, wishful thinking, and substance use (Carver, Scheier, & Weintraub, 1989; Xie, 1998). It was also proposed that people may overuse their phones (i.e., problematic smartphone use) to cope with the social isolation and absence of various outdoor activities during the COVID-19 pandemic (Elhai, Yang, McKay, & Asmundson, 2020). Some other negative strategies such as over-eating, using drugs, and alcohol might briefly alleviate distress under the situation of self-isolation but are harmful in the longer-term (Taylor et al., 2020a). Besides, evidence from previous studies had found that positive coping was related to better psychological adjustment, while negative coping was associated with worse consequences (Hawken, Turner-Cobb, & Barnett, 2018). Our results demonstrated that when individuals perceived similar levels of psychological stress, those mainly adopting positive coping strategies were more likely to experience less emotional distress, suggesting that positive coping might be a "resilient" factor. That is, positive and adaptive coping, such as training on stress management and encouragement of self-care, would contribute more to the improvement of emotional resilience (Taylor, 2019). In contrast, those who prefer to use more negative coping strategies are more likely to experience more emotional distress, therefore, are a "high-risk" population for mental illness under stress.

There are several implications in the present study. Firstly, psychological stress is related to emotional distress in the early stage of the pandemic during which the whole society is under panic. Hotopf and Wessely (1994) found that people with high levels of stress were more tend to fall ill with a viral infection and suffer more neurotic symptoms than non-stressed individuals. Therefore, it is necessary to screen individuals with higher stress levels at an early stage to provide appropriate psychological interventions in time, to improve their physical and psychological fitness. Secondly, boredom proneness was found to be an important mediator of mental health, which echoed with the viewpoint that various personality traits are vulnerability factors for high levels of pandemic-related emotional distress and worry(Taylor, 2019). As mindfulness training played a key role in alleviating the negative impact related to an individual's boredom proneness (LePera, 2011), intervention with home-based mindfulness training might be beneficial to them. Thirdly, our research suggested positive coping as a potential protective factor while negative coping a risk factor under stress. Proper use of official media to disseminate positive coping strategies might be an effective and convenient method to alleviate the effect of stress on mental health among the general population.

There are also some limitations to this study. First of all, it should be noted that this was a cross-sectional study without the temporal factor. It would be informative to follow up on the dynamic change of mental health along with the development of the COVID-19 pandemic. For example, compared with the initial peak of the COVID-19 pandemic, levels of stress and fear were decreased while depression levels were significantly increased during the remission phase when the number of cases declined (Duan et al., 2020). Considering that the second wave of the COVID-19 might be approaching, it remains to be investigated whether the rising number of cases and persistent social distancing are associated with a further deterioration of mental health. However, it is worthwhile to mention that data in our research was collected at the initial as well as the most serious stage of the outbreak, which may to a large extent reflect the most significant impact of pandemic-related stress on mental health. Secondly, all questionnaires were self-reported, which might not be consistent with the objective assessment by mental health professionals. Nevertheless, subjective measurements were widely used during the emergent public health events (Lau et al., 2008; Leder, Pastukhov, & Schütz, 2020), and all questionnaires used here had been demonstrated high internal consistency. Thirdly, though we aimed at the general population, our sample mainly consists of well-educated young people, who may have higher immunity to viruses as well as a better capability to manage stress. Clinical characteristics of COVID-19 showed that the mortality rate of the elderly patients was higher than that of young and middle-aged patients (Liu, Chen, Lin, & Han, 2020), which implicated possibly higher psychological stress and more emotional distress in elderly individuals. Last but not least, it should be noted that COVID-19 has a greater negative impact on individuals with anxiety or mood disorders when compared with mentally healthy people (Asmundson et al., 2020). Considering that the current study only recruited healthy people, future studies should focus more on this vulnerable group.

5. Conclusion

A higher level of perceived stress due to the COVID-19 pandemic was related to more emotional distress. Stress-related increase in emotional distress is mediated by boredom proneness. Furthermore, positive coping strategies act as a buffer in alleviating emotional distress induced by stress while negative coping strategies may aggravate emotional symptoms under stress.

Author contribution

J.H.Wu and Y.Q.Gan developed the study concept.

All authors contributed to the study design.

L.L.Yan and H.X.Duan performed the data analysis and interpretation under the supervision of J.H.Wu and Y.Q.Gan.

L.L.Yan and H.X.Duan drafted the manuscript.

H.X.Duan provided critical revisions.

All authors approved the final version of the manuscript for submission.

Declaration of Competing Interest

The authors declare no competing interests.

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References

Asmundson, G. J., & Taylor, S. (2020). Coronaphobia: Fear and the 2019-nCoV outbreak. *Journal of Anxiety Disorders, 70*, Article 102196. https://doi.org/10.1016/j.janxdis.2020.102196

Asmundson, G. J., Paluszek, M. M., Landry, C. A., Rachor, G. S., McKay, D., & Taylor, S. (2020). Do pre-existing anxiety-related and mood disorders differentially impact COVID-19 stress responses and coping? *Journal of Anxiety Disorders.* , Article 102271. https://doi.org/10.1016/j.janxdis.2020.102271

Berman, S. L., Kurtines, W. M., Silverman, W. K., & Serafini, L. T. (1996). The impact of exposure to crime and violence on urban youth. *The American Journal of Orthopsychiatry, 66*(3), 329–336. https://doi.org/10.1037/h0080183

Besharart, M. A., Khadem, H., Zarei, V., & Momtaz, A. (2020). Mediating role of perceived stress in the relationship between facing existential issues and symptoms of depression and anxiety. *Iranian Journal of Psychiatry, 15*(1), 81.

Blakey, S. M., Reuman, L., Jacoby, R. J., & Abramowitz, J. S. (2015). Tracing "fearbola" : Psychological predictors of anxious responding to the threat of Ebola. *Cognitive Therapy and Research, 39*(6), 816–825. https://doi.org/10.1007/s10608-015-9701-9

Blalock, J. A., & Joiner, T. E. (2000). Interaction of cognitive avoidance coping and stress in predicting depression/anxiety. *Cognitive Therapy and Research, 24*(1), 47–65. https://doi.org/10.1023/A:1005450908245

Blaszczynski, A., McConaghy, N., & Frankova, A. (1990). Boredom proneness in pathological gambling. *Psychological Reports, 67*(1), 35–42.

Bonanno, G. A., Ho, S. M. Y., Chan, J. C. K., Kwong, R. S. Y., Cheung, C. K. Y., Wong, C. P. Y., … Wong, V. C. W. (2008). Psychological resilience and dysfunction among hospitalized survivors of the SARS epidemic in Hong Kong: A latent class approach. *Health Psychology, 27*(5), 659–667. https://doi.org/10.1037/0278-6133.27.5.659

Booth, J., Connelly, L., Lawrence, M., Chalmers, C., Joice, S., Becker, C., … Dougall, N. (2015). Evidence of perceived psychosocial stress as a risk factor for stroke in adults: A meta-analysis. *BMC Neurology, 15*(1), 233. https://doi.org/10.1186/s12883-015-0456-4

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology, 56*(2), 267. https://doi.org/10.1037/0022-3514.56.2.267

Chao, M., Xue, D., Liu, T., Yang, H., & Hall, B. J. (2020). Media use and acute psychological outcomes during COVID-19 outbreak in China. *Journal of Anxiety Disorders.* , Article 102248. https://doi.org/10.1016/j.janxdis.2020.102248

Chapman, L. K., Kertz, S. J., & Woodruff-Borden, J. (2009). A structural equation model analysis of perceived control and psychological distress on worry among African American and European American young adults. *Journal of Anxiety Disorders, 23*(1), 69–76. https://doi.org/10.1016/j.janxdis.2008.03.018

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385–396. https://doi.org/10.2307/2136404

Coiro, M. J., Bettis, A. H., & Compas, B. E. (2017). College students coping with interpersonal stress: Examining a control-based model of coping. *Journal of American College Health, 65*(3), 177–186.

Colizzi, M., Bortoletto, R., Silvestri, M., Mondini, F., Puttini, E., Cainelli, C., & Zoccante, L. (2020). Medically unexplained symptoms in the times of Covid-19 pandemic: A case-report. *Brain, Behavior, & Immunity-Health.* , Article 100073. https://doi.org/10.1016/j.bbih.2020.100073

Cowling, B. J., Ng, D. M. W., Ip, D. K. M., Liao, Q., Lam, W. W. T., Wu, J. T., … Fielding, R. (2010). Community psychological and behavioral responses through the first wave of the 2009 influenza A(H1N1) pandemic in Hong Kong. *The Journal of Infectious Diseases, 202*(6), 867–876. https://doi.org/10.1086/655811

Cribari-Neto, F., Ferrari, S. L., & Oliveira, W. A. (2005). Numerical evaluation of tests based on different heteroskedasticity-consistent covariance matrix estimators. *Journal of Statistical Computation and Simulation, 75*(8), 611–628.

Culp, N. A. (2006). The relations of two facets of boredom proneness with the major dimensions of personality. *Personality and Individual Differences, 41*(6), 999–1007. https://doi.org/10.1016/j.paid.2006.02.018

Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2004). Boredom proneness in anger and aggression: Effects of impulsiveness and sensation seeking. *Personality and Individual Differences, 37*(8), 1615–1627.

Danckert, J., Boylan, J., Seli, P., & Scholer, A. (2020). *Boredom and rule breaking during COVID-19*.

Davidson, R., & MacKinnon, J. G. (1993). Estimation and inference in econometrics. *OUP Catalogue.*

Derogatis, L. R., Lipman, R. S., Rickels, K., Uhlenhuth, E. H., & Covi, L. (1974). The hopkins symptom checklist (HSCL): A self-report symptom inventory. *Behavioral Science, 19*(1), 1–15.

Doering, L. V., Dracup, K., Caldwell, M. A., Moser, D. K., Erickson, V. S., Fonarow, G., … Hamilton, M. (2004). Is coping style linked to emotional states in heart failure patients? *Journal of Cardiac Failure, 10*(4), 344–349. https://doi.org/10.1016/j.cardfail.2003.10.001

Duan, H., Yan, L., Ding, X., Gan, Y., Kohn, N., & Wu, J. (2020). Impact of the COVID-19 pandemic on mental health in the general Chinese population: Changes, predictors and psychosocial correlates. *Psychiatry Research*, Article 113396.

Duan, L., & Zhu, G. (2020). Psychological interventions for people affected by the COVID-19 epidemic. *The Lancet Psychiatry, 7*(4), 300–302. https://doi.org/10.1016/S2215-0366(20)30073-0

Dyson, R., & Renk, K. (2006). Freshmen adaptation to university life: Depressive symptoms, stress, and coping. *Journal of Clinical Psychology, 62*(10), 1231–1244. https://doi.org/10.1002/jclp.20295

Eastwood, J. D., Frischen, A., Fenske, M. J., & Smilek, D. (2012). The unengaged mind: Defining boredom in terms of attention. *Perspectives on Psychological Science, 7*(5), 482–495. https://doi.org/10.1177/1745691612456044

Elhai, J. D., Levine, J. C., Alghraibeh, A. M., Alafnan, A. A., Aldraiweesh, A. A., & Hall, B. J. (2018). Fear of missing out: Testing relationships with negative affectivity, online social engagement, and problematic smartphone use. *Computers in Human Behavior, 89*, 289–298. https://doi.org/10.1016/j.chb.2018.08.020

Elhai, J. D., Yang, H., McKay, D., & Asmundson, G. J. (2020). COVID-19 anxiety symptoms associated with problematic smartphone use severity in Chinese adults. *Journal of Affective Disorders*. https://doi.org/10.1016/j.jad.2020.05.080

Farmer, R., & Sundberg, N. D. (1986). Boredom proneness–the development and correlates of a new scale. *Journal of Personality Assessment, 50*(1), 4–17. https://doi.org/10.1207/s15327752jpa5001_2

Gan, Y., Zhang, Y., Wang, X., Wang, S., & Shen, X. (2006). The coping flexibility of neurasthenia and depressive patients. *Personality and Individual Differences, 40*(5), 859–871.

Gao, Y., Xu, M., Yang, Y., & Yao, K. (2004). Discussion on the coping style of undergraduates and the correlative factors during the epidemic period of SARS. *Chinese Medical Ethics*, 02.

Goldberg, Y. K., Eastwood, J. D., LaGuardia, J., & Danckert, J. (2011). Boredom: An emotional experience distinct from apathy, anhedonia, or depression. *Journal of Social and Clinical Psychology, 30*(6), 647–666.

Hall, B. J., Chang, K., Chen, W., Sou, K. L., Latkin, C., & Yeung, A. (2018). Exploring the association between depression and shenjing shuairuo in a population representative epidemiological study of Chinese adults in Guangzhou, China. *Transcultural Psychiatry, 55*(6), 733–753.

Havnen, A., Anyan, F., Hjemdal, O., Solem, S., Gurigard Riksfjord, M., & Hagen, K. (2020). Resilience moderates negative outcome from stress during the COVID-19 pandemic: A moderated-mediation approach. *International Journal of Environmental Research and Public Health, 17*(18), 6461.

Hawken, T., Turner-Cobb, J., & Barnett, J. (2018). Coping and adjustment in caregivers: A systematic review. *Health Psychology Open, 5*(2). https://doi.org/10.1177/2055102918810659, 2055102918810659.

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Publications.

Hayes, A. F., & Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior Research Methods, 39*(4), 709–722.

Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter? *Psychological Science, 24*(10), 1918–1927. https://doi.org/10.1177/0956797613480187

Hotopf, M. H., & Wessely, S. (1994). Viruses, neurosis and fatigue. *Journal of Psychosomatic Research, 38*(6), 499–514. https://doi.org/10.1016/0022-3999(94)90047-7

Isacescu, J., & Danckert, J. (2018). Exploring the relationship between boredom proneness and self-control in traumatic brain injury (TBI). *Experimental Brain Research, 236*(9), 2493–2505.

Isacescu, J., Struk, A. A., & Danckert, J. (2017). Cognitive and affective predictors of boredom proneness. *Cognition & Emotion, 31*(8), 1741–1748. https://doi.org/10.1080/02699931.2016.1259995

Iso-Ahola, S. E., & Crowley, E. D. (1991). Adolescent substance abuse and leisure boredom. *Journal of Leisure Research, 23*(3), 260–271.

Jungmann, S. M., & Witthöft, M. (2020). Health anxiety, cyberchondria, and coping in the current COVID-19 pandemic: Which factors are related to coronavirus anxiety? *Journal of Anxiety Disorders*. , Article 102239. https://doi.org/10.1016/j.janxdis.2020.102239

Lau, A. L., Chi, I., Cummins, R. A., Lee, T. M., Chou, K. L., & Chung, L. W. (2008). The SARS (Severe Acute Respiratory Syndrome) pandemic in Hong Kong: Effects on the subjective wellbeing of elderly and younger people. *Aging & Mental Health, 12*(6), 746–760. https://doi.org/10.1080/13607860802380607

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York, NY: Springer.

Leder, J., Pastukhov, A. S., & Schütz, A. (2020). *Even prosocially oriented individuals save themselves first: Social value orientation, subjective effectiveness and the usage of protective measures during the COVID-19 pandemic in Germany*..

Lee, F. K., & Zelman, D. C. (2019). Boredom proneness as a predictor of depression, anxiety and stress: The moderating effects of dispositional mindfulness. *Personality and Individual Differences, 146*, 68–75. https://doi.org/10.1016/j.paid.2019.04.001

Leong, F. T. L., & Schneller, G. R. (1993). Boredom proneness: Temperamental and cognitive components. *Personality and Individual Differences, 14*(1), 233–239. https://doi.org/10.1016/0191-8869(93)90193-7

LePera, N. (2011). Relationships between boredom proneness, mindfulness, anxiety, depression, and substance use. *The New School Psychology Bulletin, 8*(2), 15–25.

Lima, C. K. T., de Medeiros Carvalho, P. M., Lima, I. D. A. S., de Oliveira Nunes, J. V. A., Saraiva, J. S., de Souza, R. I., & Neto, M. L. R. (2020). The emotional impact of Coronavirus 2019-nCoV (new Coronavirus disease). *Psychiatry Research*. , Article 112915. https://doi.org/10.1016/j.psychres.2020.112915

Liu, K., Chen, Y., Lin, R., & Han, K. (2020). Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients. *The Journal of Infection*. https://doi.org/10.1016/j.jinf.2020.03.005

Long, J. S., & Ervin, L. H. (2000). Using heteroscedasticity consistent standard errors in the linear regression model. *The American Statistician, 54*(3), 217–224.

Luo, Y., & Wang, H. (2009). Correlation research on psychological health impact on nursing students against stress, coping way and social support. *Nurse Education Today, 29*(1), 5–8. https://doi.org/10.1016/j.nedt.2008.05.019

Mahmoud, J. S. R., Staten, R. T., Hall, L. A., & Lennie, T. A. (2012). The relationship among young adult college students' depression, anxiety, stress, demographics, life satisfaction, and coping styles. *Issues in Mental Health Nursing, 33*(3), 149–156. https://doi.org/10.3109/01612840.2011.632708

Mark, G., & Smith, A. P. (2012a). Effects of occupational stress, job characteristics, coping, and attributional style on the mental health and job satisfaction of university employees. *Anxiety, Stress, and Coping, 25*(1), 63–78. https://doi.org/10.1080/10615806.2010.548088

Mark, G., & Smith, A. P. (2012b). Occupational stress, job characteristics, coping, and the mental health of nurses. *British Journal of Health Psychology, 17*(3), 505–521. https://doi.org/10.1111/j.2044-8287.2011.02051.x

Mercer-Lynn, K. B., Hunter, J. A., & Eastwood, J. D. (2013). Is trait boredom redundant? *Journal of Social and Clinical Psychology, 32*(8), 897–916. https://doi.org/10.1521/jscp.2013.32.8.897

Mertens, G., Gerritsen, L., Duijndam, S., Salemink, E., & Engelhard, I. M. (2020).). Fear of the coronavirus (COVID-19): Predictors in an online study conducted in March 2020. *Journal of Anxiety Disorders*. , Article 102258. https://doi.org/10.1016/j.janxdis.2020.102258

Mikulas, W. L., & Vodanovich, S. J. (1993). The essence of boredom. *The Psychological Record, 43*(1), 3.

Nowack, K. M. (1989). Coping style, cognitive hardiness, and health status. *Journal of Behavioral Medicine, 12*(2), 145–158. https://doi.org/10.1007/BF00846548

Onder, G., Rezza, G., & Brusaferro, S. (2020). Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *Jama, 323*(18), 1775–1776. https://doi.org/10.1001/jama.2020.4683

Orcutt, J. D. (1984). Contrasting effects of two kinds of boredom on alcohol use. *Journal of Drug Issues, 14*(1), 161–173.

Pallant, J. (2011). *Survival manual. A step by step guide to data analysis using SPSS*..

Peng, J., Guo, W., Zhao, L., Han, X., & Wu, S. (2020). Short Boredom Proneness Scale: Adaptation and validation of a Chinese version with college students. *Social Behavior and Personality an International Journal, 48*(2), 1–8. https://doi.org/10.2224/sbp.8968

Presti, G., McHugh, L., Gloster, A. T., Karekla, M., & Hayes, S. C. (2020). The dynamics of fear at the time of COVID-19: A contextual behavioral science perspective. *Clinical Neuropsychiatry, 17*(2), 65–71.

Raj, S. B., & Subramony, S. (2008). Impact of tsunami on the mental health of victims. *Journal of the Indian Academy of Applied Psychology, 34*, 132–140.

Sawyer, M. G., Pfeiffer, S., & Spence, S. H. (2009). Life events, coping and depressive symptoms among young adolescents: A one-year prospective study. *Journal of Affective Disorders, 117*(1-2), 48–54. https://doi.org/10.1016/j.jad.2008.12.013

Shi, J., Huang, A., Jia, Y., & Yang, X. (2020). Perceived stress and social support influence anxiety symptoms of Chinese family caregivers of community-dwelling older adults: A cross-sectional study. *Psychogeriatrics*.. https://doi.org/10.1111/psyg.12510

Sommers, J., & Vodanovich, S. J. (2000). Boredom proneness: Its relationship to psychological-and physical-health symptoms. *Journal of Clinical Psychology, 56*(1). https://doi.org/10.1002/(SICI)1097-4679(200001)56:1<149::AID-JCLP14>3.0.CO;2-Y, 149-155.

Spada, M. M., Nikčević, A. V., Moneta, G. B., & Wells, A. (2008). Metacognition, perceived stress, and negative emotion. *Personality and Individual Differences, 44*(5), 1172–1181. https://doi.org/10.1016/j.paid.2007.11.010

Struk, A. A., Carriere, J. S., Cheyne, J. A., & Danckert, J. (2017). A short boredom proneness scale: Development and psychometric properties. *Assessment, 24*(3), 346–359. https://doi.org/10.1177/1073191115609996

Taylor, S. (2019). *The psychology of pandemics: Preparing for the next global outbreak of infectious disease*. Cambridge Scholars Publishing.

Taylor, S., Landry, C. A., Paluszek, M. M., Fergus, T. A., McKay, D., & Asmundson, G. J. (2020a). COVID stress syndrome: Concept, structure, and correlates. *Depression and Anxiety*. https://doi.org/10.1002/da.23071

Taylor, S., Landry, C., Paluszek, M., Fergus, T. A., McKay, D., & Asmundson, G. J. (2020b). Development and initial validation of the COVID stress scales. *Journal of Anxiety Disorders*. , Article 102232. https://doi.org/10.1016/j.janxdis.2020.102232

Tian, F., Li, H., Tian, S., Yang, J., Shao, J., & Tian, C. (2020). Psychological symptoms of ordinary Chinese citizens based on SCL-90 during the level I emergency response to COVID-19. *Psychiatry Research, 288*(April), Article 112992. https://doi.org/10.1016/j.psychres.2020.112992

Vodanovich, S. J., Verner, K. M., & Gilbride, T. V. (1991). Boredom proneness: Its relationship to positive and negative affect. *Psychological Reports, 69*(3_suppl), 1139–1146.

Vollrath, M., & Torgersen, S. (2000). Personality types and coping. *Personality and Individual Differences, 29*(2), 367–378. https://doi.org/10.1016/S0191-8869(99)00199-3

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., … Ho, R. C. (2020a). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health, 17*(5). https://doi.org/10.3390/ijerph17051729, 1729.

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., & Mcintyre, R. S. (2020b). Brain, Behavior, and Immunity A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain, Behavior, and Immunity*. https://doi.org/10.1016/j.bbi.2020.04.028 (April), 0–1.

Wang, D. P. (2015). Effect of perceived stress on college students' life satisfaction: Mediator role of boredom proneness. *Journal of Mianyang Normal University, 7*, 3.

Wang, H., Xia, Q., Xiong, Z., Li, Z., Xiang, W., Yuan, Y., & Li, Z. (2020c). The psychological distress and coping styles in the early stages of the 2019 coronavirus disease (COVID-19) epidemic in the general mainland Chinese population: A web-based survey. *PloS One, 15*(5). https://doi.org/10.1371/journal.pone.0233410. e0233410.

Wang, Q., Xu, W., Ren, L., Wang, W., & Wang, Y. (2019). The relationship between hope and post-traumatic stress disorder in Chinese shidu parents: The mediating role of perceived stress. *Journal of Affective Disorders, 251*, 23–30. https://doi.org/10.1016/j.jad.2019.03.049

Weybright, E. H., Caldwell, L. L., Ram, N., Smith, E. A., & Wegner, L. (2015). Boredom prone or nothing to do? Distinguishing between state and trait leisure boredom and its association with substance use in South African adolescents. *Leisure Sciences, 37*(4), 311–331.

Wheaton, M. G., Abramowitz, J. S., Berman, N. C., Fabricant, L. E., & Olatunji, B. O. (2012). Psychological predictors of anxiety in response to the H1N1 (swine flu) pandemic. *Cognitive Therapy and Research, 36*(3), 210–218.

Wood, S. K., & Bhatnagar, S. (2015). Resilience to the effects of social stress: Evidence from clinical and preclinical studies on the role of coping strategies. *Neurobiology of Stress, 1*, 164–173.

Wright, E. N., Hanlon, A., Lozano, A., & Teitelman, A. M. (2019). The impact of intimate partner violence, depressive symptoms, alcohol dependence, and perceived stress on 30-year cardiovascular disease risk among young adult women: A multiple mediation analysis. *Preventive Medicine, 121*, 47–54. https://doi.org/10.1016/j.ypmed.2019.01.016

Wu, P., Fang, Y., Guan, Z., Fan, B., Kong, J., Yao, Z., … Hoven, C. W. (2009). The psychological impact of the SARS epidemic on hospital employees in China: Exposure, risk perception, and altruistic acceptance of risk. *The Canadian Journal of Psychiatry, 54*(5), 302–311. https://doi.org/10.1177/070674370905400504

Xiang, Y., Wang, R., Jiang, Y., & Mo, L. (2016). Relationships among personality, coping style, and negative emotional response in earthquake survivors. *Social Behavior and Personality, 44*(3), 499. https://doi.org/10.2224/sbp.2016.44.3.499

Xiao, H., Zhang, Y., Kong, D., Li, S., & Yang, N. (2020). The effects of social support on sleep quality of medical staff treating patients with coronavirus disease 2019 (COVID-19) in January and February 2020 in China. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research, 26*. https://doi.org/10.12659/MSM.923549. e923549-1.

Xie, Y. (1998). Reliability and validity of the simplified coping style questionnaire. *Chinese Journal of Clinical Psychology*.

Yang, T., & Huang, H. (2003). An epidemiological study on stress among urban residents in social transition period. *Chinese Journal of Epidemiology, 24*(9), 760. PMID: 14521764.

Yu, H. Y. R., Ho, S. C., So, K. F. E., & Lo, Y. L. (2005). The psychological burden experienced by Hong Kong midlife women during the SARS epidemic. *Stress and Health : Journal of the International Society for the Investigation of Stress, 21*(3), 177–184. https://doi.org/10.1002/smi.1051

Yu, Y., Peng, L., Liu, B., Liu, Y., Li, M., Chen, L., … Li, J. (2016). The effects of anxiety and depression on stress-related growth among Chinese army recruits: Resilience and coping as mediators. *Journal of Health Psychology, 21*(9), 1884–1895. https://doi.org/10.1177/1359105314567769

Zhang, Y., Wang, J., Zhao, J., Tanimoto, T., Ozaki, A., Crump, A., & Jiang, Q. W. (2020). Association between quarantined living circumstances and perceived stress in Wuhan City during the COVID-19 outbreak: A rapid, exploratory cross-sectional study. *Exploratory Cross-Sectional Study*. https://doi.org/10.2139/ssrn.3556642 (3/16/2020).

Zheng, Y. P., Lin, K. M., Takeuchi, D., Kurasaki, K. S., Wang, Y., & Cheung, F. (1997). An epidemiological study of neurasthenia in Chinese-Americans in Los Angeles. *Comprehensive Psychiatry, 38*(5), 249–259.