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Mental health and psychological resilience during the COVID-19 pandemic: A cross-cultural comparison of Japan, Malaysia, China, and the U.S.

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ABSTRACT

Background: The current study examined how psychological resilience acted as a buffer against mental health deterioration during the coronavirus disease 2019 (COVID-19) pandemic. We conducted an online survey in four countries (Japan, Malaysia, China, and the U.S.) to examine how psychological resilience functions toward the maintenance of mental health during the COVID-19 pandemic.

Methods: We collected data from 1583 citizens from four countries via an online survey between October 14 and November 2, 2020. We gathered demographic data and measured mental distress (depression, anxiety, and stress) and fear of COVID-19. Data on sense of control, ego-resilience, grit, self-compassion, and resilience indicators were also collected.

Results: Sense of control was negatively associated with mental distress in all four countries. Self-compassion was negatively associated with mental distress in the samples from Japan, China, and the U.S. We also found an interaction effect for sense of control: the lower the sense of control, the stronger the deterioration of mental distress when the fear of COVID-19 was high.

Limitations: This study's cross-sectional design precludes causal inferences. Further, lack of data from people who were actually infected with the virus limits comparisons of people who were and were not infected. Finally, as this study only compared data from four countries, comparisons with more countries are needed.

Conclusions: A sense of control and self-compassion may help buffer against mental health deterioration during the COVID-19 pandemic. Sense of control was consistently associated with mental health across cultures.

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had a detrimental effect on mental health worldwide (World Health Organization, 2021a, 2021b, 2021c). It has had serious and widespread social impacts—lasting for longer than a year—even on individuals uninfected by the virus, due to restrictions imposed on people's lifestyles, the need

to exercise self-restraint, the experience of lockdown and social isolation, and the fear of COVID-19 (Torales et al., 2020; Vinkers et al., 2020; Wang et al., 2021; Wu et al., 2021a, 2021b). For example, Wu et al. (2021a) found that people in locked-down cities exhibited higher levels of generalized anxiety disorder symptoms than those in non-locked-down cities. In another study, Wu et al. (2021b) conducted a meta-analysis and reported that the prevalence of depression and anxiety

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can be seen in more than 30% of the population. Those impacts seem to vary based on variety of factors, such as rates of infection and restrictions imposed to reduce the spread of COVID-19. Mental health has become an important global challenge as a result of the pandemic, and various strategies must be implemented to address it.

Early suggestions and investigation on the mental health and psychological aspects of individuals during the COVID-19 pandemic highlight the importance of enhancing psychological resilience and other factors related to well-being (Barton et al., 2020; Dębski et al., 2021; Deniz, 2021; Kubo et al., 2021; Masuyama et al., 2021; Satici et al., 2020; Schnell and Krampe, 2020; Totosty de Zepetnek et al., 2021; Vinkers et al., 2020; Wu et al., 2021a, 2021b). Furthermore, psychological flexibility (Kashdan and Rottenberg, 2010), which is closely related to psychological resilience has also been found to contribute to maintaining mental health during the COVID-19 pandemic (Landi et al., 2020; Pakenham et al., 2020).

Although recovery from this pandemic is a global challenge, cultural differences exist in psychological characteristics, including psychological resilience (Ungar, 2008, 2013), which likely impact individuals' pandemic experiences. Given the differences in COVID-19 infection status and quarantine strategies employed across countries, the current pandemic could have had different effects on mental health across diverse cultural contexts. Put another way, the underlying pathway of the mental health crisis caused by the pandemic could differ across countries, and consequently, effective strategies for improving mental health may also differ. Thus, it is important to examine the relationship between cultural differences, the impact of these differences on mental health, and the related positive psychological factors in the context of the COVID-19 pandemic (Table 1; Block and Kremen, 1996; Duckworth et al., 2007; Lachman and Weaver, 1998; Neff, 2003; Prilleltensky et al., 2001).

Sense of control (Lachman and Weaver, 1998), grit (Duckworth et al., 2007), ego-resilience (Block and Kremen, 1996), and self-compassion (Neff, 2003) are non-cognitive factors (Heckman and Rubinstein, 2001) that contribute to people's success and maintenance of mental health. It has been suggested that these factors may prevent mental health deterioration during the COVID-19 pandemic (Bono et al., 2020; Coyne et al., 2021; Heath et al., 2020; Kubo et al., 2021; Padmanabhanunni and Pretorius, 2021). Furthermore, these factors can be enhanced by psychological interventions (Eskreis-Winkler et al., 2016; Chmitorz et al., 2018; Neff and Germer, 2013; Pandey et al., 2018; Smith et al., 2019). By enhancing these factors, it is believed that not only the maintenance of mental health but also the improvement of mental distress can be achieved. However, many mental health studies have focused on only a single psychological resilience factor. More effective interventions could be designed if a multi-factor approach was used, particularly if multiple factors are found to contribute to the maintenance of mental health during the COVID-19 pandemic.

This study examined the quantitative differences and effects of the four aforementioned resilience factors in four countries: Japan, Malaysia, China, and the United States (U.S.). We selected the four countries from the viewpoint of cultural diversity and different measures

to the COVID-19 pandemic.

We aimed to reveal the common psychological factors that contribute to the maintenance of mental health in these countries during the COVID-19 pandemic. Positive psychological factors that are prevalent only in specific countries may also be identified. By identifying these factors, we can develop effective interventions to maintain mental health specific to those countries. The central research question guiding this study is as follows: What factors are associated with psychological resilience and buffer against mental health deterioration during the COVID-19 pandemic across cultures?

2. Methods

2.1. Study design and respondents

The current study used data from the RE-COVER (REsilience to COVID-19 in Each Region; Sugawara et al., 2021) Project, which includes an international survey on resilience factors and mental health. In addition, we conducted a contemporaneous international survey on Japanese (N = 322), Malaysian (N = 423), Chinese (N = 505), and U.S. (N = 333) citizens. The total number of respondents was 1583 ($M_{\text{age}} = 32.22$, $SD = 12.90$, range = 19–82).

The study was conducted between October 14 and November 2, 2020. For data collection, we used crowdsourcing platforms (Japan and the U.S.) and web survey companies (Malaysia and China).

The number of infected persons and deaths and their proportion in the four countries by October 2020 was as follows: Japan (100,392 infected (0.08%), 1755 deaths (0.0014%)), Malaysia (30,889 infected (0.10%), 249 deaths (0.0008%)), China (91,893 infected (0.0065%), 4746 deaths (0.00034%)), and the U.S. (7,077,015 infected (2.16%), 227,178 deaths (0.0692%)) (World Health Organization, 2021a).

The first part of the web survey explained the research ethics. We specified that the survey was approved by the research ethics committee of the University of Tsukuba. Respondents were informed that they did not have to answer any question they did not wish to, that they were considered to have consented to the research by answering the questions, and that the data would be anonymized and published in a form that would not identify individuals. The items of the scales and raw data measured in the RE-COVER Project have already been made openly available (<https://osf.io/p56ga/>).

2.2. Procedures and outcomes

We used a four-country dataset from an online survey. Demographic information was obtained regarding respondents' age, sex, marital status, number of children, and occupation. The change in practicing self-restraint (i.e., number of hours staying home) was measured by an original single item, which assessed the frequency of going out on a 3-point scale ranging from "time of going out increased in the last month (1)" to "time of going out decreased in the last month (3)." Change in income was assessed with a single item on a 5-point scale ranging from "largely decreased (1)" to "largely increased (5)."

Table 1
Definitions of resilience factors addressed in this study.

Term	Definition	Reference
Sense of control	A person's sense of control over her or his life.	e.g., Lachman and Weaver (1998)
Ego-resilience	Ability to flexibly adapt to difficult and stressful conditions.	e.g., Block and Kremen (1996)
Grit	Passion and perseverance for long-term goals.	e.g., Duckworth et al. (2007)
Self-compassion	Entails three main components: (a) self-kindness—being kind and understanding toward oneself in instances of pain or failure rather than being harshly self-critical, (b) common humanity—perceiving one's experiences as part of the larger human experience rather than seeing them as separating and isolating, and (c) mindfulness—holding painful thoughts and feelings in balanced awareness rather than over-identifying with them.	e.g., Neff (2003)

Subjective social status (SSS; Adler et al., 1994) was assessed by a single item on a 10-point scale ranging from “worst (1)” to “best (10).” Relational mobility as an indicator of cultural differences was measured using the Relational Mobility Scale (12 items; Yuki and Schug, 2020), which considers the degree of flexibility versus the fixed nature of interpersonal relationships and group memberships (e.g., It is easy for them to meet new people), with a 7-point scale ranging from “strongly disagree (1)” to “strongly agree (7).” In this study, the coefficients of reliability for this scale were adequate ($\alpha = 0.80, \omega = 0.74$). Higher scores on this measure indicate greater relational mobility.

2.2.1. Mental distress

Mental distress (Antony et al., 1998; Moussa et al., 2001; Xueting, 2012) was measured using the Depression Anxiety Stress Scales-21 (DASS-21; 21 items; e.g., I felt I wasn’t worth much as a person), with a 4-point scale ranging from (0) “did not apply to me at all, or none of the time” to (3) “applied to me very much, or most of the time.” Higher scores on this measure indicate greater mental distress. In this study, the coefficients of reliability for this scale were very good ($\alpha = 0.98, \omega = 0.98$). Higher scores on this measure indicate greater mental distress.

2.2.2. Fear of COVID-19

Fear of COVID-19 (Ahorsu et al., 2020; Chang et al., 2022; Masuyama et al., 2022) was measured using the Fear of COVID-19 Scale (FCV; 7 items; e.g., I am most afraid of coronavirus-19), with a 4-point scale ranging from (1) “strongly disagree” to (4) “strongly agree.” In this study, the coefficients of reliability for this scale were good ($\alpha = 0.89, \omega = 0.89$). Higher scores on this measure indicate greater fear of COVID-19.

2.2.3. Ego-resilience

Ego-resilience (Block and Kremen, 1996; Chen et al., 2020; Hata and Onodera, 2013) was measured using the Ego Resiliency Scale (14 items), which considers the extent to which individuals show flexibility in responding to changing environmental demands (e.g., I quickly get over and recover from being startled), with a 4-point scale ranging from (1) “does not apply at all” to (4) “applies very strongly.” In this study, the coefficients of reliability for this scale were good ($\alpha = 0.90, \omega = 0.90$). Higher scores on this measure indicate greater ego-resilience.

2.2.4. Sense of control

Sense of control (Dan, 2019; Lachman and Weaver, 1998; Ryff et al., 2018) was measured using the Sense of Control Scale (12 items), which evaluates the extent to which people perceive that they have the capability to shape their life and environment (e.g., When I really want to do something, I usually find a way to succeed at it), with a 7-point scale ranging from (1) “strongly disagree” to (7) “strongly agree.” In this study, the coefficients of reliability for this scale were good ($\alpha = 0.86, \omega = 0.86$). Higher scores on this measure indicate greater sense of control.

2.2.5. Grit

Grit (Duckworth et al., 2007; Takehashi et al., 2019; Zhong et al., 2018) was measured using the Grit Scale-short (8 items), which evaluates the extent to which individuals show trait-level perseverance and passion for long-term goals (e.g., I finish whatever I begin), with a 5-point scale ranging from (1) “not at all like me” to (5) “very much like me.” In this study, the coefficients of reliability for this scale were adequate ($\alpha = 0.74, \omega = 0.72$). Higher scores on this measure indicate greater grit.

2.2.6. Self-compassion

Self-compassion (Arimitsu, 2014; Chen et al., 2011; Neff, 2003) was measured using the Self-Compassion Scale (26 items), which considers the extent to which individuals show care and compassion toward themselves in the face of hardships or perceived inadequacy (e.g., I’m kind to myself when I’m experiencing suffering), with a 5-point scale

ranging from (1) “almost never” to (5) “almost always.” In this study, the coefficients of reliability for this scale were good ($\alpha = 0.89, \omega = 0.89$). Higher scores on this measure indicate greater self-compassion.

All scales were translated into the respondents’ native languages, and reliability and validity were also examined. For Malaysian respondents, we prepared questionnaires in both English and Malay.

2.3. Statistical analysis

We used statistical software HAD 17.202 (Shimizu, 2016), which is free and downloadable (<https://osf.io/32cyp/>). When conducting analysis using open data, such as in this study, it is easy for other researchers to re-examine the data and enhance the results.

3. Results

3.1. Demographic, infection status, and social variables

Among the respondents from all four countries, the proportion of male respondents was slightly higher among the Chinese respondents (Table 2). The other three countries had approximately equal proportions of male and female respondents. The average age of the Chinese respondents was the lowest, while that of the U.S. respondents was the

Table 2
Demographic, infection status, and social variables in Japan, Malaysia, China, and the U.S.

	Total	Japan	Malaysia	China	U.S.	p-value
Gender						
Male	931	147	220	384	180	<0.0001
Female	643	167	203	121	152	
Other	9	8	0	0	1	
Mean age	32.22	38.72	32.72	21.79	41.76	<0.0001
SD	12.90	9.13	11.02	8.84	11.83	
Range	19–82	19–66	18–76	18–82	19–74	
Marital status						
Unmarried	966	159	220	434	153	<0.0001
Married	521	146	170	63	142	
Divorce/ separated	77	15	21	5	36	
Other	19	2	12	3	2	
Change in self-restraint						
Decreased	861	78	336	298	149	<0.0001
Little or no change	568	222	45	139	162	
Increased	86	18	15	34	19	
Missing	68	4	27	34	3	
Change in income						
Largely decreased	250	43	118	64	25	<0.0001
Slightly decreased	356	95	113	60	88	
Little or no change	763	173	132	271	187	
Slightly increased	53	1	15	11	26	
Largely increased	40	10	16	7	7	
Missing	121	0	29	92	0	
Infection status						
Family or myself	78	0	13	44	21	
Relatives	114	3	26	35	50	
Neighborhood	169	26	52	3	55	
No one	1303	291	340	442	230	
Missing	6	6	0	0	0	
Relational mobility	4.40	4.09	4.21	4.43	4.89	<0.0001
SSS	5.62	5.62	6.56	5.29	4.88	<0.0001

Data are mean or n. Infection status was not subjected to statistical analysis because multiple responses were allowed. SSS = Subjective Social Status.

highest among the four countries. Regarding self-restraint (i.e., number of hours staying home), most respondents in Japan answered that there was no change from the previous month (September 2020). By contrast, in Malaysia and China, respondents reported a decrease in self-restraint. In the U.S., the number of respondents who reported a reduction in self-restraint and those who reported no changes in self-restraint were almost equal. Regarding income, most respondents in Japan, China, and the U.S. reported a slight decrease or no change, whereas many in Malaysia reported a decrease. As for infection status, the Japanese respondents reported the lowest number of confirmed infections among acquaintances, compared to respondents in Malaysia, China, and the U.S. Overall, the findings indicate that infection rates, levels of self-restraint, and economic losses were significantly different among the four countries surveyed.

3.2. Correlation analyses

The variables measured in this study were subjected to correlation analyses for each country using the data compiled for all four countries (Table 3 and Appendix 1 A-D). Mental distress was weakly and negatively associated with age ($r = -0.06, p < .05$) and change in income ($r = -0.16, p < .01$), and weakly and positively associated with gender ($r = 0.10, p < .01$; male = 1, female = 2) and subjective social status ($r = 0.05, p < .05$). Fear of COVID-19 had a moderate positive association with mental distress ($r = 0.50, p < .01$), while sense of control ($r = -0.53, p < .01$), grit ($r = -0.31, p < .01$) and self-compassion ($r = -0.39, p < .01$) were negatively associated with mental distress. Interestingly, self-restraint ($r = -0.01, n.s.$) and ego-resilience ($r = 0.02, n.s.$) did not show a significant association with mental distress. Fear of COVID-19 had significant negative associations with sense of control ($r = -0.32, p < .01$), grit ($r = -0.11, p < .01$), and self-compassion ($r = -0.18, p < .01$), but no correlation with ego-resilience ($r = -0.00, n.s.$).

3.3. Main analysis: hierarchical multiple regression analysis

We conducted a hierarchical multiple regression analysis to examine the interaction between the fear of COVID-19 and the impact of resilience factors on mental distress. Hierarchical multiple regression analysis is a method for analyzing the importance of a variable of interest by feeding in the variable (a group of variables to be fed in is called a step) and testing for a statistically significant increase in the variance explanatory rate (change in R^2). With mental distress as the dependent variable, age, gender, self-restraint, change in income, subjective social status, and relationship mobility were entered in the first step as control variables. Fear of COVID-19 was input in the second step. In the third step, sense of control, ego-resilience, grit, and self-compassion were input. In the fourth step, the interaction between fear of COVID-19 and each of the four resilience factors was added (Table 4). Hierarchical multiple regression analysis of this model was performed on the data from the four countries combined as well as on the data from each country separately (see Appendix 2 A-E for the results of the hierarchical multiple regression analysis up to the third step).

In Step 1, age showed a significantly negative association with mental distress in the total dataset ($\beta = 0.04, p < .05$), Malaysia ($\beta = -0.11, p < .05$), and the U.S. ($\beta = -0.10, p < .05$). In the U.S., self-restraint showed a significant negative association with mental distress ($\beta = -0.10, p < .05$). In Step 2, fear of COVID-19 was positively associated with mental distress in the total dataset ($\beta = 0.30, p < .001$), Japan ($\beta = 0.23, p < .01$), Malaysia ($\beta = 0.20, p < .01$), China ($\beta = 0.34, p < .01$), and the U.S. ($\beta = 0.28, p < .01$). In Step 3, sense of control exhibited a significantly negative association with mental distress in the total dataset ($\beta = -0.36, p < .001$), Japan ($\beta = -0.37, p < .01$), Malaysia ($\beta = -0.46, p < .01$), China ($\beta = -0.34, p < .01$), and the U.S. ($\beta = -0.37, p < .01$). Ego-resilience showed a significantly positive association with mental distress in the total dataset ($\beta = 0.14, p < .01$), Malaysia ($\beta = 0.13, p < .01$), and China ($\beta = 0.08, p < .05$). Grit

Table 3 Associations of demographic and social variables with mental illness and psychological resilience factors in Japan, Malaysia, China, and the U.S.

	M	SD	1	2	3	4	5	6	7	8	9	10	11	α
1. Age	32.22	12.90	-											-
2. Gender	-	-	0.17	-										-
3. Self-restraint	1.60	0.78	0.04	-0.02										-
4. Income	2.49	0.89	-0.05	-0.05	0.13	**								-
5. SSS	5.62	2.02	0.18	0.06	0.01	0.05	*							-
6. Relational mobility	4.40	0.80	0.07	0.00	-0.03	0.09	**	-0.02						0.80
7. Mental distress	1.58	0.63	-0.06	0.10	-0.01	-0.16	**	0.05	-0.23	**				0.98
8. Fear of COVID-19	2.73	0.93	0.01	0.18	-0.05	-0.18	**	-0.01	-0.22	**	0.50	**		0.89
9. Sense of control	4.61	0.98	0.02	-0.09	0.00	0.15	**	-0.10	0.39	**	-0.53	**	-0.32	0.86
10. Ego-resilience	2.66	0.58	-0.15	-0.05	-0.02	0.01	-0.09	**	0.20	**	-0.02	**	0.32	0.90
11. Grit	3.21	0.63	0.11	-0.02	-0.05	0.08	**	-0.09	0.29	**	-0.31	**	0.46	0.74
12. Self-compassion	3.09	0.61	0.04	-0.07	-0.03	0.09	**	-0.14	0.25	**	-0.39	**	0.52	0.89

Note. SSS = Subjective Social Status, M = Mean, SD = Standard Deviation, α = Cronbach's alpha, ω = McDonald's omega.
 ** $p < .01$.
 * $p < .05$.

Table 4
Hierarchical multiple regression analysis with mental distress as the dependent variable in Step 4.

	Variables	Total		Japan		Malaysia		China		US	
Step 1	Age	-0.04	*	-0.02		-0.11	**	-0.02		-0.10	*
	Sex	-0.01		0.01		-0.03		0.00		-0.05	
	Self-restraint	0.02		-0.01		0.00		0.05		-0.10	*
	Income	-0.03		-0.05		-0.03		-0.03		0.00	
	SSS	0.01		0.13	*	0.05		0.01		-0.06	
Step 2	Relational mobility	0.03		-0.02		-0.03		-0.01		-0.01	
	Fear of Covid-19	0.30	**	0.23	**	0.20	**	0.34	**	0.28	**
Step 3	Sense of control	-0.36	**	-0.37	**	-0.46	**	-0.34	**	-0.37	**
	Ego-resilience	0.14	**	0.09		0.13	**	0.08	*	0.06	
Step 4	Grit	-0.06	*	-0.03		-0.11	*	-0.06	*	-0.11	*
	Self-compassion	-0.20	**	-0.20	**	-0.07		-0.09	**	-0.22	**
	FCV*Sense of control	-0.17	**	-0.05		-0.03		-0.27	**	-0.16	**
	FCV*Ego-resilience	0.20	**	0.11	*	0.07		0.14	**	0.02	
	FCV*Grit	-0.04		-0.02		0.02		-0.04		0.01	
	FCV*Self-compassion	-0.03		-0.07		-0.02		-0.01		0.00	
	R ² (at Step 4)	0.52	**	0.42	**	0.43	**	0.75	**	0.60	**
	ΔR ² (at Step 4)	0.06	***	0.01		0.01		0.10	***	0.02	**

Note. R² is the value at Step 4. ΔR² is the value when the fourth step is added from the third step.

SSS = Subjective Social Status.

*** p < .001.

** p < .01.

* p < .001.

exhibited a significantly negative association with mental distress in the total dataset ($\beta = -0.06, p < .05$), Malaysia ($\beta = -0.11, p < .05$), China ($\beta = -0.06, p < .05$), and the U.S. ($\beta = -0.11, p < .05$). Self-compassion showed a significantly negative association with mental distress in the total dataset ($\beta = -0.20, p < .01$), Japan ($\beta = -0.20, p < .01$), China ($\beta = -0.27, p < .01$), and the U.S. ($\beta = -0.22, p < .01$).

In the fourth step, the amount of change in R2 from the third step was significant for the data for the total dataset ($\Delta R^2 = 0.06, p < .001$) and for the data from China ($\Delta R^2 = 0.10, p < .001$) and the U.S. ($\Delta R^2 = 0.02, p < .01$). We used a post-hoc statistical power calculator to determine the power of the multiple regression (Soper, 2022). For the total dataset

and the Chinese data, power was above 0.95 when calculated at the 5% significance level for the R² of the increment. For Japan, Malaysia, and the U.S., the incremental R² was small with a power less than 0.80. For the data from Japan and Malaysia, the change in R² was significant until the third step (Table 4). Therefore, we examined the interaction between fear of COVID-19 and positive psychological factors only for the total dataset and for China.

The interaction effects of fear of COVID-19 and sense of control were significant in the total dataset ($\beta = -0.17, p < .01$; Fig. 1A) and China ($\beta = -0.27, p < .01$; Fig. 1B). The results of the simple slope analysis showed that as the fear of COVID-19 increased, mental distress scores

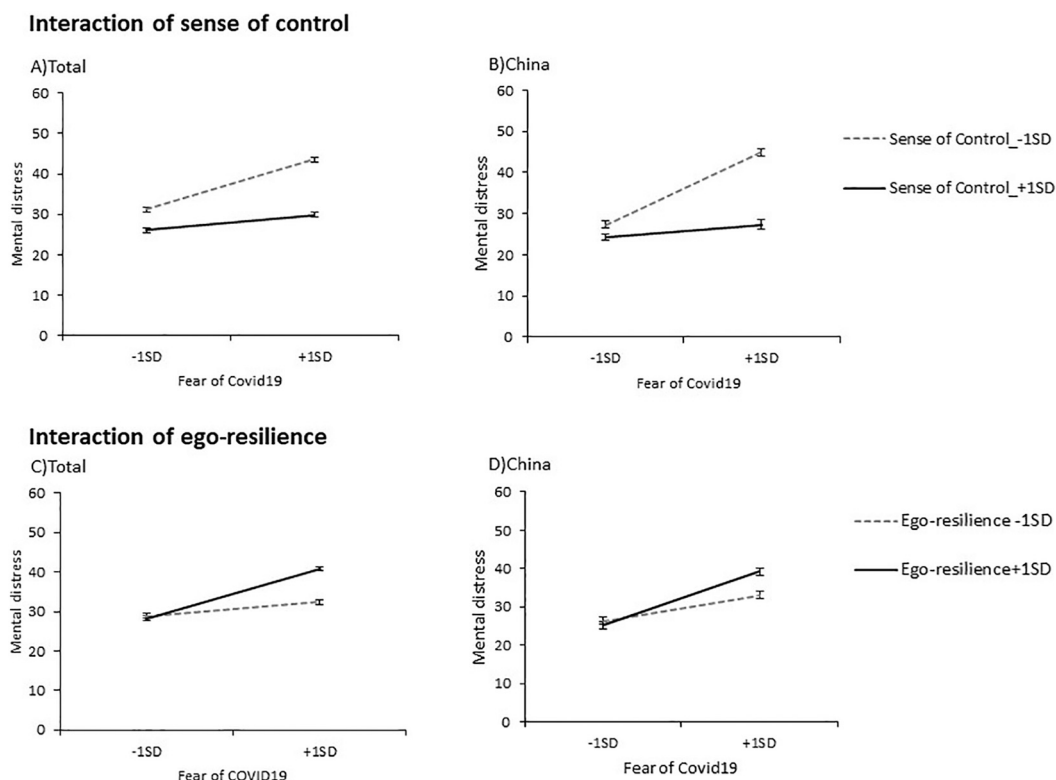


Fig. 1. Interaction effect between sense of control or ego-resilience and fear of COVID-19 on mental distress.

increased more for those with a low sense of control than for those with a high sense of control. In other words, when sense of control was low, fear of COVID-19 was more positively related to mental distress than when sense of control was high ($p < .01$).

The interaction effects of fear of COVID-19 and ego-resilience were significant in the total dataset ($\beta = 0.20, p < .01$; Fig. 1C) and China ($\beta = 0.14, p < .01$; Fig. 1D). The results of the simple slope analysis showed that the high ego-resilience group showed higher mental distress scores when the fear of COVID-19 increased than did the low ego-resilience group ($p < .01$).

4. Discussion

We conducted a contemporaneous study in four countries (Japan, Malaysia, China, and the U.S.) with the aim of determining resilience factors that are related to the maintenance of mental health during the COVID-19 pandemic. The results provide a snapshot of respondents' mental health and resilience factors that are associated with mental distress amidst the COVID-19 pandemic. Data were collected in September 2020, and thus the results should be carefully interpreted considering the pandemic conditions at this particular time.

The results of this study showed that sense of control, grit, and self-compassion were negatively associated with mental distress, as observed from the data across the four countries. Therefore, to remedy mental distress during the COVID-19 pandemic, it may be effective to increase people's sense of control, grit, and self-compassion. In particular, sense of control was negatively related to mental distress in all four countries. Furthermore, the moderation effect of a sense of control was shown, and a high sense of control was shown to be more likely than a low sense of control to prevent mental health deterioration due to heightened fear of COVID-19. Therefore, sense of control may be an effective resilience factor for maintaining mental health during the current pandemic, regardless of country or culture. However, cultural differences may influence whether sense of control is an effective resilience factor for mental health. For example, a prior study by Haerper et al. (2020) found that the Japanese place less emphasis on sense of control than do Westerners. Since such differences in values and beliefs about control impact the ability to cope with stress (Lazarus and Folkman, 1984), sense of control may not contribute to resilience for Japanese people, who place less value on control.

Previous studies (Abramson et al., 1978; von Hecker and Sedek, 1999) have shown that when individuals perceive themselves as lacking control, they report decreased mental health quality. During the COVID-19 pandemic, many things have been beyond one's control, such as infection controls, infection rates, lockdowns, and sudden shifts to telework. Interventions and positive feedback that increase one's sense of control during the COVID-19 pandemic may improve mental health. For example, mindfulness and impulse control training could enhance a sense of control (Pandey et al., 2018; Smith et al., 2019).

Self-compassion was significantly and negatively associated with mental distress in all countries, except Malaysia, indicating that self-compassion may also be effective in maintaining mental health during the pandemic. In Malaysia, where the association between self-compassion and mental distress was moderately negative ($r = -0.38$), sense of control and grit were more effective in reducing mental distress than self-compassion. This could suggest that self-compassion is not effective in maintaining mental health in situations where the pandemic is spreading rapidly, such as in Malaysia (the number of infected people in October 2020 was about 11.6 times higher than in September 2020). Alternatively, country- and region-specific differences have been reported about the extent to which self-compassion is associated with mental health (Arimitsu et al., 2019; Neff et al., 2008), which may explain the lack of strong association between self-compassion and mental distress in Malaysia.

Grit was found to be negatively associated with adverse mental health outcomes in Malaysia, China, and the U.S., but to a lesser extent

than sense of control and self-compassion. Thus, grit may not be as crucial as a sense of control or self-compassion in maintaining mental health during the COVID-19 pandemic. Specifically, grit did not reveal a negative association with mental distress in the Japanese sample. The regression coefficients were also small in Malaysia, China, and the U.S.; this may be because they were controlled by other resilience factors. Considering the sample size and the small regression coefficients, the buffering effect of grit is considered to be small.

In addition, data from the total dataset (all four countries) and Malaysia and China showed a positive association between ego-resilience and mental distress. These findings are in contrast to the findings of previous studies (Kubo et al., 2021; Padmanabhanunni and Pretorius, 2021) and are contrary to what we expected. These differences may have been caused by the fact that several resilience factors were addressed simultaneously in our study rather than a single resilience factor. Ego-resilience is characterized by the ability to control oneself in the face of changing circumstances (Block and Block, 1980). Thus, it is possible that those with high ego-resilience may have suffered increased mental distress in an environment where COVID-19 was widespread because they tried too hard to over-control themselves (Block and Block, 1980). In consideration of the above, in situations where COVID-19 infection rates are increasing, interventions that increase sense of control or self-compassion, rather than ego-resilience, may be more effective in reducing mental distress.

The results obtained in this study also have clinical implications. For example, by assessing resilience factors, it may be possible to predict whether an individual's mental health is likely to deteriorate during the COVID-19 pandemic. In particular, when psychological resilience was included, the demographic variables showed few significant associations. In other words, we need to pay attention to not only characteristics such as age and gender, but also individual resilience while tackling mental health issues during the COVID-19 pandemic. In the future, psychological intervention programs that increase sense of control and self-compassion may help to maintain the mental health of people worldwide during the ongoing pandemic (e.g., Ferrari et al., 2019; Msefi et al., 2016). For example, acceptance and commitment therapy (Hayes et al., 2006; Shepherd et al., 2022) is one approach for enhancing psychological flexibility (Kashdan and Rottenberg, 2010; Landi et al., 2020; Pakenham et al., 2020), which is closely related to psychological resilience.

This study has several limitations. This is a cross-sectional study, and thus causality cannot be determined. Therefore, it is necessary to conduct a longitudinal study to examine the causal effect more clearly. Obtaining follow-up data through the end of the pandemic will also reveal the extent to which psychological resilience contributes to the recovery of mental health. Although resilience was treated as a moderating factor in this study, future research can consider whether it also mediates the relationship between the four predictor variables in this study with mental health. In this study, due to the lack of data on people who were actually infected with the virus, we were not able to compare those who were infected with COVID-19, those who were not infected, and those who were not infected themselves but whose loved ones had been infected. Research on the mental health and resilience of people who have been infected will become necessary, especially since many of them are suffering from sequelae. In addition, because this study only compared the data of four countries, comparisons with more countries, especially those in Europe, Africa, and South America, are needed. Given that we have made the dataset of this study publicly available, it will be useful to compare and discuss the data to enable further research on this topic.

5. Conclusions

Sense of control and self-compassion may help prevent mental health deterioration during the COVID-19 pandemic. Particularly, sense of control is consistently associated with mental health across cultures.

CRediT authorship contribution statement

DS; Conceptualization, Funding acquisition, Data curation, Formal analysis, Investigation, Project administration, Visualization, Writing – original draft. YC; Conceptualization, Investigation, Writing – review & editing. TK; Conceptualization, Data curation, Investigation, Visualization. RIABRRS, SLN, and EPYM; Conceptualization, Investigation, Visualization, Resources, Writing – review & editing. AM; Conceptualization, Data curation, Investigation, Writing. YG; Conceptualization, Investigation Resources. TYJ; Conceptualization, Investigation, Validation, Writing – review & editing.

Data sharing

We have made the data of this study available as open data at OSF (<https://osf.io/p56ga/>).

Ethical consideration

All participants provided informed consent and permission to publish.

Conflict of interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2022.05.032>.

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