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Mediating effect of resilience in the relationship between loneliness and life satisfaction during COVID-19: A cross-country study of Thai and Chinese college students

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Abstract

This study investigated the compensating mediating mechanism of resilience in the relationship between loneliness and life satisfaction in Thai and Chinese college students during a risk period of coronavirus disease 2019 transmission. A total of 262 Thai and 247 Chinese college students were enrolled in the study between December 2020 and January 2021. A measurement model was constructed with the items of loneliness, resilience, and life satisfaction by using structural equation models. Subsequently, structural mediating models were constructed according to the valid items and a multigroup comparison was performed. The relationship between loneliness and life satisfaction differed significantly between Thai and Chinese college students as a result of the mediating effect of resilience. Resilience in Thai college students partly compensated for the negative influence of loneliness on life satisfaction, and resilience in Chinese college students compensated completely for the negative influence of loneliness on life satisfaction.

KEYWORDS
cross-country study, life satisfaction, loneliness, resilience

1 | INTRODUCTION

Among the various marked life changes due to coronavirus 2019 (COVID-19), the enforcement of social distancing has been an effective if difficult transmission prevention measure (World Health Organization, 2020a, 2020b). Typically, countries with collectivist cultures value strong social support networks (Barreto et al., 2021); examples of such countries include Thailand and China (Jenvdhanaken & Rangponsumrit, 2020; Jiang et al., 2020). However, when universities in China and Thailand faced a second outbreak of the epidemic at the end of 2020, different Thai and Chinese governments' preventive measures in terms of social distancing were observed between these universities (Department of Disease Control, 2020; Ministry of Education of the People's Republic of China, 2020). Thai universities in Bangkok used online platforms for teaching to ensure the safety of college students in January 2021 (International Affairs Division of Kasetsart University, 2021). However, while adhering to distancing measures, students could still freely enter and exit the campus (International Affairs Division of Kasetsart University, 2021). Chinese universities managed the situation by closing off the campus; under these stringent prevention measures, students living on campus were not allowed to leave (Wuhan University's New Coronavirus Infection Pneumonia Epidemic Prevention and Control Headquarters, 2020b).

Social distancing measures have resulted in an increase in feelings of subjective loneliness (Benke et al., 2020; Birthe & Gizem, 2021; Padmanabhanunni & Pretorius, 2021). The lack of face-to-face interaction between people (Matias et al., 2020) has further exacerbated individual perceived loneliness and, in turn, life satisfaction (Birthe & Gizem, 2021; Matias et al., 2020; Ruggieri et al., 2021). Resilience as a representative mediator plays a key adaptive role in people's response to stressful feelings in life, reducing their negative reactions to stress and increasing positive functioning in people's evaluation of their life state (Arslan, 2019; Cazan & Truta, 2015; Gerino et al., 2017). The compensatory model of resilience describes the compensatory role of resilience between stress and outcomes, illustrating that stress can be neutralized by resilience, thereby resulting in positive outcomes (Wang et al., 2015). Thus, this study explored resilience as a potential compensatory role for loneliness that can positively contribute to subjective life satisfaction.

Cultural differences (Hofstede, 1991; Jenvdhanaken & Rangponsumrit, 2020; Jiang et al., 2020) and epidemic prevention regulations have resulted in disparate feelings of loneliness among Chinese and Thai college students, with other potential influencing factors including different life satisfaction, religious beliefs (Yablo & Field, 2007), birth order (Brinthaupt & Dove, 2012; Nyman, 1995), and school education (Phra, 2015; Zheng & Kapoor, 2021). This study employed cross-country comparisons to examine the invariance of the Thai and Chinese mediating models of loneliness, resilience, and life satisfaction. The primary objective was to discuss the potentially different psychological states of Thai and Chinese college students after accounting for the differences in management between Thai and Chinese universities during the pandemic period and the cultural characteristics of China and Thailand. The current findings may serve as a reference for universities regarding the implementation of effective psychological counseling for students.

2 | LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Loneliness is a disagreeable subjective feeling resulting from a perceived shortage of social connection (Mellor et al., 2008; Padmanabhanunni & Pretorius, 2021). During periods of increased COVID-19 risk, social distancing is widely implemented as a transmission prevention measure, thus amplifying individual feelings of loneliness (Benke et al., 2020; Birthe & Gizem, 2021; Padmanabhanunni & Pretorius, 2021). In terms of human needs during COVID-19 isolation, Matias et al. (2020) highlighted the crucial need for affiliation and its regulatory role in individual stress adaptation in the social distance process. However, social distancing measures reduce face-to-face affiliation between individuals, thus exacerbating feelings of loneliness and, in turn, reducing subjective life satisfaction (Benke et al., 2020; Birthe & Gizem, 2021; Matias et al., 2020). Life satisfaction is an individual cognitive

evaluation of current living quality, a high level of which contributes to individual physical and psychological health (Gan et al., 2020). The more acute the feelings of loneliness under pandemic prevention measures (Benke et al., 2020; Birthe & Gizem, 2021; Padmanabhanunni & Pretorius, 2021), the lower was the current life satisfaction (Benke et al., 2020; Ruggieri et al., 2021). Therefore, we proposed the following hypothesis:

Hypothesis 1 (H1): Loneliness negatively predicts life satisfaction in Thai and Chinese college students.

Under COVID-19 social distancing measures, feelings of loneliness act as negative emotional stress and reflect an individual's dissatisfaction with their level of social contact (Gerino et al., 2017; Padmanabhanunni & Pretorius, 2021). Resilience is an ability that assists some individuals in stressful experiences in overcoming negative events and adapting to adversity (Cazan & Truta, 2015; Padmanabhanunni & Pretorius, 2021; Wang et al., 2015) and is essential to life satisfaction (Cazan & Truta, 2015). According to the compensatory model of resilience, resilience has a positive function that is able to counteract the adverse influence of a detrimental factor on the outcome (Wang et al., 2015). Studies have determined that resilience as a mediator can reduce the stressful feelings produced by life difficulties and contribute to an individual's positive subjective judgment of their life state (Arslan, 2019; Cazan & Truta, 2015; Gerino et al., 2017). In regard to loneliness as negative emotional stress, resilience may positively compensate for its negative effect and help improve life satisfaction. Therefore, the following was the second hypothesis:

Hypothesis 2 (H2): Resilience performs a mediator in the relationship between loneliness and life satisfaction in Thai and Chinese college students.

Those in collectivist cultures typically have interdependent characteristics and generally enjoy a stronger social connection among family and group members, and members of these cultures tend to have high social relationship needs (Barreto et al., 2021). The human needs in COVID-19 isolation theory highlight the necessity of social connection with friends and relatives, emphasizing its contribution to an individual's mental well-being during social distancing (Matias et al., 2020). The Asian countries of China and Thailand have collectivist societies (Hofstede, 1991; Jenvdhanaken & Rangponsumrit, 2020; Jiang et al., 2020). However, the sociocultural characteristics in these countries differ and may result in differences in Thai and Chinese college students' attitudes toward such relationships. Thailand, which is a Buddhist-majority country largely composed of multichild families, emphasizes altruism and interdependence through social relationships (Chaturachinda & Boonthai, 2017; Downey & Condron, 2004; Phra, 2015; Yablo & Field, 2007). By contrast, China, whose society is largely composed of single-child families (Hesketh et al., 2015), tends to be atheist (Rogacz, 2018; Zheng & Kapoor, 2021) and has become increasingly independent and self-centered in the modern era (Brinthaupt & Dove, 2012; Nyman, 1995; Y. X. Zhang & Yin, 2019). Furthermore, the different Thai and Chinese COVID-19 protocols may result in different feelings toward social distancing among college students in these countries. Thai universities applied open management (i.e., requiring social distancing between the students and arranging entrance and exit into and from the campus) for the students during the COVID-19 risk period (Department of Disease Control, 2020; International Affairs Division of Kasetsart University, 2021). By contrast, Chinese universities applied closed-off management (i.e., preventing aggregative activities on campus and forbidding students from exiting the campus) for the students (Ministry of Education of the People's Republic of China, 2020; Wuhan University's New Coronavirus Infection Pneumonia Epidemic Prevention and Control Headquarters, 2020a). Because Thai and Chinese college students have disparate cultural characteristics and were subjected to different COVID-19 prevention policies, they may have different social communication requirements (Birthe & Gizem, 2021), resulting in varying degrees of loneliness (Beam & Kim, 2020; Birthe & Gizem, 2021; Dean et al., 2021) and negative effects on life satisfaction (Gan et al., 2020; Padmanabhanunni & Pretorius, 2021; Ruggieri et al., 2021). The different levels of loneliness indicate that Thai and Chinese students respond differently to an absence of social communication

(Mellor et al., 2008; Padmanabhanunni & Pretorius, 2021). Moreover, the different levels of loneliness between Thai and Chinese students may indicate differences in their resilience (Gerino et al., 2017). Moreover, studies have indicated that strong, safe attachments to family, friends, community, and institutions are greatly beneficial in maintaining individual resilience (Gunnestad, 2006; Yıldırım & Tanrıverdi, 2020). However, because of the potentially different deficiencies in social communication between Thai and Chinese college students, the protective mechanism of resilience on outcomes (Arslan, 2019; Cazan & Truta, 2015) may have different effects on their life satisfaction (Gerino et al., 2017). Therefore, the third hypothesis was the following:

Hypothesis 3 (H3): The structural model of loneliness, resilience, and life satisfaction differs between university students in Thailand and China.

On the basis of H1, H2, and H3, a hypothetical model was developed, as illustrated in Figure 1.

3 | MATERIALS AND METHODS

3.1 | Participants

As per their COVID-19 protocols, the sampled Thai universities implemented an online class format, whereas the sampled Chinese universities implemented closed-off teaching management for all students. We used purposive sampling and an online survey to obtain the research samples. Thai college lecturers sent 289 online questionnaires to Thai students in three universities in Bangkok, Thailand, through the LINE application platform. Chinese university counselors sent 303 online questionnaires to Chinese students in three universities in Wuhan, Hubei, China, using the WeChat application platform. Because the three universities in Bangkok and Wuhan are located in regions that were deeply influenced by the pandemic and implemented rapid COVID-19 management protocols, the students of these universities faced a stricter social distancing experience than did the students from other areas. Data collection was conducted between December 2020 and January 2021. Before sampling, teachers in the Department of Eastern Languages, Faculty of Humanities, Kasetsart University, subjected the questionnaire items to standardized back-translation. Back-translation was used to guarantee the equivalence of content between the Thai and Chinese questionnaire items (Brislin, 1970). The design of this study was reviewed and approved by the Ethics Review Board of the International College of Krirk University. Participants were recruited using messages posted in the chat groups of elective courses by Thai lecturers and Chinese counselors. After interested Thai and Chinese participants signed an online consent form and joined the LINE and WeChat survey chat groups,
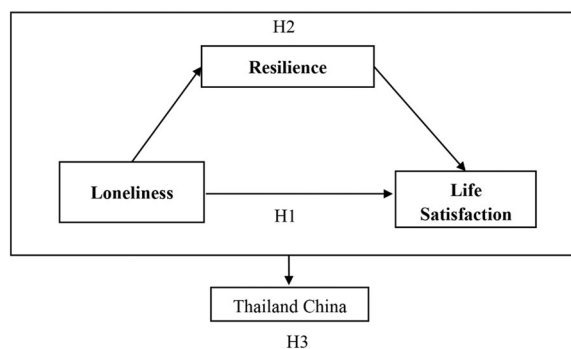

FIGURE 1 Hypothetical model.

TABLE 1 Sample demographics

Group	Thai group (N = 262)	Chinese group (N = 247)
Gender		
Male	126	112
Female	136	135
Grade		
Freshman	32	9
Sophomore	74	11
Junior	116	52
Senior	40	175

respectively, the Thai lecturers and Chinese counselors explained the voluntary nature and confidentiality of the study and directed the students in completing the online questionnaires. After the exclusion of 27 Thai and 56 Chinese questionnaires with inconsistent answers for the reverse-worded questions, 262 Thai and 247 Chinese samples were obtained. Table 1 presents the demographics of the samples.

3.2 | Materials

The three interrelated concepts (i.e., loneliness, resilience, and life satisfaction) were measured using a loneliness scale, resilience scale, and life satisfaction scale. We developed the relationships among these concepts on a theoretical basis with reference to relevant research, and their measurement scales were scored on a five-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

First, loneliness was defined as a subjectively perceived deficiency of social connection during a certain period (Hays & DiMatteo, 1987; Richardson et al., 2017). The scale for measuring an individual's perceived experience of loneliness contained eight items, with six forward items and two reverse items (Hays & DiMatteo, 1987). The measurement construct for the loneliness scale pertains to feelings of subjective isolation and lack of companionship (Hays & DiMatteo, 1987).

Second, resilience was defined in terms of the competence to cope with stress and manage adversity (Campbell-Sills & Stein, 2007; Y. Wu et al., 2020). Resilience was used to assess the degree of an individual's flexibility to stress; the scale comprised 10 items evaluating dealing with adversities (Campbell-Sills & Stein, 2007). The measurement construct for the resilience scale reflects positive thinking about oneself and negative events as well as self-efficacy in terms of dealing with adversities (Campbell-Sills & Stein, 2007).

Third, life satisfaction was defined as a subjective evaluation of general life satisfaction; that is, an individual's cognitive assessment of their current life and degree of satisfaction with their living conditions and life goals (R. Zhang et al., 2019). The scale contained five items to evaluate satisfaction with life (Diener et al., 1985). The measurement construct for life satisfaction reflects an individual's subjective perception of their current life state and goals and their willingness to maintain this current life state (Diener et al., 1985).

3.3 | Reliability and validity

We developed hypothetical models through structural equation modeling (SEM) using the data of Thai and Chinese respondents (Byrne, 2010; Kline, 2010; M. L. Wu, 2007). The original Thai and Chinese data were collated and

combined with SPSS, and the 509 valid samples were analyzed using AMOS. We constructed the measurement model using the overall samples after the questionnaire items were correctly coded (Figure 2). On the basis of the results of the factor loadings per variable, items in the measurement model were classified as suitable and retained only when their loading was greater than 0.50. Finally, the two reverse questions on the loneliness scale were removed because they exhibited factor loadings less than 0.50 following forwarding coding. Only 21 valid items remained (Table 2) and were subsequently employed for analysis.
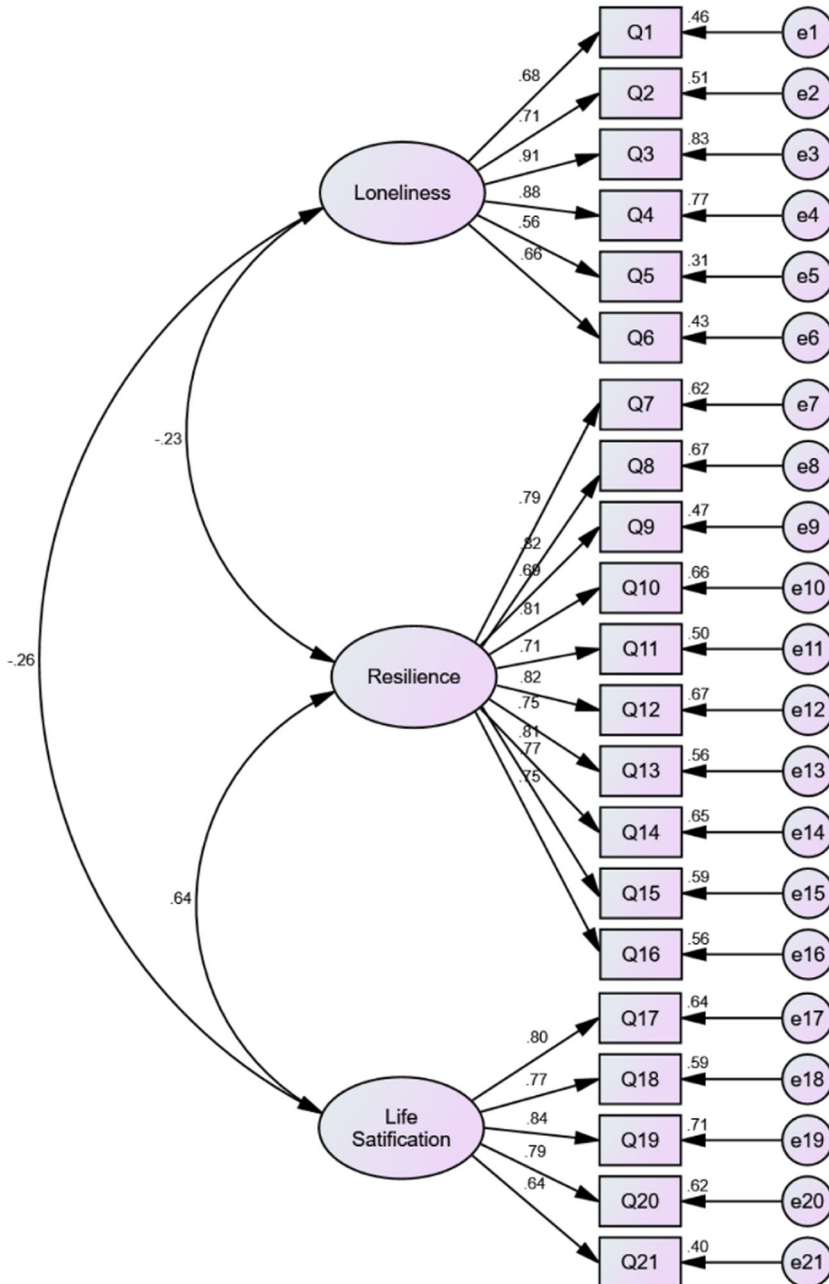

FIGURE 2   Confirmatory factor analysis model.

TABLE 2 The valid measurement questions and parameters in loneliness (Q1–Q6), resilience (Q7–Q16), and life satisfaction (Q17–Q21)

No.	Questionnaire items	Mean	SD	SRC	t Value
Q1	I lack companionship	2.18	1.25	0.67	14.73***
Q2	There is no one I can turn to	2.00	1.21	0.72	14.44***
Q3	I feel left out	2.12	1.21	0.91	8.55***
Q4	I feel isolation from others	2.07	1.22	0.88	10.75***
Q5	I am unhappy being so withdrawn	2.47	1.41	0.56	15.30***
Q6	People are around me but not with me	2.28	1.28	0.66	14.85***
Q7	I am able to adapt to change	3.94	0.92	0.79	14.32***
Q8	I can deal with whatever comes	3.80	0.92	0.82	13.89***
Q9	I try to see humorous side of problems	3.71	1.03	0.69	15.04***
Q10	Coping with stress can strengthen me	3.81	1.07	0.81	13.97***
Q11	I tend to bounce back after illness or hardship	3.82	1.06	0.71	14.94***
Q12	I can achieve goals despite obstacles	3.82	0.94	0.82	13.91***
Q13	I can stay focused under pressure	3.54	1.04	0.75	14.66***
Q14	I am not easily discouraged by failure	3.64	1.06	0.81	14.05***
Q15	I think of self as strong person	3.80	1.04	0.77	14.49***
Q16	I can cope with unpleasant feelings	3.78	1.05	0.75	14.65***
Q17	In most ways my life is close to my ideal	3.26	1.06	0.80	12.58***
Q18	The conditions of my life are excellent	3.36	1.02	0.77	13.25***
Q19	I am satisfied with my life	3.65	1.07	0.84	11.26***
Q20	So far I have gotten the important things I want in life	3.17	1.20	0.79	12.83***
Q21	If I could live my life over, I would change almost nothings	3.02	1.24	0.64	14.66***

Abbreviation: SRC, standardized regression coefficients.

***$p < .001$. Items per variable were separated by instructions that specified variable concepts.

In this study, the overall samples reflected a normal distribution. In the univariate normality analysis, the absolute skewness and kurtosis values were within the range 0.01–0.94 and 0.06–1.04, respectively (Bollen & Long, 1993). For multivariate normality, Mardia's coefficient was 155.46 (i.e., lower than $p(p + 2) = 483$) (Raykov & Marcoulides, 2008). Moreover, Cronbach's α values were .87, .94, and .87 for the scales of loneliness, resilience, and life satisfaction, respectively (Table 3).

We employed confirmatory factor analysis (CFA) to test the construct validity of the latent structures, namely, the convergent and discriminant validity. The CFA model revealed that the factor loadings of all observed indicators were 0.56 to 0.91 (Figure 2), no variance was negative in the parameters (Kline, 2010; Wu, 2007), and all item parameters represented significant t values. In addition, the model fit indices exhibited the following reasonable values: $\chi^2 = 539.24$ ($p < .001$), normed χ^2 (χ^2/df) = 0.90, root mean residual (RMR) = 0.05, comparative fit index (CFI) =0.95, root mean square error of approximation (RMSEA) = 0.06, parsimonious normed fit index (PNFI) = 0.82, goodness-of-fit index (GFI) =0.91, and normed-fit index (NFI) = 0.92 (Kline, 2010; Wu, 2007). The composite reliability (CR) and average variance extracted (AVE) of the three latent structures ranged from 0.88 to 0.94 and

TABLE 3 Reliability, validity, and correlation parameters in loneliness, resilience, and life satisfaction

	Cronbach's α	CR	AVE	Loneliness	Resilience	Life satisfaction
Loneliness	.87	0.88	0.55	0.74		
Resilience	.94	0.94	0.60	−0.23	0.78	
Life satisfaction	.87	0.88	0.59	−0.26	0.64	0.77

Note: The diagonal represents the square root of AVEs, and the correlation coefficients between two variables are shown below it.

Abbreviations: AVE, average variance extracted; CR, composite reliability.
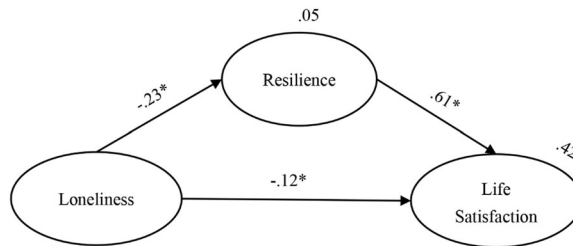
FIGURE 3 Overall structural model.

0.55 to 0.60, respectively (Table 3). Thus, the results of the CFA model demonstrated that the measurement scales had reasonable internal consistency reliability and convergent validity. Finally, the discriminant validity measurement of the three latent structures revealed that the correlation coefficients between the two variables were smaller than the corresponding square roots of their AVEs (Table 3).

Common method variance (CMV) is an indicator of the spurious relationships between variables in self-reported items; we first applied the psychological isolation technique as a controlling method (Peng et al., 2006). The psychological isolation method involves the use of specific instructions to inform the measurement content of every variable and separate variables in the questionnaire (e.g., "The following topics are presented to understand your social connection situation during the social distancing period"). The one-factor model containing 21 observed indicators indicated poor model fit in relation to the following indices: $\chi^2 = 2691.92$ ($p < .000$), $\chi^2/df = 14.24$, RMR = 0.23, RMSEA = 0.16, GFI = 0.58, CFI = 0.62, NFI = 0.60, and PNFI = 0.54. Thus, the results supported the absence of serious CMV in the self-reported items (Verhagen & van Dolen, 2011).

4 | RESULTS

4.1 | Overall structural mediating model

A structural model of "Loneliness → Life Satisfaction" was formed on the basis of the overall samples; the loneliness ($R^2 = 7\%$, $\gamma = -0.26$, $p < .001$) negatively predicted life satisfaction. Subsequently, for the mediating structure of "Loneliness → Resilience → Life Satisfaction," loneliness ($R^2 = 5\%$, $\gamma = -0.23$, $p < .001$) negatively predicted resilience. Loneliness and resilience conjointly explained life satisfaction ($R^2 = 42\%$), while loneliness ($\gamma = -0.12$, $p < .01$) and resilience ($\gamma = 061$, $p < .001$) predicted life satisfaction, respectively (Figure 3). In a model comparison of "Loneliness → Life Satisfaction" and "Loneliness → Resilience → Life Satisfaction," the path value of "Loneliness → Life Satisfaction" decreased from −0.26 ($p < .001$) to −0.12 ($p < .01$). In the overall structural mediating model, the

**TABLE 4** Bootstrap estimates in overall samples

Mediating effect	Path value	Bias-corrected 95% CI		Percentile 95% CI	
		LB	UB	LB	UB
Total effect (Loneliness → Life Satisfaction)	−0.26***	−0.39	−0.15	−0.39	−0.15
Direct effect (Loneliness → Life Satisfaction)	−0.12**	−0.23	−0.03	−0.23	−0.03
Indirect effect (Loneliness → Life Satisfaction)	−0.14***	−0.22	−0.07	−0.22	−0.07

Abbreviations: CI, confidence interval; LB, lower bounds; UB, upper bounds.

**p < .01; ***p < .001.
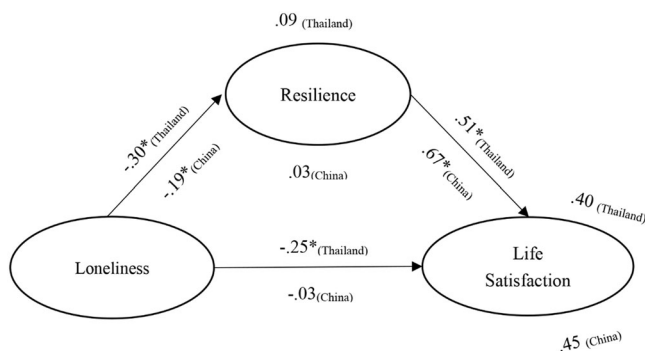
FIGURE 4 Mediating models of Thailand and China.

factor loadings of all items were between 0.56 and 0.91, and the following indices indicated an acceptable model fit for our data: $\chi^2 = 539.24$ ($p < .001$), $\chi^2/df = 2.90$, RMR = 0.05, RMSEA = 0.06, GFI = 0.91, CFI = 0.95, NFI = 0.92, and PNFI = 0.82 (Kline, 2010; Wu, 2007).

The bootstrap method revealed that resilience partially mediated the influence of loneliness on life satisfaction (Table 4). The confidence interval estimates revealed that the total effect of loneliness on life satisfaction was −0.26 ($p < .001$). Resilience partially mediated the influence of loneliness on life satisfaction; consequently, the indirect effect of "Loneliness → Life Satisfaction" reached −0.14 ($p < .001$), and the direct effect decreased to −0.12 ($p < .01$).

4.2 | Thai and Chinese mediating structural models

The overall sample group was separated into the Thai and Chinese groups, numbering 262 and 247 valid questionnaire samples, respectively. The default model was applied to the multigroup comparative analysis, and the following model fit indices indicated that their structural model was reasonable: $\chi^2 = 886.11$ ($p < .001$), $\chi^2/df = 2.38$, RMR = 0.07, RMSEA = 0.05, GFI = 0.86, CFI = 0.93, NFI = 0.88, and PNFI = 0.78 (Kline, 2010; Wu, 2007). For the Thai and Chinese mediating models, the factor loadings of all items ranged from 0.43 to 0.91 and 0.67 to 0.92, respectively.

The structural model of the Thai and Chinese groups is depicted in Figure 4. For the Thai group, in the structure of "Loneliness → Life Satisfaction" without the mediating variable, loneliness negatively predicted life satisfaction ($R^2 = 16\%$, $\gamma = -0.40$, $p < .001$). When resilience was input as a mediator, the path coefficient of loneliness and life satisfaction decreased from −0.40 ($p < .001$) to −0.25 ($p < .001$). Loneliness negatively predicted resilience ($R^2 = 9\%$, $\gamma = -0.30$, $p < .001$), while loneliness and resilience together explained life satisfaction ($R^2 = 40\%$), and loneliness ($\gamma = -0.25$, $p < .001$) and resilience ($\gamma = 0.51$, $p < .001$) predicted life satisfaction, respectively (Figure 4).

TABLE 5 Bootstrap estimates in Thai and Chinese groups

Mediating effect	Path value	Bias-corrected 95% CI		Percentile 95% CI	
		LB	UB	LB	UB
Thai group					
Total effect (Loneliness → Life Satisfaction)	−0.40***	−0.57	−0.25	−0.58	−0.25
Direct effect (Loneliness → Life Satisfaction)	−0.25***	−0.40	−0.11	−0.40	−0.11
Indirect effect (Loneliness → Life Satisfaction)	−0.15***	−0.27	−0.07	−0.27	−0.07
Chinese group					
Total effect (Loneliness → Life Satisfaction)	−0.16*	−0.32	−0.01	−0.33	−0.01
Direct effect (Loneliness → Life Satisfaction)	−0.03	−0.18	0.09	−0.18	0.10
Indirect effect (Loneliness → Life Satisfaction)	−0.13*	−0.25	−0.03	−0.25	−0.03

Abbreviations: CI, confidence interval; LB, lower bounds; UB, upper bounds.

*$p < .05$; ***$p < .001$.

For the Chinese group, in the structure of "Loneliness → Life Satisfaction" without the mediating variable, loneliness negatively predicted life satisfaction (R^2 = 2%, γ = −0.15, $p < .05$). However, with resilience as a mediator, the path coefficient of loneliness and life satisfaction decreased from −0.15 ($p < .05$) to −0.03 ($p > .05$). Loneliness negatively predicted resilience (R^2 = 3%, γ = −0.19, $p < .01$), while loneliness and resilience together explained life satisfaction (R^2 = 45%), and loneliness (γ = −0.03, $p > .05$) and resilience (γ = 0.67, $p < .001$) predicted life satisfaction, respectively (Figure 4). The structural paths of loneliness and life satisfaction in the Thai and Chinese groups supported H1.

The bootstrap method revealed that resilience partially mediated the influence of loneliness on life satisfaction in the Thai group, and completely mediated the influence in the Chinese group.

For the Thai group, the confidence interval estimates revealed the total effect of loneliness and life satisfaction was −0.40 ($p < .001$). However, resilience partly mediated the influence of loneliness on life satisfaction (Table 5); the indirect effect reached −0.15 ($p < .001$), and the direct effect was reduced to −0.25 ($p < .001$). For the Chinese group, the confidence interval estimates indicated the total effect of loneliness on life satisfaction was −0.16 ($p < .05$). The lack of a direct effect was attributable to resilience completely mediating the influence of loneliness on life satisfaction. Consequently, the indirect effect reached −0.13 ($p < .05$), and the direct effect decreased to −0.03 ($p > .05$). Thus, the confidence interval estimates supported H2.

4.3 | Multigroup comparison

In the parallel model constructed on the basis of the default model, the three structural paths of Thai and Chinese mediating structural models were equally limited (Byrne, 2010; Paulssen et al., 2014). The following model fit indices of the parallel model demonstrated acceptable fit: χ^2 = 892.77 ($p < .001$), χ^2/df = 2.38, RMR = 0.08, RMSEA = 0.05, GFI = 0.86, CFI = 0.93, NFI = 0.88, and PNFI = 0.79. The χ^2 test revealed no significant difference between the default model (χ^2 = 886.11, $p < .001$, χ^2/df = 2.38, RMR = 0.07, RMSEA = 0.05, GFI = 0.86, CFI = 0.93, NFI = 0.88, and PNFI = 0.78) and parallel model fits ($\Delta\chi^2$ (3)= 6.66, $p > .05$). Therefore, we observed a two-group invariance in the path constructs of the Thai and Chinese mediating models. The pairwise parameter comparisons of the multigroup analysis indicated measurement invariance in three structural paths (Table 6). The paths of "Loneliness → Resilience" and "Resilience → Life Satisfaction" had no significant difference, thus exhibiting invariance between the Thai and Chinese groups. However, a significant difference (Z = − 2.47, $p < .05$) was noted

TABLE 6 Pairwise parameter comparisons of multigroup analysis

	Default model		Parallel model	Parameter differences
χ^2 value	886.11		892.77	
Group number				
Thai group (N)		262		
Chinese group (N)		247		
Structural path coefficient				
Loneliness → Life Satisfaction				
Thai group (γ)	−0.25***		−0.15***	−2.47*
Chinese group (γ)	−0.03		−0.13***	
Loneliness → Resilience				
Thai group (γ)	−0.30***		−0.30***	−0.46
Chinese group (γ)	−0.18**		−0.21***	
Resilience → Life Satisfaction				
Thai group (γ)	0.51***		0.54***	−0.14
Chinese group (γ)	0.67***		0.65***	

*p < .05; **p < .01; ***p < .001.

in the path of "Loneliness → Life Satisfaction," indicating that the relationship between loneliness and life satisfaction differed significantly between the Thai and Chinese groups. For the Thai group, under the mediating effect of resilience, loneliness had a significant negative influence on life satisfaction (γ = −0.25, p < .01). However, resilience completely mediated the influence of loneliness on life satisfaction in the Chinese group, in that no relationship remained (γ = −0.03, p > .05). Thus, resilience as a mediating factor between loneliness and life satisfaction functioned differently in the Thai and Chinese groups. The pairwise parameter comparisons of the multigroup analysis supported H3.

5 | DISCUSSION

The SEM testing results supported H1 and are consistent with other studies and theories (Birthe & Gizem, 2021; Gan et al., 2020; Matias et al., 2020; Ruggieri et al., 2021). A high level of life satisfaction strongly contributes to individual physical and psychological health (Gan et al., 2020). These study results revealed that loneliness under social distancing prevention measures was detrimental to the life satisfaction of Thai and Chinese college students. Thus, the perceived feelings of loneliness must be reduced through related strategies.

The SEM mediating model results supported H2 and are consistent with the compensation model theory of resilience and the results of studies on resilience (Arslan, 2019; Cazan & Truta, 2015; Gerino et al., 2017; Wang et al., 2015). From the theoretical framework of the compensation function of resilience (Wang et al., 2015), loneliness as negative emotional stress (Gerino et al., 2017) can be positively compensated for by resilience, thereby exerting a lower negative influence on life satisfaction. Thus, resilience played a partial mediation between loneliness and life satisfaction in the overall Thai–Chinese structural model. Furthermore, the mediating effects in the mediating structural models of the Thai and Chinese students supported H2. For the Thai college students, resilience partially compensated for the influence of loneliness on life satisfaction; resilience completely mediated this negative influence in the Chinese college students.

The compensation function of resilience for loneliness was essential for life satisfaction in this study (Arslan, 2019; Cazan & Truta, 2015; Gerino et al., 2017; Wang et al., 2015). The SEM mediating analysis for both groups indicated the potential for reducing the effect of loneliness on life satisfaction when individuals perceived themselves as resilient to stress during prolonged periods of social distancing. Therefore, maintaining perceived resilience to stress is demonstrably beneficial to an individual's evaluation of their life state under the emotional stress of loneliness (Gerino et al., 2017).

H3 was also supported; we observed an obvious difference in the mediating structural models of the Thai and Chinese college students. In addition to the different mediating roles of resilience in the relationship between loneliness and life satisfaction in the two groups, measurement invariance between the two groups was also observed. In brief, the negative influence of loneliness reduced the life satisfaction of Thai and Chinese groups to different extents as a result of the compensation mechanism of resilience (Wang et al., 2015). Under the mediating effect of resilience, loneliness in Thai college students had a partially negative effect on their life satisfaction, but this effect was completely mediated in the Chinese college students. The results of the Thai–Chinese mediating structural models and measurement invariance test indicated that the influence of perceived loneliness on life satisfaction in Thai college students was much greater than that in Chinese college students.

This marked difference may have been caused by the divergent COVID-19 policies of open and closed-off management at the Thai and Chinese universities (Department of Disease Control, 2020; International Affairs Division of Kasetsart University, 2021; Ministry of Education of the People's Republic of China, 2020; Wuhan University's New Coronavirus Infection Pneumonia Epidemic Prevention and Control Headquarters, 2020a). The Thai students may have perceived a lower level of safe affiliation in open social distancing management compared with the Chinese students experiencing closed-off management, thereby increasing the effect of perceived loneliness on life satisfaction (Matias et al., 2020). The Thai students were more likely to be from multichild families (Chaturachinda & Boonthai, 2017) and excel at maintaining interpersonal relationships (Downey & Condron, 2004). Thus, they may have required stronger group affiliation than did the Chinese students (Murgai, 2004). However, Chinese college students were more likely to be from single-child families (Hesketh et al., 2015), be more independent, and be content being alone than Thai students (Nyman, 1995). Thus, Thai college students likely more readily perceived the influence of loneliness on life satisfaction as a result of the absence of affiliation. Compared with the Chinese students, who are characteristically atheist and independent (Rogacz, 2018; Y. X. Zhang & Yin, 2019; Zheng & Kapoor, 2021), the Thai students were likely raised with the Buddhist principles of altruism and interpersonal interdependence (Phra, 2015; Yablo & Field, 2007), which may have heightened their perception of loneliness under social distancing measures. The differing social distancing policies, familial structures, and cultural backgrounds may explain the Thai students' need for affiliation, the lack of which during the social distancing period resulted in the stronger influence of loneliness on their life satisfaction; the compensating mechanism of resilience was insufficient to neutralize this effect. By contrast, the influence of loneliness on the Chinese students' life satisfaction during the social distancing period was weaker, and the compensating function of resilience fully neutralized this effect.

6 | CONCLUSION

The results of this study demonstrated that resilience mediated the influence of loneliness on life satisfaction in Thai and Chinese college students. Resilience in Thai college students partially compensated for the negative influence of loneliness on life satisfaction, whereas resilience in Chinese college students fully compensated for this negative effect. The primary reason for this disparity was that Thai college students perceived much stronger feelings of loneliness with a greater negative effect on their life satisfaction than did the Chinese college students.

6.1 | Research implications

The results of this study revealed that the theoretical mechanism of resilience acted as a compensating mediator and counteracted the negative influence of loneliness on life satisfaction to different extents for Thai and Chinese college students. This finding can assist researchers investigating the compensating function of resilience in understanding the similar role of resilience in collectivist cultural groups.

We also identified the reason for the different mediating functions of resilience between these two student groups, with loneliness exerting a greater negative effect on the life satisfaction of the Thai college students than on that of the Chinese college students. First, establishing and maintaining resilience in response to negative lonely feelings may benefit from an individual's social support system (Gunnestad, 2006; Heath et al., 2020; Yıldırım & Çelik Tanrıverdi, 2020). In relation to student management services, we recommend that student managers and counselors assist Thai and Chinese college students in constructing social support networks so that these students can maintain resilience to loneliness in a social distancing context. Second, Thai college students may rely more heavily on affiliation (Chaturachinda & Boonthai, 2017; Murgai, 2004; Phra, 2015; Yablo & Field, 2007) compared with Chinese college students (Brinthaupt & Dove, 2012; Hesketh et al., 2015; Nyman, 1995; Rogacz, 2018; Y. X. Zhang & Yin, 2019; Zheng & Kapoor, 2021) and thus perceive stronger feelings of loneliness than do Chinese college students in a social distancing context. In a social distancing context, those providing student management services must consider students' cultural characteristics, that is, whether the students are domestic or international students. In particular, university services must address Thai students' need for affiliation and respect Chinese students' independence.

6.2 | Limitations and future research

In this study, we employed SEM to test the measurement validity of the measurement instruments and mediating effects. The measurement model of this study revealed that the measurement tools had high reliability and validity and were suitable for subsequent model analysis. However, an item in the Thai structural mediating model had a low factor loading. Therefore, follow-up cross-country comparative research could analyze the cultural suitability of such measurement instruments.

Social distancing continues to be vital in the prevention of COVID-19 transmission. Social distancing policies can induce feelings of loneliness and place limits on traditional modes of education. Therefore, follow-up research could employ a comparative approach to education and social distancing in different countries.

The measurement and sampling methods employed in this study limited the generalizability of its results to Thai and Chinese populations. Thus, future cross-country comparative studies can increase the sample size and use strict measurement and sampling procedures.

AUTHOR CONTRIBUTIONS
Chia-Ching Tu conceived the study, led the research design, and drafted and revised the manuscript. Dong Yang performed the measurements and statistics and assisted in the research design and the manuscript revision. Lei Pan gathered questionnaires from Thai college students and assisted in the research design. Xiao Dai gathered questionnaires from Chinese college students and assisted in the research design.

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CONFLICTS OF INTEREST
The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Research data are available from the corresponding author.

ETHICS STATEMENT

The design of this study was reviewed and approved by the institutional review board at the International College of Krirk University. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Declaration of Helsinki Declaration of 1975 (in its most recently amended version). Informed consent was obtained from all participants included in the study. The purpose of the research was explained to the participants first, and then they were asked to sign informed consent. Participation was voluntary, and all data were handled confidentially.

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