

# Sense of place and post-traumatic growth in the post-COVID era: A moderated mediation model of psychological resilience and social-emotional competence

**Jianzhen Zhang**

Zhejiang Normal University

**Yifei Chen**

Zhejiang Normal University

**Hongmei Yu**

Zhejiang Normal University

**Zhenni An**

Zhejiang Normal University

**Collins Opoku Antwi**

Zhejiang Normal University

**Jiahao Ge** (✉ [jiahaoge@foxmail.com](mailto:jiahaoge@foxmail.com))

Zhejiang Normal University

---

## Research Article

**Keywords:** COVID-19, post-traumatic growth, sense of place, psychological resilience, social-emotional competence

**Posted Date:** May 23rd, 2023

**DOI:** <https://doi.org/10.21203/rs.3.rs-2940083/v1>

**License:**   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

**Additional Declarations:** No competing interests reported.

---

# Abstract

## Background

In the post-COVID era, identifying ways to promote post-traumatic growth among the general public is a pressing concern. However, few studies have explored the potential positive impact of people's relationship with place on post-traumatic growth. Therefore, this study investigated the relationship between sense of place and post-traumatic growth, as well as the mediating role of psychological resilience and moderating effect of social-emotional competence.

## Methods

We conducted a survey with 1203 high school students in eastern China to assess their levels of sense of place, post-traumatic growth, psychological resilience, and social-emotional competence. Moderated mediation models were tested using SPSS, AMOS, and PROCESS.

## Results

The results indicated a significant positive impact of sense of place on post-traumatic growth ( $\beta = 0.111$ ,  $p < 0.001$ ), with psychological resilience serving as a mediator ( $\beta = 0.401$ ,  $p < 0.001$ ). Moreover, social-emotional competence moderated the relationship between sense of place and psychological resilience in this pathway ( $\beta = 0.073$ ,  $p < 0.001$ ).

## Conclusions

The results indicated that sense of place may have both direct and indirect impacts through psychological resilience on post-traumatic growth. In addition, individuals with higher social-emotional competence tend to experience more post-traumatic growth, even when their sense of place is similar to individuals with lower social-emotional competence. These findings have significant implications for promoting post-traumatic growth among adolescents in the post-COVID era.

## 1. Introduction

In January 2023, the World Health Organization announced that the COVID-19 pandemic may be at a turning point and the world was entering a post-pandemic era [1]. In this new era, addressing the range of mental health problems created by COVID-19 has become an urgent task. Common psychiatric symptoms in patients hospitalized and isolated for COVID-19 include post-traumatic stress disorder (PTSD), depression, anxiety, and insomnia [2]. In addition, since the threat of COVID-19 is persistent and invisible [3], many people have suffered from anxiety and depression [4]. Consequently, researchers have

sought to identify effective methods for coping with COVID-19 trauma and promoting post-traumatic growth (PTG) in the post-COVID era [5, 6].

PTG refers to positive psychological changes, such as increased sense of meaning, closer interpersonal relationships, increased self-worth, and a clearer purpose in life, that may occur after individuals have experienced trauma or severe adversity [7]. Kavanagh [8] and Stallard [9] found that PTG positively impacted caregivers who experienced stress and anxiety during the COVID-19 pandemic. Moreover, PTG increased appreciation of the meaning of life among individuals who experienced COVID-19 [10].

PTG is influenced by individual and external factors, such as sense of place (SOP), which is an emotional connection between people and places [11] that creates person–environment interactions [12]. Several studies suggested a connection between SOP and PTG. Knez [13] investigated how place identity in individuals before and after a natural disaster can foster PTG. Qian et al. [14] demonstrated that individuals with highly positive local identities and behaviors in disaster areas were more capable of “growing through adversity”. However, the relationship between SOP and PTG in the post-COVID-19 era remains under-investigated.

Psychological resilience (PR) is the ability to cope with stress, adversity, and frustration [15] and an important predictor of PTG. Wang [16] found that people’s PR during the early stages of the COVID-19 pandemic was positively associated with PTG. Furthermore, research has shown that PR is associated with SOP. Xu et al. [17] found that students’ SOP enhanced their PR during the COVID-19 pandemic. Prayag et al. [18] found that strong SOP positively contributed to PR after experiencing an earthquake. However, although SOP, PR, and PTG are closely related, few studies have considered them together.

The role of social-emotional competence (SEC) in regulating individuals’ cognitive and psychological processes has received extensive attention from researchers based on cognitive theory of emotions [19, 20]. As an important component of emotional intelligence [21], SEC is positively correlated with PR [22]. Individuals with higher SEC have healthier social relationships and greater attachment to and satisfaction with their environment, which in turn enhances their psychological comfort and positive emotional states, strengthening PR [23]. However, few studies have focused on the potential moderating role of SEC. Therefore, this study examined the SOP–PTG relationship among students who experienced the COVID-19 pandemic, the mediating role of PR, and the moderating role of SEC.

## **2. Theoretical basis and hypotheses**

### **2.1. Sense of place**

The concept of SOP was initially introduced by Tuan [24]. Despite its complexity and multidimensionality [25], SOP is typically considered to be a system comprising cognitive, affective, and behavioral components [26]. Jorgensen [27] distinguished between three SOP dimensions: place identity, place attachment, and place dependence. Place identity pertains to an individual’s sense of identification with a particular place [28]. Place attachment refers to emotional attachment to a place [29]. Place dependence

relates to individuals' dependence on place-based resources and services in their daily lives [30]. In affective geography theory, SOP is conceptualized as an emotional–environmental connection arising from people's emotional experiences of the environment [27, 31]. SOP is highly valued for its impact on human physical and mental health and has been shown to affect behavior, perception, and mood [32, 33]. Furthermore, frequent exposure to natural environments can significantly improve people's mental health [34]. Researchers have measured SOP in various ways, including self-reports and behavioral and physiological measures. Jorgensen [27] developed the Lakeshore Property Attachment Scale to compare the predictive power of different factors on residents' place identity in a lakeshore area. This study employed Jorgensen's scale to measure SOP.

## **2.2. Post-traumatic growth**

Since the first systematic elaboration of PTG by Tedeschi and Calhoun [7], the concept has gradually received increasing attention [35]. PTG is a process by which, after experiencing a traumatic event, an individual may experience changes in five areas: individual strength, connection to others, new possibilities, appreciation of life, and spirituality and existence [36]. PTG may be promoted by individual factors—including sociodemographic variables, such as gender and age [37–39], and individual cognitive and emotional factors, such as self-efficacy and risk perception abilities [40–42]—and environmental factors, such as workplace, social support, socioeconomic status, and severity of traumatic events [39, 43–45]. Classic measures of PTG include the Post-Traumatic Growth Inventory (PTGI) scale [7], and the Short-Form PTGI (PTGI-SF) [46]. This study used the former.

## **2.3 Link between sense of place and post-traumatic growth**

By integrating the literature on SOP and PTG, a possible link between them can be inferred. SOP is commonly described as an emotional bond between an individual and a place [24] and is linked to individuals' environmental perceptions [47]. PTG comprises positive psychological changes resulting from effective coping with a traumatic event and implies responding to the environmental context [7]. Bratman et al. [48] demonstrated that environmental factors can influence an individual's mood, attention, and impulse control, affecting their mental health and cognitive functioning. Ecosystem theory suggests that the interconnected human–environment system should be the object of psychological study [49]; therefore, it provides further support for the potential SOP–PTG link.

Place identity can facilitate PTG among individuals affected by natural disasters [13]. Following a traumatic event, individuals tend to develop a stronger emotional connection with the place where the event occurred [50], suggesting a potential SOP–PTG link. Lederbogen et al. [51] indicated that high levels of SOP could potentially promote PTG. Shevchenko et al. [52] found that individuals with more social interactions and outdoor activities recover faster from COVID-19 trauma. Contrastingly, individuals affected by pandemic-related isolation were more likely to suffer from trauma due to reduced contact with their social environment [53]. Therefore, the following hypothesis was posed:

H1: SOP is positive correlated with PTG.

## 2.4. Mediating role of psychological resilience

PR refers to an individual's capacity to adapt and function normally following exposure to stressors, such as illness, setbacks, trauma, and adversity [54]. PR enables people to quickly return to their baseline level of functioning. PR is "the ability to maintain positive functioning in the face of adversity, including the ability to actively cope, adapt, and recover from stress or trauma" (American Psychological Association) [55]. PR can aid individuals in maintaining a balance in the face of challenges, adapting to change, developing and growing, and learning from negative experiences.

PR is influenced by various factors, including individual factors, such as gender, age, and emotion regulation [56–58], and external factors, such as family social status, and social support [59, 60]. Furthermore, there is a potential SOP–PR link. Positive interactions with nature can enhance PR [61]. An ecosystem-based framework of PR outlines three aspects of PR that play a role: risk and protective factors that coexist in the external environment, PR factors possessed by individuals themselves, and mechanisms that act on the dynamics between the individual, environment, and outcome [62]. Strong SOP can increase an individual's sense of belonging and self-esteem and enhance their ability to cope with stress and adversity; thus, it can be considered as a protective factor [63]. Secondly, the social and cultural factors related to adversity are also associated with SOP [64], affecting people's ability to cope in adversity [65]. PR is an important factor promoting PTG [66]. Lades et al. [67] found that individuals with higher PR were better able to recover from COVID-19-related trauma. Therefore, we hypothesized that SOP may impact PTG by enhancing individuals' PR.

H2: PR mediates the relationship between SOP and PTG.

## 2.5. Social-emotional competence as a moderator

The development of PR is closely linked to individual self-regulation. Emotional regulation in response to stress can be facilitated by SEC [68]. SEC involves a range of abilities that enable individuals to direct their thoughts and behaviors in social interactions, including perceiving, understanding, expressing, and regulating emotions [69, 70]. The OECD [71] indicated that SEC predicts psychological well-being among students. Martinsone [72] found that SEC facilitated pro-social behavior and emotion regulation.

According to the Big Five personality model [73], SEC includes perceiving, using, and understanding emotions. Individuals with high SEC exhibit better emotional understanding and expression [74, 75] and are better able to form emotional connections and attachments in their interactions with their surroundings, promoting PR [76]. The theory of emotional intelligence posits that SEC plays a moderating role. Emotional intelligence refers to the level of intelligence individuals display when processing emotional information and is closely associated with their ability to regulate emotions [77, 78].

SEC has been shown to be a key moderating variable in the relationship between environmental factors and PR. For instance, individuals with high SEC experience more positive emotions in the workplace, promoting PR [79]. Conversely, individuals with low SEC are susceptible to social conflicts and poor

lifestyle habits due to undeveloped emotional understanding, expression, and control during interactions with various elements of place, hindering PR's formation [69, 80].

Thus, we hypothesized that SEC may moderate the predictive effect of SOP on the level of PR. Specifically, high SEC helps individuals obtain psychosocial resources, such as social support, from the environment. These resources interact with internal personality traits to promote self-perception and identity and enhance individuals' adaptive capacity, thereby increasing PR [81–83]. Therefore, the following hypothesis was posed:

H3: SEC plays a moderating role in the SOP–PR link.

## **3. Materials and methods**

### **3.1. Participants and procedures**

This study included public high school students (aged 16–18) in a region in eastern China selected using whole-group sampling. Throughout November 2022, paper questionnaires were distributed to participants, who were provided an explanation of the study and questionnaire details before completing the questionnaires. After obtaining consent from parents, teachers, and students, the questionnaires were collected. Validity testing was conducted on the 1500 questionnaires, and 1203 were found to be valid. Among respondents, 659 (54.8%) were male and 544 (45.2%) were female. Moreover, 709 (58.9%) and 494 (41.1%) were from urban and rural areas, respectively.

### **3.2. Materials**

Our survey instrument comprised two parts and five sections overall. The first part acquired demographic information (gender, residential location). The second part comprised questionnaires about SOP, PTG, PR, and SEC. All the scales were originally in English; therefore, back translation was performed to ensure accuracy. Furthermore, the questionnaires were adjusted and refined by the researchers prior to finalization. All scales were scored on seven-point Likert scales (1 = strongly disagree; 7 = strongly agree). Higher scores indicated higher levels of the measured constructs.

#### **3.2.1 Sense of place scale**

Our SOP scale was based on the Lakeshore Sense of Place Survey developed by Jorgensen and Stedman [84]. The final questionnaire had 12 items across 3 dimensions: place identity (e.g., “This place is so close to me that I can be my true self”), place attachment (e.g., “This place relaxes me”), and place dependence (e.g., “I like this place most when I do what I like best”). Confirmatory factor analysis (CFA) demonstrated satisfactory fit for a single-factor model:  $\chi^2/df = 2.950$  CFI = 0.992, TLI = 0.985, RMSEA = 0.040, SRMR = 0.042. Cronbach's  $\alpha$  was 0.871.

#### **3.2.2 Psychological resilience scale**

PR was measured using the Connor-Davidson resilience scale (CD-RISC; Connor and Davidson) [85]. The final questionnaire has 24 questions across 3 dimensions: resilience (e.g., “I don’t give up easily when things don’t look promising”), strength (e.g., “Past successes give me the confidence to face challenges”), and optimism (e.g., “I can handle whatever happens”). CFA demonstrated satisfactory fit for a single-factor model:  $\chi^2/df = 2.965$ , CFI = 0.980, TLI = 0.969, RMSEA = 0.040, SRMR = 0.046; Cronbach’s  $\alpha$  was 0.953.

### **3.2.3 Post-traumatic growth scale**

We adapted the PTGI developed by Tedeschi and Calhoun [7]. The final questionnaire had 19 questions across four dimensions: relating to others (e.g., “I have a sense of closeness to others”), new possibilities (e.g., “I have opened up a new path in my life”), personal strength (e.g., “I have discovered that I am stronger than I thought”), and appreciation of life (e.g., “I prioritize the most important things in my life”). CFA demonstrated satisfactory fit for a single-factor model fit:  $\chi^2/df = 2.957$ , CFI = 0.992, TLI = 0.981, RMSEA = 0.040, SRMR = 0.037. Cronbach’s  $\alpha$  was 0.960.

### **3.2.4 Social-emotional competence scale**

SEC was measured using the Delaware SEC Scale [86]. The questionnaire had 12 items across 4 dimensions: responsible decision-making (e.g., “I feel responsible for my own actions”), interpersonal skills (e.g., “I am good at resolving conflicts with others”), self-management (“I can control my own behavior”), and social awareness (e.g., “I consider the feelings of others”). CFA demonstrated satisfactory fit for a single-factor model:  $\chi^2/df = 2.921$ , CFI = 0.991, TLI = 0.982, RMSEA = 0.040, SRMR = 0.022. Cronbach’s  $\alpha$  was 0.890.

### **3.2.5 Covariates**

As previous research suggests that an individual’s gender and residential location may be related to PTG [39, 40], we included these aspects as control variables.

## **3.3. Data analysis**

Data analysis was conducted using SPSS and AMOS. Harman’s one-way test was performed to test for common method bias. Bivariate correlation analysis was conducted to examine correlations among all variables, with continuous variables being pooled together. AMOS was used to perform CFA.

The PROCESS macro (model 4) in SPSS was used to test the mediating role of PR in the SOP–PTG link, using 95% bias-corrected confidence intervals and 5000 bootstrap samples. The mediating effect was considered significant when the 95% confidence interval did not include zero.

Furthermore, we examined whether SEC moderated the mediation process using PROCESS macro (Model 7). Significance was determined in the same way as the mediation effect. If the moderating effect was significant, simple slope analysis was conducted using the PROCESS macro to further explore the nature of the moderating effect.

## 4 Results

### 4.1. Common method bias

The results showed that there were 14 factors with eigenvalues greater than one. The maximum factor variance explained was 25.81%, less than the critical value of 40%, indicating no significant common method bias [87].

### 4.2. Descriptive statistics

The descriptive characteristics are shown in Table 1. There were significant correlations between gender, residential location, and the other variables of interest. Therefore, we used them as control variables. Moreover, SOP, PR, SEC, and PTG were significantly and positively correlated



Table 1  
Descriptive characteristics

<b>Variable</b>	<b>N</b>	<b>M</b>	<b>SD</b>
SOP	1203	55.727	12.805
Gender			
Male	659	56.067	13.698
Female	544	55.314	11.631
Residential location			
Urban	709	55.882	12.609
Suburban	494	55.504	13.091
PTG	1203	76.838	18.468
Gender			
Male	659	77.042	19.339
Female	544	76.590	17.368
Residential location			
Urban	709	77.367	19.385
Suburban	494	76.079	17.056
PR	1203	108.460	24.071
Gender			
Male	659	110.728	25.087
Female	544	105.711	22.497
Residential location			
Urban	709	110.275	24.532
Suburban	494	105.854	23.170
SEC	1203	60.078	11.420
Gender			
Male	659	59.378	11.755
Female	544	60.926	10.950
Residential location			

Variable	N	M	SD
Urban	709	60.756	11.216
Suburban	494	59.105	11.648

### 4.3. Validity of measurement variables

CFA showed that the measure model was appropriate. Fit indices were acceptable:  $\chi^2/df = 2.735$ , CFI = 0.936, TLI = 0.930, RMSEA = 0.040, and SRMR = 0.049.

### 4.4. Moderated mediation model

Using standardized variables, Hayes' SPSS PROCESS macro was used to analyze the mediating role of PR between SOP and PTG. Linear regressions are shown in Table 2. SOP had a significant positive predictive effect on PR ( $\beta = 0.554$ ,  $t = 23.239$ ,  $p < 0.001$ ) and PTG ( $\beta = 0.111$ ,  $t = 3.569$ ,  $p < 0.001$ ). In addition, PR significantly and positively predicted PTG ( $\beta = 0.4011$ ,  $t = 12.7964$ ,  $p < 0.001$ ).

Table 2  
Predictors of post-traumatic growth: Psychological resilience as mediator

Variables	PTG		PR		PTG	
	$\beta$	t	$\beta$	t	$\beta$	t
SOP	0.333	12.094 <sup>***</sup>	0.554	23.239 <sup>***</sup>	0.111	3.569 <sup>***</sup>
PR					0.401	12.796 <sup>***</sup>
Gender			-0.096	-4.055 <sup>***</sup>	0.033	1.285
Residential location			-0.082	-3.490 <sup>***</sup>	0.004	0.162
R <sup>2</sup>	0.114		0.337		0.221	
F	38.626 <sup>***</sup>		152.493 <sup>***</sup>		67.848 <sup>***</sup>	
* $p < 0.05$ , ** $p < 0.01$ , *** $p < 0.001$ .						

Nonparametric percentile bootstrapping was conducted to examine mediating effects (Table 3). While controlling for gender and residential location, the indirect pathway—i.e., SOP related to PTG through PR—was significant (95% CI [0.174, 0.273]). The effect size was 0.222, with a significant mediating effect of 66.66% (effect share). The direct effect of SOP on PTG was also significant (95% CI [0.050, 0.172]). The direct effect size was 0.111, which was significant and accounted for 33.34% of the effect. In addition, the total effect of SOP on PTG was significant when PR was not considered in the regression equation, with an effect size of 0.333. The findings indicated that high school students' SOP was significantly and positively correlated with PTG, with PR playing a mediating role, supporting H1 and H2.

Table 3  
Decomposition of the total, direct, and mediating effects

Path	Effect size	Boot SE	Boot LLCI	Boot ULCI	Ratio
Indirect effect	0.222	0.025	0.174	0.273	66.66%
Direct effect	0.111	0.031	0.050	0.172	33.34%
Total effect	0.333	0.028	0.279	0.387	

Furthermore, we examined the moderating role of SEC, particularly whether the mediating effect differed significantly according to SEC levels. SOP had a significant positive predictive effect on PTG ( $\beta = 0.111$ ,  $t = 3.570$ ,  $p < 0.001$ ), while gender and residential location did not (Table 4). SOP was a significant predictor of PR ( $\beta = 0.362$ ,  $t = 13.907$ ,  $p < 0.001$ ). Both gender and residential location were significant predictors of PR. In addition, PR was a positive predictor of PTG ( $\beta = 0.401$ ,  $t = 12.796$ ,  $p < 0.001$ ). The SOP and SEC interaction terms had the same predictive effect on PR ( $\beta = 0.073$ ,  $t = 5.433$ ,  $p < 0.001$ ). The moderated mediating effects model is shown in Fig. 1.

Table 4  
Moderated mediation effect

Variables	PTG		PR	
	$\beta$	t	$\beta$	t
SOP	0.111	3.570 <sup>***</sup>	0.362	13.907 <sup>***</sup>
SEC			0.411	15.196 <sup>***</sup>
SEC×SOP			0.073	5.433 <sup>***</sup>
PR	0.401	12.796 <sup>***</sup>		
Gender	0.033	1.285	-0.120	-5.488 <sup>***</sup>
Residential location	0.004	0.162	-0.063	-2.913 <sup>**</sup>
R <sup>2</sup>	0.221		0.445	
F	67.848 <sup>***</sup>		159.900 <sup>***</sup>	

To further explain the moderating role of SEC, we performed a simple slope test. The data were analyzed by assigning samples to low- and high-SEC subgroups. When SEC moderated the first half of the SOP–PR–PTG pathway, SOP was a significant positive predictor of PR regardless of SEC levels (Table 5). At high levels of SEC ( $M + 1SD$ ), higher levels of SOP were associated with higher PR. This, higher SEC was associated with more significant positive links between SOP and PR.

Table 5  
Changes to the mediating effect of psychological resilience according to levels of social-emotional competence

SEC	Effect value	BootSE	95%CI
M-1SD	0.116	0.022	[0.074,0.161]
0	0.145	0.020	[0.108,0.186]
M + 1SD	0.174	0.023	[0.132,0.220]

## 5. Discussion

### 5.1. General discussion

This study examined the potential mechanism underlying the SOP–PTG link in a sample of Chinese adolescents who experienced COVID-19. The findings indicated that SOP positively influenced PTG, and this relationship is mediated by PR. Moreover, SEC moderated the first half of the mediating pathway via PR in the SOP–PTG link. To the best of our knowledge, this is the first study that elucidates a moderated mediation mechanism linking SOP and PTG, which is an important area of concern in the post-COVID era. Although some studies have focused on PTG after COVID-19 [88], few studies have investigated person-place interactions.

The significant SOP–PTG relationship is consistent with the findings of a review indicating that high SOP can promote individual psychological well-being [89]. Moreover, this supports Bronfenbrenner’s [49] ecosystem theory, suggesting that positive development occurs through regular, active two-way interactions between individuals and their environment [90]. Accordingly, external environmental factors, such as school ecology and community support, promote children’s mental health [91]. Enhancing individuals’ perception of place through positive exposure to the environment can promote PTG [92]. Studies during COVID-19 have shown that chronic lack of social contact leads to psychiatric disorders, such as PTSD [93]. People who feel uneasy about their community and family relationships are more likely to have mental health problems [94]. Furthermore, our results support affective geography theory (Anderson, 2001), which suggests that an individual’s emotional identity and sense of belonging to a place can influence their behavior and physiology, affecting their mental health and well-being. Lades [67] showed that individuals who experienced more of their living environment and participated in outdoor activities during COVID-19 were well positioned to alleviate negative emotions and enhance well-being. In this study, SOP was positively associated with PTG, suggesting that individuals can promote psychological well-being by enhancing their emotions and connections to place [96]. Therefore, people, especially those who have experienced COVID-19-related traumatic events [97], should interact more with their environment to enhance their level of SOP and in turn promote PTG.

Moreover, our results revealed that PR mediates the SOP–PTG link, expanding understanding of the internal mechanism by which SOP indirectly promotes PTG. Ungar et al. [98] suggested that SOP is associated with the development of PR. Moreover, Cao [99] found that individuals exposed to COVID-19-related stressors, such as isolation and infection, were more likely to develop anxiety symptoms. High SOP has been found to promote positive affective attitudes and enhance individual PR [100]. Southwick [15] argued that PR can be enhanced through multiple levels of social support, including family, community, and social organizations. Ma [101] found that during COVID-19, residents' perceived satisfaction and comfort with their living environment were associated with increased PR. Therefore, promoting SOP is crucial to enhancing PR [102].

In addition, our study found a positive association between PR and PTG. Environmental enrichment during an individual's early years can counteract the effects of anxiety-like behaviors in the amygdala, build PR, and promote lifelong resilience to trauma-related stress [103]. Furthermore, our findings support the extension of meaning construction theory [104], which suggests that individuals actively adapt to their environments by seeking information and constructing new cognitive frameworks when experiencing uncertainty or dilemmas. SOP is an individual's active construction of meaning about place [105]. SOP can develop through self-reflection and value reconstruction [106], enhancing PR [107]. Park [108] found that active meaning construction promotes PR, reduces stress, and enhances individual well-being. Tongeren [109] found that during COVID-19, active meaning construction contributed to individuals' positive psychology, enhancing PR and reducing distress and anxiety. Therefore, we suggest that PR mediates the SOP–PTG link. SOP influences an individual's PTG after promoting PR.

In addition, we found that the SOP–PR relationship is moderated by SEC. SOP is more strongly associated with PR among individuals with high SEC. High SEC is associated with increased psychological well-being, social identity, and emotion regulation [110, 111]. Díaz et al. (2022) found that adolescents with high SEC had greater subjective and psychological well-being. Li [112] found that individuals with high SEC had better emotion regulation and cognitive and behavioral coping strategies during COVID-19. Our finding about the moderating effect of SEC can be explained by emotional intelligence theory [69], which suggests that SEC includes emotion perception, comprehension, expression, and regulation sub-competencies [113, 114]. Individuals with high EQ have stronger emotion regulation and cognitive reappraisal abilities, which are associated with higher levels of PR [115]. Tariq [116] found that individuals with high EQ had higher life satisfaction during the COVID-19 period. Individuals with high SEC are better able to perceive, understand, and regulate their emotions about places and express themselves effectively during environmental and social interactions [117]. They are also more likely to receive sufficient psychosocial resources such as social support [118], promoting PR [119]. Thus, the predictive effect of SOP on PR is significantly enhanced by increasing levels of SEC.

Finally, high SEC enhances the mediating effect of PR in the relationship between SOP and PTG. Individuals with high SEC are more likely to receive high-quality social support from their environment, increasing social satisfaction [120]. This facilitates individuals' growth and recovery after a traumatic event [121]. Liu [122] found that individuals with high SEC were less likely to experience PTSD symptoms

during the COVID-19 pandemic. Contrastingly, individuals with low SEC may struggle with memory, decision-making, and behavioral execution due to ineffective emotion regulation strategies, hindering PTG [123]. Neuroscientific evidence suggests that individuals with low SEC may also have dysregulated release of hormones, such as norepinephrine, potentially affecting their ability to engage in stress responses and resilience, hindering PTG [124]. Therefore, to help individuals recover from traumatic events such as COVID-19, promoting SEC can enhance their level of PR and ultimately lead to PTG.

## 5.2. Implications

There are several implications from this study relating to PTG in the post-COVID era. First, we suggest that SOP may form part of spiritual therapies promoting PTG. We recommend that individuals affected by COVID-19 trauma actively explore the local natural environment, participate and integrate in the local community, and learn about local culture and traditions [125]. Moreover, we suggest developing a sense of place identity, attachment, and dependence [126]. For young people, school administrators or parents could attempt to enhance PR through place-based psychological interventions to promote PTG [127].

Second, by identifying the role of PR, our findings provide an expanded understanding of the internal mechanisms by which SOP indirectly promotes PTG, supporting and enriching meaning construction theory [128]. Specifically, incorporating SOP into this theory posits that increased SOP contributes to the construction of meaning in the lives of high school students [129], promotes the development of PR, and facilitates PTG among high school students following exposure to COVID-19 [130].

Third, this study expands SEC research by demonstrating its moderating role, revealing how the relationship between individuals and society can impact mental health, particularly after a socially impactful traumatic event such as COVID-19 [131]. SEC is crucial in helping individuals build positive relationships with wider society [132], which is directly linked to their psychological well-being [17]. To enhance their psychological well-being, individuals can practice communication skills, actively listen and empathize with others' perspectives, feelings, and emotions, cultivate high-quality social networks, and proactively seek social support [133].

## 5.3. Limitations and future directions

This study had several limitations. First, the results are based on cross-sectional data; therefore, causality cannot be inferred. Future studies should adopt experimental or longitudinal designs to establish causality. Second, the data were gathered through self-report measures, which are vulnerable to various biases. Although steps were taken to minimize the impact of these biases, their influence cannot be entirely eliminated. Collecting data from multiple sources, such as parents, teachers, and peers, could address this issue. Third, our sample consisted of Chinese high school-aged adolescents, and the results may not be generalizable to other age groups or cultural contexts. Including participants from diverse age groups and cultural backgrounds may enhance the external validity of the proposed model.

## 6. Conclusion

Adopting a person–environment approach, this study investigated the SOP–PTG relationship. The findings revealed direct and indirect effects of SOP on PTG through PR. Furthermore, the SOP–PR relationship was moderated by SEC. The results shed light on how person–place and person–society interactions impact individuals’ PTG, which has implications for public mental health recovery in the post-COVID-19 era.

## Declarations

### Ethics approval and consent to participate

The study adhered to the principles of the Declaration of Helsinki. All participants provided written informed consent. This study was approved by the Research Ethics Committee of Zhejiang Normal University (number: ZSRT2023056)

### Consent for publication

Not applicable.

### Competing interests

The authors declare that they have no competing interests.

### Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

### Funding

This research was supported by The National Social Science Fund of China (BAA180017).

### Authors’ contributions

**Jianzhen Zhang:** Writing - review & editing, project administration. **Yifei Chen:** Investigation, Resources, Writing - original draft, Writing - review & editing. **Hongmei Yu:** Writing - review & editing, Data curation, Methodology. **Zhenni An:** Formal analysis, Investigation, Writing - original draft. **Collins Opoku Antwi:** Methodology, Supervision, Validation. **Jiahao Ge:** Investigation, Resources, Writing - review & editing, project administration.

### Acknowledgements

Not applicable.

## References

1. WHO. Statement on the fourteenth meeting of the International Health Regulations. (2005) Emergency Committee regarding the coronavirus disease (COVID-19) pandemic. 2023. [https://www.who.int/news/item/30-01-2023-statement-on-the-fourteenth-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-coronavirus-disease-\(covid-19\)-pandemic](https://www.who.int/news/item/30-01-2023-statement-on-the-fourteenth-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-coronavirus-disease-(covid-19)-pandemic). Accessed 18 Apr 2023.
2. Mazza MG, De Lorenzo R, Conte C, Poletti S, Vai B, Bollettini I et al. Anxiety and depression in COVID-19 survivors: Role of inflammatory and clinical predictors. *Brain, Behavior, and Immunity*. 2020;89:594–600.
3. DePierro J, Lowe S, Katz C. Lessons learned from 9/11: Mental health perspectives on the COVID-19 pandemic. *Psychiatry Res*. 2020;288:113024.
4. Vindegaard N, Benros ME. COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. *Brain Behav Immun*. 2020;89:531–42.
5. Duan L, Shao X, Wang Y, Huang Y, Miao J, Yang X, et al. An investigation of mental health status of children and adolescents in china during the outbreak of COVID-19. *J Affect Disord*. 2020;275:112–8.
6. Jamshaid S, Bahadar N, Jamshed K, Rashid M, Imran Afzal M, Tian L, et al. Pre- and Post-Pandemic (COVID-19) Mental Health of International Students: Data from a Longitudinal Study. *Psychol Res Behav Manage*. 2023;16:431–46.
7. Tedeschi RG, Calhoun LG. The Posttraumatic Growth Inventory: measuring the positive legacy of trauma. *J Trauma Stress*. 1996;9:455–71.
8. Kavanagh BE, O'Donohue JS, Ashton MM, Lotfaliany M, McCallum M, Wrobel AL et al. Coping with COVID-19: Exploring coping strategies, distress, and post-traumatic growth during the COVID-19 pandemic in Australia. *Front Psychiatry*. 2022;13.
9. Stallard P, Pereira AI, Barros L. Post-traumatic growth during the COVID-19 pandemic in carers of children in Portugal and the UK: cross-sectional online survey. *BJPsych Open*. 2021;7:e37.
10. Sun W, Chen W-T, Zhang Q, Ma S, Huang F, Zhang L, et al. Post-Traumatic Growth Experiences among COVID-19 Confirmed Cases in China: A Qualitative Study. *Clin Nurs Res*. 2021;30:1079–87.
11. Sedawi W, Assaraf OBZ, Reiss MJ. Regenerating Our Place: Fostering a Sense of Place Through Rehabilitation and Place-Based Education. *Res Sci Educ*. 2021;51:461–98.
12. Scannell L, Gifford R. The relations between natural and civic place attachment and pro-environmental behavior. *J Environ Psychol*. 2010;30:289–97.
13. Knez I, Butler A, Ode Sang Æ, Ångman E, Sarlöv-Herlin I, Åkerskog A. Before and after a natural disaster: Disruption in emotion component of place-identity and wellbeing. *J Environ Psychol*. 2018;55:11–7.
14. Qian L, Zheng C, Lai Q, Guo J. A County Town in Ruins: Memories, Emotions, and Sense of Place in Post-Earthquake Beichuan, China. *Sustainability*. 2021;13:11258.
15. Southwick SM, Bonanno GA, Masten AS, Panter-Brick C, Yehuda R. Resilience definitions, theory, and challenges: interdisciplinary perspectives. *Eur J Psychotraumatol*. 2014;5.



16. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. *Int J Environ Res Public Health*. 2020;17:1729.
17. Xu W, Feng C, Tang W, Yang Y, Ruminant. Posttraumatic Stress Disorder Symptoms, and Posttraumatic Growth Among Wenchuan Earthquake Adult Survivors: A Developmental Perspective. *Front Public Health*. 2022;9.
18. Prayag G, Ozanne LK, Spector S. A psychological wellbeing perspective of long-term disaster recovery following the Canterbury earthquakes. *Int J Disaster Risk Reduct*. 2021;63:102438.
19. Gross JJ. The emerging field of emotion regulation: An integrative review. *Rev Gen Psychol*. 1998;2:271–99.
20. MacDonald HZ, Price JL. The role of emotion regulation in the relationship between empathy and internalizing symptoms in college students. *Mental Health and Prevention*. 2019;13:43–9.
21. Mayer JD, Roberts RD, Barsade SG. Human abilities: emotional intelligence. *Annu Rev Psychol*. 2008;59:507–36.
22. King N, Bunce L. Emotional Intelligence and Self-Determined Behaviour Reduce Psychological Distress: Interactions with Resilience in Social Work Students in the UK. *Br J Social Work*. 2019;49.
23. Brackett MA, Rivers SE, Salovey P. Emotional intelligence: Implications for personal, social, academic, and workplace success. *Soc Pers Psychol Compass*. 2011;5:88–103.
24. Tuan YF, Topophilia. *A Study of Environmental Perception, Attitudes and Values*. New Jersey:Prentice-Hall Inc. 1974;6:323–5.
25. Seamon D, Sowers J, Place, Placelessness ER. 2008. <https://doi.org/10.4135/9781446213742.n5>.
26. Canter D. Understanding, assessing, and acting in places: is an integrative framework possible? *Environment, cognition, and action*. 1991.
27. Jorgensen BS, Stedman RC, SENSE OF PLACE AS AN ATTITUDE: LAKESHORE OWNERS ATTITUDES TOWARD THEIR PROPERTIES. *J Environ Psychol*. 2001;21:233–48.
28. Proshansky HM, Fabian AK, Kaminoff R. Place-identity: Physical world socialization of the self. *J Environ Psychol*. 1983;3:57–83.
29. Giuliani MV. Theory of Attachment and Place Attachment. In M. Bonnes, T. Lee, and M. Bonaiuto, editors, *Psychological theories for environmental issues*. 2003. p. 137–70.
30. Altman I. *Place Attachment*. Springer Science & Business Media; 1992.
31. Smith JM. *A Geography of the Lifeworld: Movement, Rest and Encounter*. *Geogr Rev*. 2017;107:e55–7.
32. Campelo A. Rethinking Sense of Place: Sense of One and Sense of Many. In: Kavaratzis M, Warnaby G, Ashworth GJ, editors. *Rethinking Place Branding: Comprehensive Brand Development for Cities and Regions*. Cham: Springer International Publishing; 2015. pp. 51–60.
33. Raymond CM, Kyttä M, Stedman R. Sense of Place, Fast and Slow: The Potential Contributions of Affordance Theory to Sense of Place. *Front Psychol*. 2017;8:1674.

34. Twohig-Bennett C, Jones A. The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. *Environ Res.* 2018;166:628–37.
35. Chi X, Becker B, Yu Q, Willeit P, Jiao C, Huang L, et al. Prevalence and Psychosocial Correlates of Mental Health Outcomes Among Chinese College Students During the Coronavirus Disease (COVID-19) Pandemic. *Front Psychiatry.* 2020;11:803.
36. Tedeschi RG, Calhoun LG, Target Article. Posttraumatic Growth: Conceptual Foundations and Empirical Evidence. *Psychol Inq.* 2004;15:1–18.
37. Blom DM, Sulkers E, Post WJ, Schroevers MJ, Ranchor AV. Sub-groups (profiles) of individuals experiencing post-traumatic growth during the COVID-19 pandemic. *Front Psychol.* 2022;13.
38. Helgeson VS, Reynolds KA, Tomich PL. A meta-analytic review of benefit finding and growth. *J Consult Clin Psychol.* 2006;74:797–816.
39. Linley PA, Joseph S. Positive change following trauma and adversity: a review. *J Trauma Stress.* 2004;17:11–21.
40. Abraído-Lanza AF, Guier C, Colón RM. Psychological Thriving Among Latinas With Chronic Illness. *J Soc Issues.* 1998;54:405–24.
41. Hyun S, Wong GTF, Levy-Carrick NC, Charmaraman L, Cozier Y, Yip T, et al. Psychosocial correlates of posttraumatic growth among U.S. young adults during the COVID-19 pandemic. *Psychiatry Res.* 2021;302:114035.
42. Vishnevsky T, Cann A, Calhoun LG, Tedeschi RG, Demakis GJ. Gender Differences in Self-Reported Posttraumatic Growth: A Meta-Analysis. *Psychol Women Q.* 2010;34:110–20.
43. Forstmeier S, Kuwert P, Spitzer C, Freyberger HJ, Maercker A. Posttraumatic growth, social acknowledgment as survivors, and sense of coherence in former German child soldiers of World War II. *Am J Geriatr Psychiatry.* 2009;17:1030–9.
44. Na PJ, Tsai J, Southwick SM, Pietrzak RH. Factors associated with post-traumatic growth in response to the COVID-19 pandemic: Results from a national sample of U.S. military veterans. *Soc Sci Med.* 2021;289:114409.
45. Yıldız E. Posttraumatic growth and positive determinants in nursing students after COVID-19 alarm status: A descriptive cross-sectional study. *Perspect Psychiatr Care.* 2021;57:1876–87.
46. Cann A, Calhoun LG, Tedeschi RG, Taku K, Vishnevsky T, Triplett KN, et al. A short form of the Posttraumatic Growth Inventory. *Anxiety Stress Coping.* 2010;23:127–37.
47. Lewicka M. Place attachment: How far have we come in the last 40 years? *J Environ Psychol.* 2011;31:207–30.
48. Bratman GN, Hamilton JP, Daily GC. The impacts of nature experience on human cognitive function and mental health. *Ann N Y Acad Sci.* 2012;1249:118–36.
49. Bronfenbrenner U. *The Ecology of Human Development: Experiments by Nature and Design.* Harvard University Press; 1979.

50. Newman E, Kaloupek D. Overview of research addressing ethical dimensions of participation in traumatic stress studies: autonomy and beneficence. *J Trauma Stress*. 2009;22:595–602.
51. Lederbogen F, Kirsch P, Haddad L, Streit F, Tost H, Schuch P, et al. City living and urban upbringing affect neural social stress processing in humans. *Nature*. 2011;474:498–501.
52. Shevchenko Y, Huber N, Reips U-D. Psychological well-being during the COVID-19 pandemic: Combining a web survey with experience sampling methodology. *PLoS ONE*. 2023;18:e0282649.
53. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *The Lancet Psychiatry*. 2020;7:547–60.
54. Kobasa SC. Stressful life events, personality, and health: an inquiry into hardiness. *J Pers Soc Psychol*. 1979;37:1–11.
55. APA, Resilience. <https://www.apa.org>.2022. <https://www.apa.org/topics/resilience>. Accessed 14 Mar 2023.
56. Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. *Child Dev*. 2000;71:543–62.
57. Masten AS. Global perspectives on resilience in children and youth. *Child Dev*. 2014;85:6–20.
58. Wagnild GM, Young HM. Development and psychometric evaluation of the Resilience Scale. *J Nurs Meas*. 1993;1:165–78.
59. Masten AS. Ordinary magic. Resilience processes in development. *Am Psychol*. 2001;56:227–38.
60. Windle G. What is resilience? A review and concept analysis. *Reviews in Clinical Gerontology*. 2011;21:152–69.
61. Berman MG, Jonides J, Kaplan S. The cognitive benefits of interacting with nature. *Psychol Sci*. 2008;19:1207–12.
62. Kumpfer KL. Factors and Processes Contributing to Resilience. In: Glantz MD, Johnson JL, editors. *Resilience and Development: Positive Life Adaptations*. Boston, MA: Springer US; 2002. pp. 179–224.
63. Devine-Wright P, Howes Y. Disruption to place attachment and the protection of restorative environments: A wind energy case study. *J Environ Psychol*. 2010;30:271–80.
64. Karmanov D, Hamel R. Assessing the restorative potential of contemporary urban environment(s): Beyond the nature versus urban dichotomy. *Landsc Urban Plann*. 2008;86:115–25.
65. Jia X, Liu X, Ying L, Lin C. Longitudinal relationships between social support and posttraumatic growth among adolescent survivors of the wenchuan earthquake. *Front Psychol*. 2017;8.
66. Fredrickson BL, Tugade MM, Waugh CE, Larkin GR. What good are positive emotions in crisis? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. *J Personal Soc Psychol*. 2003;84:365–76.
67. Lades LK, Laffan K, Daly M, Delaney L. Daily emotional well-being during the COVID-19 pandemic. *Br J Health Psychol*. 2020;25:902–11.

68. Tsaousis I, Nikolaou I. Exploring the relationship of emotional intelligence with physical and psychological health functioning. *Stress and Health*. 2005;21:77–86.
69. Daniel G. *Emotional Intelligence Why it Can Matter More Than IQ*. New York: NY: Bantam Books; 1995.
70. Salovey P, Mayer JD. Emotional intelligence. *Imagination Cognition and Personality*. 1989;9:185–211.
71. OECD. Are Students Ready to Take on Environmental Challenges? | en | OECD. Are students ready to take on environmental challenges? 2022. <https://www.oecd.org/education/are-students-ready-to-take-on-environmental-challenges-8abe655c-en.htm>. Accessed 10 Apr 2023.
72. Martinsone B, Supe I, Stokenberga I, Damberga I, Cefai C, Camilleri L, et al. Social Emotional Competence, Learning Outcomes, Emotional and Behavioral Difficulties of Preschool Children: Parent and Teacher Evaluations. *Front Psychol*. 2021;12:760782.
73. Acosta P, Muller N, Sarzosa MA. *Beyond Qualifications: Returns to Cognitive and Socio-Emotional Skills in Colombia*. 2015.
74. Sánchez-Álvarez N, Extremera N, Fernández-Berrocal P. The relation between emotional intelligence and subjective well-being: A meta-analytic investigation. *J Posit Psychol*. 2016;11:276–85.
75. Wong C-S, Law KS. The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study. *Leadersh Q*. 2002;13:243–74.
76. Armstrong AR, Galligan RF, Critchley CR. Emotional intelligence and psychological resilience to negative life events. *Pers Individ Differ*. 2011;51:331–6.
77. Mayer JD, Caruso DR, Salovey P. The Ability Model of Emotional Intelligence: Principles and Updates. *Emot Rev*. 2016;8:290–300.
78. Salovey P, Sluyter D. Emotional development and emotional intelligence: Educational implications. 1997.
79. Grant AM, Curtayne L, Burton G. Executive coaching enhances goal attainment, resilience and workplace well-being: a randomised controlled study. *J Posit Psychol*. 2009;4:396–407.
80. Holt-Lunstad J. Social Relationships and Mortality Risk: A Meta-analytic Review. *PLoS Med*. 2010.
81. Domitrovich CE, Durlak JA, Staley KC, Weissberg RP. Social-Emotional Competence: An Essential Factor for Promoting Positive Adjustment and Reducing Risk in School Children. *Child Dev*. 2017;88:408–16.
82. Mancini AD, Bonanno GA, Clark AE. Stepping off the hedonic treadmill: Individual differences in response to major life events. *J Individual Differences*. 2011;32:144–52.
83. Wei M, Russell D, Zakalik R, Adult, Attachment. Social Self-Efficacy, Self-Disclosure, Loneliness, and Subsequent Depression for Freshman College Students: A Longitudinal Study. *J Couns Psychol*. 2005;52:602–14.
84. Jorgensen BS, Stedman RC. A comparative analysis of predictors of sense of place dimensions: Attachment to, dependence on, and identification with lakeshore properties. *J Environ Manage*.

- 2006;79:316–27.
85. Connor KM, Davidson JRT. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety*. 2003;18:76–82.
  86. Mantz LS, Bear GG, Yang C, Harris A. The Delaware Social-Emotional Competency Scale (DSECS-S): Evidence of Validity and Reliability. *Child Ind Res*. 2018;11:137–57.
  87. Zhou H, Long L. Statistical Remedies for Common Method Biases. *Adv Psychol Sci*. 2004;12:942.
  88. Bridgland VME, Moeck EK, Green DM, Swain TL, Nayda DM, Matson LA, et al. Why the COVID-19 pandemic is a traumatic stressor. *PLoS ONE*. 2021;16:e0240146.
  89. Albers T, Ariccio S, Weiss LA, Dessi F, Bonaiuto M. The Role of Place Attachment in Promoting Refugees' Well-Being and Resettlement: A Literature Review. *Int J Environ Res Public Health*. 2021;18:11021.
  90. Sameroff A. The transactional model of development: How children and contexts shape each other. *The Transactional Model*. 2009. <https://doi.org/10.1037/11877-000>.
  91. Greenberg M, Domitrovich C, Bumbarger B. The Prevention of Mental Disorders in School-Aged Children: Current State of the Field. *Prev Treat*. 2001;4:1a–1a.
  92. Shanahan DF, Astell-Burt T, Barber EA, Brymer E, Cox DTC, Dean J, et al. Nature-Based Interventions for Improving Health and Wellbeing: The Purpose, the People and the Outcomes. *Sports (Basel)*. 2019;7:141.
  93. Brooks S, Webster R, Smith L, Woodland L, Wessely S, Greenberg N et al. The Psychological Impact of Quarantine and How to Reduce It: Rapid Review of the Evidence. *SSRN Electron J*. 2020;395.
  94. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Res*. 2020;288:112954.
  95. Anderson K, Smith SJ, Editorial. Emotional geographies. *Trans Inst Br Geog*. 2001;26:7–10.
  96. Zheng C, Zhang J, Guo Y, Zhang Y, Qian L. Disruption and reestablishment of place attachment after large-scale disasters: The role of perceived risk, negative emotions, and coping. *Int J Disaster Risk Reduct*. 2019;40:101273.
  97. Killgore WDS, Cloonan SA, Taylor EC, Dailey NS. Loneliness: A signature mental health concern in the era of COVID-19. *Psychiatry Res*. 2020;290:113117.
  98. Ungar M, Ghazinour M, Richter J. Annual Research Review: What is resilience within the social ecology of human development? *J Child Psychol Psychiatry*. 2013;54:348–66.
  99. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res*. 2020;287:112934.
  100. Cheng J, Monroe M. Connection to Nature: Children's Affective Attitude Toward Nature. *Environment and Behavior - ENVIRON BEHAV*. 2012;44:31–49.
  101. Ma L, Ye R, Ettema D, van Lierop D. Role of the neighborhood environment in psychological resilience. *Landsc Urban Plann*. 2023;235:104761.

102. Kalisch R, Baker DG, Basten U, Boks MP, Bonanno GA, Brummelman E, et al. The resilience framework as a strategy to combat stress-related disorders. *Nat Hum Behav.* 2017;1:784–90.
103. Hegde A, Suresh S, Mitra R. Early-life short-term environmental enrichment counteracts the effects of stress on anxiety-like behavior, brain-derived neurotrophic factor and nuclear translocation of glucocorticoid receptors in the basolateral amygdala. *Sci Rep.* 2020;10:14053.
104. Weick KE. Enacted Sensemaking in Crisis Situations[1]. *J Manage Stud.* 1988;25:305–17.
105. Eyles J. *Senses of Place.* 1985.
106. Steger M. Making Meaning in Life: A Thematic Review of Successful Experimental Psychological and Psychotherapeutic Interventions. 2022. p. 5–20.
107. Park C, George L. Assessing meaning and meaning making in the context of stressful life events: Measurement tools and approaches. *J Posit Psychol.* 2013;8:483–504.
108. Park CL. Making sense of the meaning literature: an integrative review of meaning making and its effects on adjustment to stressful life events. *Psychol Bull.* 2010;136:257–301.
109. Van Tongeren DR, Van Showalter SA. Finding Meaning Amidst COVID-19: An Existential Positive Psychology Model of Suffering. *Front Psychol.* 2021;12:641747.
110. Domínguez-García E, Fernández-Berrocal P. The association between emotional intelligence and suicidal behavior: A systematic review. *Front Psychol.* 2018;9.
111. Shoshani A, Slone M. The Resilience Function of Character Strengths in the Face of War and Protracted Conflict. *Front Psychol.* 2016;6.
112. Li Y, Peng J. Does social support matter? The mediating links with coping strategy and anxiety among Chinese college students in a cross-sectional study of COVID-19 pandemic. *BMC Public Health.* 2021;21:1298.
113. Brackett MA, Salovey P. Measuring emotional intelligence with the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT). *Psicothema.* 2006;18:34–41.
114. Subhi T, Neber H, Linke S, Hava E, Zeidner M, Matthews G, et al. What We Know about Emotional Intelligence: How it Affects Learning, Work, Relationships, and Our Mental Health. *Gifted and Talented International.* 2012;27:161–6.
115. Wu Y, Li S, Yang J. Moderating Role of Perceived Social Support in the Relationship Between Emotion Regulation and Quality of Life in Chinese Ocean-Going Fishermen. *Front Psychol.* 2020;11.
116. Tariq MZ, Ali Bhatti G, Khan NA, Qadir M. Impact of Consumer Emotional Intelligence on Satisfaction With Life During the COVID-19 Pandemic. *Eur J Psychol Open.* 2021;80:125–32.
117. Siegling AB, Nielsen C, Petrides KV. Trait emotional intelligence and leadership in a European multinational company. *Pers Individ Differ.* 2014;65:65–8.
118. Jiang C, Jiang S. Influence of social participation and support on self-rated health among Chinese older adults: Mediating role of coping strategies. *Curr Psychol.* 2022. <https://doi.org/10.1007/s12144-022-02727-6>.

119. Cui Y. Relationship between Social Support and Life Satisfaction among College Students: The Mediation of Hope. *Int J Learn Teach.* 2022;;59–63.
120. Kong F, Gong X, Sajjad S, Yang K, Zhao J. How Is Emotional Intelligence Linked to Life Satisfaction? The Mediating Role of Social Support, Positive Affect and Negative Affect. *J Happiness Stud.* 2019;20:2733–45.
121. Wang C, Pan R, Wan X, Tan Y, Xu L, McIntyre RS, et al. A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain Behav Immun.* 2020;87:40–8.
122. Liu CH, Zhang E, Wong GTF, Hyun S, Hahm HC. Factors associated with depression, anxiety, and PTSD symptomatology during the COVID-19 pandemic: Clinical implications for U.S. young adult mental health. *Psychiatry Res.* 2020;290:113172.
123. Nigg JT. Annual Research Review: On the relations among self-regulation, self-control, executive functioning, effortful control, cognitive control, impulsivity, risk-taking, and inhibition for developmental psychopathology. *J Child Psychol Psychiatry.* 2017;58:361–83.
124. Ozbay F, Johnson DC, Dimoulas E, Morgan CA, Charney D, Southwick S. Social support and resilience to stress: from neurobiology to clinical practice. *Psychiatry (Edgmont).* 2007;4:35–40.
125. Alnazly E, Khraisat OM, Al-Bashaireh AM, Bryant CL. Anxiety, depression, stress, fear and social support during COVID-19 pandemic among Jordanian healthcare workers. *PLoS ONE.* 2021;16:e0247679.
126. Yip W, Ge L, Ho AHY, Heng BH, Tan WS. Building community resilience beyond COVID-19: The Singapore way. *Lancet Reg Health – Western Pac.* 2021;7.
127. Ramkissoon H. Place Affect Interventions During and After the COVID-19 Pandemic. *Front Psychol.* 2021;12.
128. King LA, Hicks JA. The Science of Meaning in Life. *Annu Rev Psychol.* 2021;72:561–84.
129. Yuen M, Lee QAY, Kam J, Lau PSY. Purpose in Life: A Brief Review of the Literature and Its Implications for School Guidance Programs. *J Psychologists Counsellors Schools.* 2017;27:55–69.
130. Schnell T, Krampe H. Meaning in Life and Self-Control Buffer Stress in Times of COVID-19: Moderating and Mediating Effects With Regard to Mental Distress. *Front Psychiatry.* 2020;11:582352.
131. Li S, Wang Y, Xue J, Zhao N, Zhu T. The Impact of COVID-19 Epidemic Declaration on Psychological Consequences: A Study on Active Weibo Users. *Int J Environ Res Public Health.* 2020;17:2032.
132. van Tilburg TG, Steinmetz S, Stolte E, van der Roest H, de Vries DH. Loneliness and Mental Health During the COVID-19 Pandemic: A Study Among Dutch Older Adults. *J Gerontol B Psychol Sci Soc Sci.* 2021;76:e249–55.
133. Kagan J, Loneliness. *Human Nature and the Need for Social Connection.* *AJP.* 2009;166:375–6.

## Figures

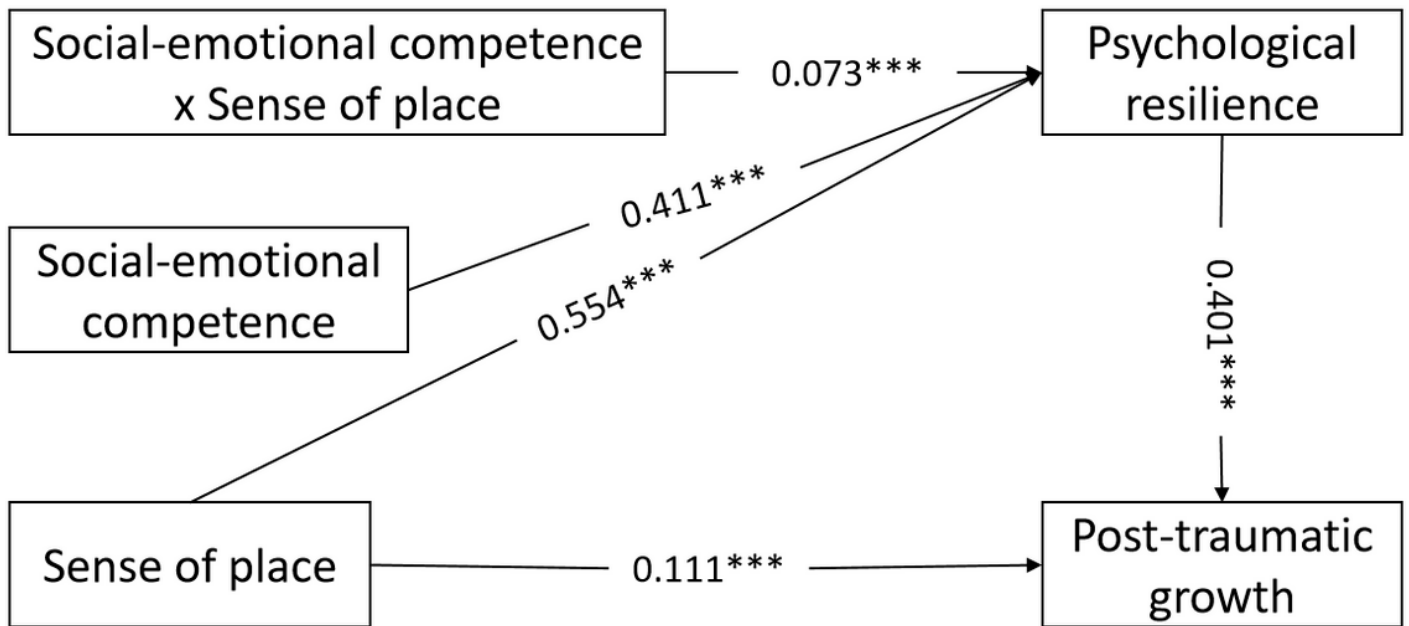


Figure 1

The study's moderated mediation model