Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Exploring posttraumatic growth after the COVID-19 pandemic

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ABSTRACT

Although it is undeniable that the COVID-19 pandemic presented new threats and traumas for human beings, posttraumatic growth that took place after the struggle with this highly challenging crisis cannot be ignored. Therefore, based on the posttraumatic growth theory, the present research focuses on aspects of tourists' positive changes after the COVID-19 outbreak. A total of 1165 potential tourists from 197 cities in 31 provinces of China were analyzed using symmetrical and asymmetrical approaches. The results of the partial least squares test revealed the net effects of social support, psychological distress, and infection risk perception on the three dimensions of tourists' posttraumatic growth, namely, travel risk aversion, social identity, and altruistic behavior. Fuzzy-set qualitative comparative analysis provided causal recipes for realizing posttraumatic growth, and necessary condition analysis supplemented the necessary antecedents. The implications of the findings and the paths for future research are also presented.

1. Introduction

The COVID-19 pandemic swept the world in 2020, causing more than 200 million infections and millions of deaths (WHO, 2021), as well as severely affecting social stability and economic development. Because of the threat of death, fear of infection, restrictions on travel, and pressure of overwhelming media coverage, the general public has had negative psychological reactions, such as depression, anxiety, and sadness (Wang et al., 2020). Many researchers believe that the COVID-19 pandemic has become an ongoing, chronic collective trauma event (Holman & Grisham, 2020; Masiero et al., 2020). However, it is fortunate that early human literary works and religious thoughts have long revealed that suffering and disasters can lead to positive personal or social change (Tedeschi & Calhoun, 1995; Tedeschi et al., 2018). Tedeschi and Calhoun (1996) proposed the term posttraumatic growth (PTG) to define the positive psychological changes experienced as a result of struggling with trauma or extremely challenging circumstances. Because PTG explains an extremely challenging crisis from a positive perspective, it provides important insights for understanding and coping with the trauma of COVID-19 (Hyun et al., 2021; Waters et al., 2021).

The COVID-19 outbreak reduced the visits of international tourists by 74% in 2020, and travel and tourism have been some of the most severely affected sectors (UNWTO, 2021). The outbreak has also caused the mobility and aggregation of tourists to be extremely challenging in terms of social distancing and epidemic control (Yin et al., 2021). In view of the importance of tourists to the prevention and control of the epidemic and the tourism industry, it is necessary to help tourists cope with the collective trauma of COVID-19, discover positive psychological experiences that they have gained from the pandemic, and promote their healthy behaviors as they live with the pandemic (Miao et al., 2021). According to Tedeschi and Calhoun (1996), PTG research can deepen individuals' understanding of traumatic events, improve their mental health, and help them draw strength from adversity so that they can face an uncertain future more intelligently. Therefore, this study aims to explore the PTG of tourists and its influencing factors during the COVID-19 pandemic.

Tedeschi and Calhoun (1996) pointed out when developing the PTG inventory (PTGI) that individuals experiencing traumatic events may obtain positive changes in five aspects: the possibility of cultivating new interests and habits, more meaningful interpersonal relationships, a greater cherishing of and appreciation of life, a stronger awareness of personal abilities, and a richer spiritual life (Tedeschi & Calhoun, 2004). Although the five dimensions of PTGI have an extensive influence, there is no consensus on the dimensional structure of PTG (Exenberger et al., 2021; Harvey & Berndt, 2020; Heidarzadeh et al., 2018). Many studies have shown that different cultural backgrounds and types of traumatic events can lead to different domains of PTG (Capielo et al., 2020; Kashyap & Hussain, 2018). For example, Exenberger et al. (2021) believe that individualistic measurements such as PTGI are not sufficient to test the growth dimensions in non-Western cultures. Their research in

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Sierra Leone showed that in addition to individual positive changes, collective growth could also be observed. Therefore, in a broad sense, PTG is a series of benefits that result from a complex combination of cognitive, emotional, and social processes after individuals struggle with traumatic events (Tedeschi & Blevins, 2015; Tedeschi et al., 2018).

Compared with traumatic events such as personal illnesses, accidents, and natural disasters, the COVID-19 pandemic has its own unique characteristics (Holman & Grisham, 2020). For example, the COVID-19 epidemic is not restricted by geography and it involves strict quarantine and isolation measures, which are due to the continuing life-threatening risk from the disease (Abdullah, 2020; Holman & Grisham, 2020). This study was conducted in China, which is regarded as a collectivist society that pays more attention to interdependence and interconnection than some other societies (Triandis, 2001). As mentioned above, individuals with different social and cultural backgrounds will have new or specific growth aspects after fighting against the COVID-19 traumatic event (Arnout & Al-Sufyani, 2021; Sun et al., 2021). Therefore, this research focuses on exploring the positive growth of tourists at personal, interpersonal, and social levels after experiencing the trauma of COVID-19, and it tests the factors that influenced tourists' positive changes.

To achieve the goals of our study, we conducted a questionnaire survey of 1165 potential tourists from 197 cities in China, and we used regression analysis, configuration analysis, and necessary condition analysis (NCA) to investigate the influence mechanism of tourists' PTG. The next section is a review of the related literature and introduces the conceptual framework and background of this study. The research methods and procedures are presented in the third part and the findings in the fourth part. The last section summarizes the theoretical and practical implications and also looks forward to future research.

2. Theoretical background and research model

2.1. COVID-19 collective trauma and tourists' PTG

Collective trauma is a group-level cataclysmic event that strikes at the basic fabric of society (Hirschberger, 2018). In the COVID-19 pandemic, individuals have faced multiple traumas, such as unemployment, isolation, and death, and the entire society has suffered from economic recession and a loss of population and resources (Barbosa et al., 2021; Stanley et al., 2021). It is indisputable that the COVID-19 pandemic has become a collective trauma (Holman & Grisham, 2020; Masiero et al., 2020). However, even in such an environment, positive changes can still be observed. As stated by Tedeschi et al. (2018), traumas and disasters are catalysts for individuals to re-understand themselves and rebuild their philosophies of life, and they are also opportunities for achieving positive social and cultural changes. Individuals who have experienced collective trauma may not only perceive personal growth but may also feel greater group strengths and social benefits, which are embodied in collective emotions, values, and social behaviors (Wlodarczyk et al., 2017). Therefore, researchers have begun to call for attention to PTG and have adopted an alternative approach to find ways that may be beneficial for everyone to cope with the pandemic trauma (Hyun et al., 2021; Miao et al., 2021; Prieto-Ursúa & Jódar, 2020).

In the context of tourism, the psychological response of tourists during COVID-19 has received increased attention. In particular, a large number of studies have focused on the impact of risk perception on tourists' psychology and behavior (Yang et al., 2021). However, little attention has been paid to travel risk aversion, which is a positive way for tourists to deal with risks based on health and self-protection when facing the threat of disease (Neuberg et al., 2011). Previous studies has shown that when facing the challenges of life-threatening diseases, the acquisition of an increased awareness of the importance of health or positive changes in health behaviors are all domains of people's PTG (Sun et al., 2021; Tedeschi et al., 2018). During the COVID-19 pandemic, as a health protection factor, travel risk aversion not only enabled tourists to plan and arrange tourism activities more rationally but also was a factor in the well-being of society (Cerami et al., 2021; Petrocchi et al., 2021). In this sense, tourism risk aversion was a positive change experienced by tourists after struggling with the collective trauma of COVID-19; it helped them to avoid travel-related health risks or reduce the negative impact of risks. When considering PTG at the individual level, this study focused on two aspects of travel risk aversion, pre-control and post-remediation, mainly in terms of health and risk concerns, the purchasing of insurance, and the selection of a destination.

Although traumatic events may threaten individual goals and beliefs and even destroy a person's original worldview, they are also conducive to the reconstruction of the meaning of life and the rebuilding of a life philosophy, as well as to the improvement of interpersonal relationships (Tedeschi et al., 2018; Tedeschi & Calhoun, 1996, 2004). Staub and Vollhardt (2008) have discussed the phenomenon of "altruism born of suffering," and they believed that trauma can promote the development of altruistic behavior. Moreover, some researchers believe that people who have suffered from adverse life events would be likely to develop inclusive altruism (Vollhardt & Staub, 2011). Harvey and Berndt (2020) have shown that altruistic expansion is one of the dimensions of PTG perceived by cancer caregivers. According to Capielo Rosario et al. (2020), PTG obtained by individuals who experienced Hurricane María included active support of others. Similar findings can be found in COVID-19 pandemic research. For example, the study of PTG experience of COVID-19 confirmed cases in China found that they were more willing to help others than before (Sun et al., 2021). In view of the important role of altruistic behavior in enhancing individual social responsibility and improving people's social relationships (Vollhardt & Staub, 2011), this study believes that altruistic behavior is the PTG experienced by tourists at the level of interpersonal relationships.

Common traumas and challenges affect groups through a social narrative and produce beneficial results for the state and society, such as boosting morale and triggering social change (Tedeschi & Calhoun, 2004; Tedeschi et al., 2018). Vázquez et al. (2008) found from the study of the collective trauma of terrorism that people could experience PTG at the social level in such ways as increased national cohesion, increased patriotism, and greater confidence in government decisions. This is similar to the findings of Capielo Rosario et al. (2020), who believed that collective trauma strengthens the national identity. Common traumatic memories and emotional expressions are conducive to improving a collective cohesion and strengthening the social identity (Wlodarczyk et al., 2017). Likewise, Sibley et al. (2020) indicated that the country's rapid and positive response to the trauma of COVID-19 may have increased citizens' sense of belonging and trust in the government, as well as their patriotism. In addition, a collective and social identity contributed to an increase in people's safe normative behavior and compliance with guiding policies, thereby effectively preventing and controlling the pandemic (Cruwys et al., 2020). Therefore, in this study, social identity, as the PTG perceived by tourists at the social level, has played an irreplaceable role in the coping with collective trauma during the pandemic.

2.2. Factors influencing PTG

A quick literature review shows that the factors influencing PTG have received increased attention in recent years. One especially notable finding was that growth can result from fighting against challenging adversity not directly caused by trauma (Tedeschi, 1999). According to Tedeschi and Calhoun (2004), there are many factors that may influence the appearance of PTG in an individual. In general, the predictors of potential PTG can be divided into two categories (Linley & Joseph, 2004): one is individual factors, including demographic characteristics, religious beliefs, cognition, psychological distress, and coping styles (Prieto-Ursúa & Jódar, 2020), and the other is external environmental factors, such as types of trauma events, social support, and social relations (Hamam et al., 2021). In particular, social support is considered

to be one of the most important predictors of PTG (Tedeschi & Calhoun, 2004).

In the collective trauma of COVID-19, worries about contracting infectious diseases became an important source of trauma (Lahav, 2020). Infection risk perception affected the cognitive processing and coping strategies of individuals after the outbreak (Prieto-Ursúa & Jódar, 2020). During the COVID-19 pandemic, the public generally lived under the shadow of disease, threat, suffering, and death, and these prompted scholars to study the negative psychological conditions caused by the epidemic (Wang et al., 2020). However, psychological distress factors such as anxiety and depression may be having a positive impact on the individual's PTG during the pandemic, but they have not received enough attention. Therefore, this study mainly explores the impact of social support, infection risk perception, psychological distress, and demographic characteristics on tourists' PTG.

2.2.1. The impact of social support on PTG

Social support refers to the experience or perception of an individual as being loved, cared for, respected, and valued by others (Wills, 1991); it may come from a person's family, community, friends, colleagues, or teachers or even strangers (Zimet et al., 1988). Because social support can provide tangible material support, intangible emotional, and information support to people experiencing pressure or adversity in life, it is considered to be an important influence on PTG, and this has been confirmed by many studies (Tedeschi & Calhoun, 1996, 2004; Tedeschi et al., 2018; Zimet et al., 1988). Research by Jaspal and Breakwell (2021) showed that social support is an important prerequisite for preventive activities such as risk aversion based on health protection. Perceiving care and social support from others in traumatic life experiences can promote individual altruism and helping behavior (Harvey & Berndt, 2020). In addition, social support from families and communities plays an important role in promoting the PTG of individuals at the social level, such as social identity and national unity (Capielo Rosario et al., 2020; Macias, LeBrón, Taylor, & Silva, 2020).

There is no doubt that social support has multiple dimensions (Zimet et al., 1988). The current research was conducted in China, which was the first country to report the COVID-19 epidemic. The Chinese government adopted a series of measures (including testing, quarantining, and community containment) to curb the development of the epidemic, and this achieved positive results (Wilder-Smith & Freedman, 2020). Support from the public, such as donations from social groups and active assistance from medical team members from all over the country, improved people's identity and sense of belonging (Sibley et al., 2020). In addition, media reports were helpful in increasing the awareness of epidemics and mastering protection methods, thereby changing people's psychology and behavior (Bhati et al., 2020). Previous studies have shown that people had more quality time with their families during the COVID-19 lockdown (Williams et al., 2021). In this sense, the support and company of family and friends could effectively relieve anxiety and other negative emotions and affect the PTG of tourists. Therefore, the social support in this study includes five dimensions: government support, public support, official media support, social media support, and family and friends support. These five dimensions are assessed in this study because of their extensive relationships with the material support, information support, and psychological support perceived by tourists.

2.2.2. The impact of infection risk perception on PTG

The type of traumatic event has an important influence on PTG (Tedeschi et al., 2018). Infectivity is a significant feature of COVID-19; it is the basis for implementing epidemic prevention policies such as social distancing and isolation and the root cause of the COVID-19 pandemic as a collective trauma event (Holman & Grisham, 2020; Masiero et al., 2020). The assessment of infection risk has affected the psychology and behavior of individuals during the COVID-19 pandemic (Prieto-Ursúa & Jódar, 2020). Bruine de Bruin and Bennett (2020) have shown that individuals with a higher perception of infection risk were more likely to implement health-based protection behaviors. Similarly, tourists' concern about infection affected their travel risk aversion and cautious travel behavior (Zheng et al., 2021). Moreover, the perception of infection risk affected individual altruism, social responsibility, and patriotism (Petrocchi et al., 2021; Sibley et al., 2020). Therefore, because infection is a unique feature of infectious diseases, this study explored the impact of infection risk perception on tourists' PTG.

2.2.3. The impact of psychological distress on PTG

Psychological distress refers to the unique uncomfortable, emotional state experienced by an individual when coping with a specific stressor or needs (Ridner, 2004). Although the relationship between psychological distress and PTG has been widely addressed by scholars, the research results have been mixed (Tedeschi & Calhoun, 2004). Some scholars believe that psychological distress factors have a negative effect or no effect on PTG. For example, Chaitin and Steinberg (2008) proposed that if people are under constant threats, they might be absorbed by their own psychological distress and, therefore, they might be unable to detect or sympathize with the pain of others and will not exhibit altruistic behavior. Linley and Joseph (2004) pointed out that psychological distress such as anxiety has a negative impact on PTG. In addition, Helgeson et al. (2006) suggested that anxiety and distress were not directly related to PTG.

However, on the basis of a literature review, Ridner (2004) proposed that individual PTG is a positive result of psychological distress. Vollhardt and Staub (2011) found that people who have experienced pain and psychological distress show more pro-social behaviors and altruistic attitudes. Research by Chen et al. (2021) showed that forms of psychological distress such as anxiety, anger, and sadness not only positively promote altruism, but also can lead to greater unity and social identity in a country. The common psychological distress felt following a collective trauma can also result in the rise of patriotism and the enhancement of national cohesion (Vázquez et al., 2008). In addition, Miao et al. (2021) believed that the anxiety, fear, and other forms of psychological distress caused by COVID-19 would further promote tourists' self-protection–based travel risk avoidance. During the COVID-19 pandemic, negative types of psychological distress such as anxiety, depression, irritability, and somatization have been common in the general population (Hamam et al., 2021). Therefore, in view of the inconsistency in the relationship between psychological distress variables and PTG, we conducted a survey to examine the impact of anxiety, depression and irritability, and somatization caused by COVID-19 on tourists' PTG.

2.2.4. The impact of demographic characteristics on PTG

Demographic characteristics are important factors that affect people's reactions to traumatic events, and they may explain why some individuals experiencing adversity develop PTG, but others do not make positive changes (Linley & Joseph, 2004). Tedeschi and Calhoun (1996) revealed that women's scores for PTG were higher than men's, especially in the dimensions of perceived spiritual and interpersonal changes. It seems that the younger the age, the higher the level of PTG. For instance, Williams et al. (2021) suggested that during the COVID-19 epidemic, the growth reported by persons over the age of 65 was much less than that of persons who were 18–24 years of age. In addition, persons who were married and had higher incomes were thought to have higher levels of growth (Mitchell et al., 2013). Finally, it is very interesting to find that a lower level of education was related to PTG, but more empirical research is needed on this factor (Bellizzi & Blank, 2006).

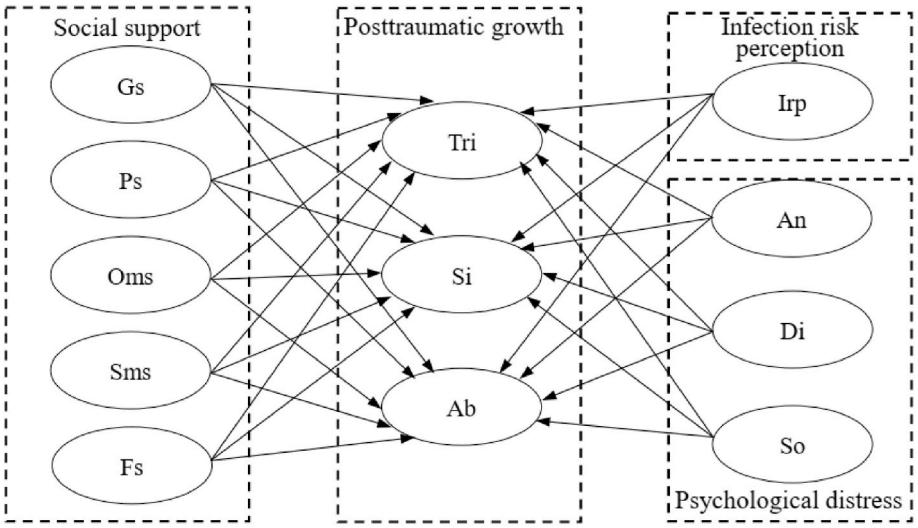
2.3. Complexity theory and research model

PTG is a complicated phenomenon (Tedeschi & Calhoun, 1996). It is not a direct result of trauma, but an adaptive growth response involving personal cognition, emotion, and behavior (Tedeschi & Calhoun, 1995;

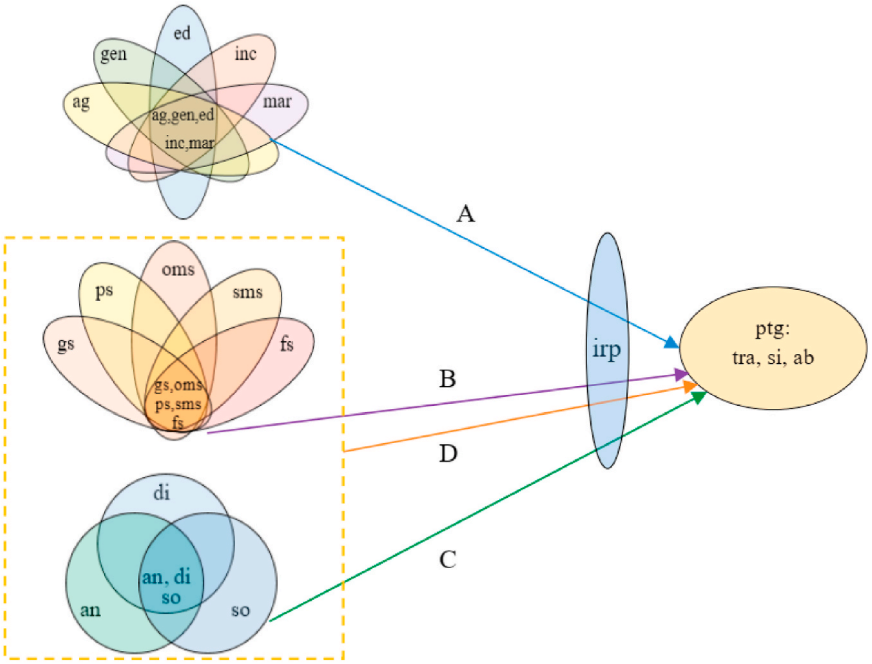
Tedeschi et al., 2018). Tedeschi and Calhoun (2004) assumed that various factors from different domains interacted, influenced each other, and had complex effects on PTG. However, the linear method based on symmetry does not seem to fully explain the complexity and interaction between influencing factors (Ragin, 2008; Woodside, 2017). Therefore, some scholars suggested that higher-order models that allow for the existence of paradoxes should be used to explore PTG (Tedeschi & Calhoun, 2004).

On the other hand, there is a lack of research on tourists' PTG in the context of the COVID-19 pandemic. New contexts like this study might cause changes in the magnitude and direction of the relationship between variables in the literature, leading to new relationships between variables. Consequently, this study attempts to introduce complexity theory to explore and understand the influencing factors of tourists' PTG after the COVID-19 pandemic. Complexity theory, which can explain complex causal relationships affected by various causal conditions (Woodside, 2017), has been used in tourism and hotel research. Underpinned by the complexity theory, the positive or negative effect of each factor in predicting a particular outcome is not invariable but is related to other influencing factors (Olya et al., 2017). For example, some studies show that psychological distress has a negative impact on PTG, while others suggest a positive impact (Linley & Joseph, 2004; Ridner, 2004). This is because the positive or negative impact of psychological distress on PTG can be determined by other causal conditions (such as social support).

In addition, the equifinality principle of complexity theory assumes that expected results can be achieved through different combinations of antecedent conditions (Woodside, 2014). In other words, a combination



(A) Net effect model



(B) Configurational model

Fig. 1. Conceptual framework. Note: ptg = posttraumatic growth; tra = travel risk aversion; si = social identity; ab = altruistic behavior; irp = infection risk perception; mar = marital status; inc = income; ed = education; gen = gender; ag = age; gs = government support; ps = public support; oms = official media support; sms = social media support; fs = family and friends support; an = anxiety; di = depression and irritability; so = somatization.

of antecedent conditions is sufficient for the result, but not necessary (Woodside, 2017). Therefore, in order to estimate the net effect of each antecedent on PTG and understand in detail the optimal combination of ingredients that would achieve PTG, this study proposes two complementary research models (Olya et al., 2017). Fig. 1(A) shows the net effect model, and Fig. 1(B) shows the configuration model. As shown in Fig. 1(B), the combination of demographic factors and infection risk perception is indicated by arrow A, which is used to explore the causal model that leads to PTG. Arrow B suggests the complex configuration from social support and infection risk perception in predicting PTG, and the combination of psychological distress and infection risk perception is indicated by arrow C. The causal recipes from the combination of social support, psychological distress, and infection risk perception is also investigated, as represented by arrow D.

3. Methodology

3.1. Measurement

The scale items of infection risk perception, social support, psychological distress, and PTG were all adapted from previous studies to fit the context of the pandemic in this study. Three items were adapted from the study by Leppin and Aro (2009) to measure tourists' perceptions of infection risk after the COVID-19 outbreak. According to the multidimensional scale of perceived social support and the research on social media (Veil et al., 2011; Zimet et al., 1988), 19 items were used to measure the 5 dimensions of social support. Sixteen items from the SCL-90 scale (Derogatis & Cleary, 1977) and SAS scale (Zung, 1971) were extracted to measure anxiety, somatization, depression, and irritability. Social identity was measured by three items adapted from the work of Phinney and Ong (2007). Using four items from Carlo and Randall (2002), altruistic behavior was measured. Based on the risk aversion theory (Nugraha et al., 2016) and the protection motivation theory, five items were designed to test travel risk aversion. The five-point Likert scale was used to evaluate each question (more details on this can be found in Appendix Table A). The items for measuring the demographic characteristics of tourists are presented in the second part of the questionnaire.

3.2. Data and procedure

A pilot study with 32 graduate students majoring in tourism management was conducted to test the comprehensibility and clarity of the scale. Subsequently, some questions were adjusted according to the feedback of the pre-investigation to avoid misinterpretation. In order to minimize the interactions between people, the first-level public health emergency response was implemented in 31 provinces of China by January 29, 2020 (China News, 2020). Considering that most people were in a state of self-isolation, anonymous online questionnaires were distributed to potential tourists in China on the popular social networking platforms WeChat and Sina Weibo. Data collection spanned 3 weeks beginning on February 19, 2020, or almost a month after the COVID-19 outbreak began in China, and it ended on March 10. Non-probability snowball sampling was used in this cross-sectional observation. All respondents voluntarily participated in and signed the informed consent survey.

The initial sample consisted of 1288 participants from 197 cities in 31 provinces across the country, and finally 1165 samples (90.5%) were obtained after excluding invalid questionnaires. In addition, this study used procedural and statistical methods (Podsakoff et al., 2003) to control the common method bias. In terms of procedure, the study ensured the anonymity of all participants, reminded them to answer according to the actual situation, and emphasized that all results would only be used for academic research. To consider the statistical remedy, Harman's single factor test was performed, and the result suggested that no single factor accounted for more than 40% of the variance. As such, the common method bias was not worthy of attention in this study.

The majority of respondents were female (69.6%). Fourteen respondents were younger than 18 years of age (1.2%). The largest group was between 18 and 25 years of age (55.5%), followed by 349 respondents aged 26–40 years (30.0%), 93 respondents aged 41–50 years (8%), and 62 respondents aged 51 years or older (5.3%). In terms of marital status, unmarried respondents accounted for the majority (69.9%); 351 respondents were married (30.1%). Among the 1165 respondents, 764 (65.6%) had a bachelor's degree, 346 (29.7%) had a graduate degree or above, and only 55 (4.7%) had a secondary level of education at most. Finally, there were 626 respondents (53.7%) with a basic monthly income of less than 2500 RMB, 2500 to 6000 RMB (18.3%), 6000 to 10,000 RMB (15.7%), 10,000 to 20,000 RMB (8.9%), and over 20,000 RMB (3.4%).

3.3. Analytical approaches

The analysis was developed in four stages. First, a series of strict reliability and validity tests were performed to check the suitability of scale. Since it was the first time that the PTG of tourists during the COVID-19 pandemic was studies, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to evaluate the fitness and validity of the scale. Second, because PLS-SEM is particularly suitable for analyzing complex path models and has excellent predictive capabilities (Urbach & Ahlemann, 2010), the software SmartPLS 3.2.8 was used to investigate the prediction factors of three dimensions of tourists' PTG. The PLS-SEM results informed the net effect of social support, infection risk perception, and psychological distress on the model outcomes.

Third, fuzzy-set qualitative comparative analysis (fsQCA) was used to explore the best combination of demographic, social support, psychological distress, and infection risk perception to predict tourists' PTG. As a link between quantitative and qualitative methods, fsQCA overcomes the shortcomings of data normality and multiple collinearity in symmetry analysis (Ragin, 2008). Fourth, although sufficient factors and optimal combination recipes have been revealed through regression analysis and fsQCA, the exploration of necessary antecedents seemed appropriate. Because a certain predictor may not be sufficient but is necessary to achieve the result (Olya et al., 2017), an analysis of the necessary conditions for the tourists' PTG was performed. Therefore, in this study, the fsQCA analysis supplements the PLS-SEM results by identifying the configurations of various antecedents and necessary conditions that are sufficient for achieving a high level of PTG.

4. Results and discussion

4.1. Reliability and validity

We conducted an EFA to test the scale composition of the items; one item from the category of psychological distress (labeled M1) was deleted due to high cross-loading in two factors, and the remaining items were loaded under their respective components (Hair et al., 2009, p. 89). Table 1 shows that the Cronbach's alpha and composite reliability values of these 11 constructs all exceeded the threshold value of 0.7, which demonstrates that the research measures were reliable (Anderson & Gerbing, 1988). The CFA results suggested that all items were adequately and significantly loaded under the construct specified by EFA (standardized factor loading [SFL] > 0.5, $p < .001$). In addition, all of the average variance extracted (AVE) values ranged from 0.6 to 0.8, exceeding the cut-off level of 0.5, revealing good convergent validity (Hair et al., 2009, p. 605). We adopted the suggestion of judging whether the AVE was greater than the square of the correlation between the constructs to test the discrimination validity (Fornell & Larcker, 1981). As shown in Table 1, the average shared squared variance (ASV) and the maximum shared squared variance (MSV) were smaller than the corresponding AVE value. Hence, these results confirmed the reliability

Table 1
Results of reliability and validity.

	SFL	α	CR	AVE	MSV	ASV		SFL	α	CR	AVE	MSV	ASV
Irp		.763	.875	.701	.065	.037	P4	.748					
Irp1	.873						P5	.904					
Irp2	.767						P6	.858					
Irp3	.868						**Di**		.928	.942	.729	.500	.083
Gs		.814	.889	.727	.360	.138	P7	.787					
gs1	.837						P8	.813					
gs2	.871						P9	.881					
gs3	.850						P10	.903					
Oms		.875	.918	.738	.415	.153	P11	.880					
Oms1	.816						P12	.854					
Oms2	.852						**So**		.909	.938	.792	.500	.070
Oms3	.879						P13	.802					
Oms4	.887						P14	.914					
Sms		.899	.930	.770	.415	.114	P15	.927					
Sms1	.846						P16	.912					
Sms2	.883						**Si**		.870	.921	.795	.360	.156
Sms3	.894						Si1	.889					
Sms4	.886						Si2	.894					
Ps		.831	.889	.667	.364	.152	Si3	.892					
Ps1	.813						**Ab**		.843	.897	.685	.304	.095
Ps2	.859						Ab1	.783					
Ps3	.830						Ab2	.869					
Ps4	.761						Ab3	.881					
Fs		.882	.921	.746	.168	.105	Ab4	.772					
Fs1	.823						**Tra**		.859	.903	.653	.304	.097
Fs2	.868						Tra1	.840					
Fs3	.858						Tra2	.854					
Fs4	.903						Tra3	.801					
An		.869	.898	.639	.328	.071	Tra4	.728					
P2	.761						Tra5	.810					
P3	.708												

Note: Irp = infection risk perception; Gs = government support; Ps = public support; Oms = official media support; Sms = social media support; Fs = family and friends support; An = anxiety; Di = depression and irritability; So = somatization; Tra = travel risk aversion; Si = social identity; Ab = altruistic behavior; α = Cronbach's alpha; CR = composite reliability.

and validity of the scale.

4.2. Sufficient antecedents

The results of PLS-SEM , which show sufficient antecedents of PTG, as presented in Table 2. It was especially notable to see that the essential criteria for evaluating the PLS structural equation model were the R^2 of each endogenous latent variable, the standardized root mean square residual (SRMR), the predictive correlation indicator Q^2, and the goodness of fit (GoF) (Urbach & Ahlemann, 2010). The R^2 values of the three endogenous variables of social identity, altruistic behavior, and travel risk aversion were 0.482, 0.265, and 0.257, respectively, all of which exceeded 0.190 (Stone, 1974). The Q^2 values obtained by the blindfolding procedure were all greater than zero, indicating a high predictive correlation. Also, as displayed in Table 2, the SRMR was 0.057 and the GoF value was 0.490, values that were superior to the acceptable levels of 0.08 and 0.360, respectively (Hu & Bentler, 1999; Wetzels et al., 2009). Finally, there were no multicollinearity problems supported by all of the variance inflation factors (VIFs) of less than 5 (Hair et al., 2009, p. 200).

Table 2
Results of PLS.

	Outcome	Path coefficient	SD	T-value	P		Outcome	Path coefficient	SD	T-value	P
Irp	Tra	.071	.033	2.164	.030	An	Tra	.157	.033	4.758	.000
	Si	.099	.026	3.794	.000		Si	−.005	.029	.163	.870
	Ab	.035	.032	1.072	.284		Ab	.066	.036	1.859	.063
Gs	Tra	.026	.042	.607	.544	Di	Tra	.039	.040	.982	.326
	Si	.181	.036	5.053	.000		Si	−.021	.035	.595	.552
	Ab	−.041	.044	.937	.349		Ab	.009	.051	.177	.859
Ps	Tra	.198	.044	4.498	.000	So	Tra	−.081	.035	2.283	.022
	Si	.205	.037	5.533	.000		Si	.008	.034	.233	.815
	Ab	.258	.042	6.077	.000		Ab	−.066	.046	1.418	.156
Oms	Tra	−.021	.045	.453	.651						
	Si	.350	.046	7.555	.000				R^2	Q^2	
	Ab	.086	.047	1.844	.065				Si	.482	.356
Sms	Tra	.067	.040	1.675	.094				Ab	.265	.166
	Si	−.009	.038	.246	.806				Tra	.257	.155
	Ab	.060	.041	1.463	.144	VIF<5					
Fs	Tra	.271	.034	7.896	.000	SRMR:.057					
	Si	.087	.030	2.880	.004	GOF:.490					
	Ab	.246	.038	6.450	.000						

Note: Irp = infection risk perception; Gs = government support; Ps = public support; Oms = official media support; Sms = social media support; Fs = family and friends support; An = anxiety; Di = depression and irritability; So = somatization; Tra = travel risk aversion; Si = social identity; Ab = altruistic behavior; VIF = variance inflation factors; SRMR = standardized root mean square residual; GOF = goodness of fit.

PLS-SEM analysis showed that the perception of infection risk was positively correlated with the two dimensions of tourists' PTG, but the coefficient value was relatively small. In addition, the impact of infection risk perception on altruistic behavior was not significant ($\beta = 0.035$, $p > .05$). In terms of social support, public support and support from family and friends had a significant positive impact on the three dimensions of tourists' PTG. However, government support ($\beta = 0.181$, $p < .001$) and official media support ($\beta = 0.350$, $p < .001$) positively promoted only social identity. Moreover, social media support was not deemed a contributor to the development of PTG. Regarding the independent influence of psychological distress on PTG, it appears that anxiety was positively related to travel risk aversion ($\beta = 0.157$, $p < .001$). It was worth noting that somatization, anxiety and depression were not associated with tourists' PTG. Next, configurational modeling was adopted to make up for the shortcomings in the PLS-SEM, such as the linear associations of links and the ignoring of contrarian cases (Ragin, 2008). Demographic characteristics were introduced to help explain the nature of tourists' PTG as affected by complex factors during the pandemic.

4.3. Assessment of configurational models

4.3.1. Cross-tabulation analyses

Cross-tabulation analysis was used to prove the asymmetrical relationship between PTG and its antecedents. For example, Table 3 shows the heterogeneity of anxiety in predicting PTG. According to the results, 815 respondents with low anxiety reported a positive outcome, and this is similar to Linley and Joseph's (2004) statement that anxiety was a negatively predictor of PTG. However, 231 (19.8%) respondents were very anxious, and 59 (5.0%) respondents had extreme anxiety but still exhibited a high PTG. Therefore, the impact of anxiety on PTG was complex, and the positive and significant effects should not be ignored (Tedeschi & Calhoun, 2004).

4.3.2. Data calibration and construct truth table

Before causal configuration analysis is done, data calibration and truth tabulation are conducted (Ragin, 2008). As the first important step of fsQCA analysis, data calibration refers to the process of transforming all causal conditions and outcomes into fuzzy-set scores. The purpose is to calibrate the clarity crisp-set data to a score of 0–1 according to the degree of membership through the three qualitative anchors of full non-membership, crossover point, and full membership. Following Ragin's (2008) suggestion, this study converted 1, 3, and 5 in the five-point Likert scale into full non-membership (0), crossover point (0.5), and full membership (1), respectively. The binary variables were directly calibrated as full non-membership (0.05) and full membership (0.95). For other characteristic variables, the maximum, intermediate, and minimum values were used as qualitative anchor points. After data calibration, Boolean algebra was used to calculate the sufficient and consistent causal combination conditions of the model results. In this study, the frequency was set at 4 and the consistency threshold was set at 0.8 to further filter the configuration recipe, that is, to construct a truth table (Olya & Han, 2019).

4.3.3. Sufficient configurations

The results of the configurational model for predicting a high PTG are presented in Table 4. Intermediate solutions that struck a balance between parsimony and complexity were preferred in this study (Ragin, 2008, p. 156). As shown, three sufficient causal models were obtained to describe the combinations of demographics and infection risk perception configuration leading to high PTG (coverage = 0.728, consistency = 0.984). Model 1 shows that when tourists were young, unmarried, had a low income, and had a high perception of infection risk, PTG scores were higher. Model 2 indicates that tourists who were married, older, less educated, had a low income, and had a high infection risk perception expressed a higher PTG. Alternatively, according to model 3, tourists who were older, married, educated, rich, and had a high infection risk perception were more likely to have higher PTG scores. Based on the results, it appears that a high PTG was not associated with gender.

With respect to the combination of social support and infection risk perception, five causal recipes explained tourists' PTG (coverage = 0.903, consistency = 0.987). The first model suggests that a combination of high government support, public support, official media support, and

Table 3
Results of cross-tabulation analyses of PTG with anxiety.

Anxiety		PTG					
Cramer's V= .122, *P*< .01		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Not at all	Count	0	0	3	44	31	78
	% of total	0.0%	0.0%	3.8%	56.4%	39.7%	100.0%
Slightly	Count	1	1	22	255	95	374
	% of total	.3%	.3%	5.9%	68.2%	25.4%	100.0%
Moderately	Count	0	0	23	277	113	413
	% of total	0.0%	0.0%	5.6%	67.1%	27.4%	100.0%
very	Count	0	0	6	153	78	237
	% of total	0.0%	0.0%	2.5%	64.6%	32.9%	100.0%
Extremely	Count	0	0	4	14	45	63
	% of total	0.0%	0.0%	6.3%	22.2%	71.4%	100.0%
	Count	1	1	58	743	362	1165
	% of total	.1%	.1%	5.0%	63.8%	31.1%	100.0%

Contrarian cases (290 cases=24.9%), indicating A → O

Table 4
Recipes formulating a high PTG.

	Raw coverage	Unique coverage	Consistency
Model A: ptg = f (inc, ed, ag, mar, gen, irp)			
M1. ~mar*~ag*~inc*irp	.572	.513	.983
M2. mar*ag*~ed*~inc*irp	.131	.037	.997
M3. mar*ag*ed*inc*irp	.177	.084	.994
solution coverage: .728			
solution consistency: .984			
Model B: ptg = f (ps, gs, oms, sms, fs, irp)			
M1. gs*ps*oms*fs	.818	.036	.993
M2. gs*ps*fs*irp	.834	.053	.992
M3. gs*ps*oms*sms*irp	.749	.011	.995
M4. gs*oms*sms*fs*irp	.750	.012	.995
M5. ps*oms*sms*fs*irp	.748	.010	.996
solution coverage:.903			
solution consistency:.987			
Model C: ptg = f (an, di, so, irp)			
M1. ~so*irp	.821	.022	.976
M2. ~di*irp	.792	.015	.980
M3. an*irp	.528	.049	.991
M4. ~an*~di*~so	.602	.027	.980
solution coverage: .927			
solution consistency: .967			
Model D: ptg = f (gs, ps, oms, sms, fs, an, di, so, irp)			
M1. gs*ps*oms*fs*~an*~di*~so	.546	.019	.997
M2. gs*ps*fs*~an*~di*~so*irp	.549	.009	.997
M3. gs*ps*sms*fs*~di*~so*irp	.662	.006	.997
M4. gs*ps*oms*sms*fs*~so*irp	.678	.009	.997
M5. gs*ps*oms*sms*fs*~di*irp	.660	.006	.997
M6. gs*ps*oms*sms*fs*an*irp	.467	.034	.999
M7. gs*oms*sms*fs*~an*~di*~so*irp	.508	.005	.998
solution coverage: .806			
solution consistency: .995			

Note: irp = infection risk perception; gs = government support; oms = official media support; sms = social media support; ps = public support; fs = family and friends support; an = anxiety; di = depression and irritability; so = somatization. The symbol ~ indicates a negation condition.

family and friends support resulted in a high score of PTG. The second model shows that high PTG was caused by high government support, public support, and family and friends support plus a high infection risk perception. Based on the third model, high government support, social support, official media support, and social media support and a high infection risk perception contributed to a high PTG. In models 4 and 5, high official media support, high social media support, high family and friends support, and a high infection risk perception stimulated a high PTG whether they were combined with government support or public support.

Regarding the combination of psychological distress and infection risk perception configurations, four models were advised for obtaining a high PTG (coverage = 0.927, consistency = 0.967). Model 1 proposes that low somatization and a high infection risk perception engendered a high PTG. Model 2 shows that low depression and irritability and a high infection risk perception led to a high PTG. According to model 3, high anxiety and a high infection risk perception contributed to a high score for PTG. In addition, model 4 suggests that a high PTG resulted from low anxiety, low depression and irritability, and low somatization. In this regard, the results suggest that low or high anxiety, when combined with other conditions, can lead to a high PTG. Model 3 proves that a certain degree of psychological anxiety or pain can promote cognitive and emotional reminders, which are not pleasant but are required for a high PTG. It is especially notable that although persistent anxiety may be accompanied by the enhancement and maintenance of PTG, a higher degree of psychological distress such as depression is not conducive to the development of a high PTG.

The fsQCA results of the combination of social support, psychological distress, and infection risk perception provide seven complex causal recipes for obtaining a high PTG (coverage = 0.806, consistency = 0.995). For example, based on the first model, high government support, public support, official media support, and family and friends support and low anxiety, depression and irritability, and somatization resulted in a high PTG. Alternatively, model 6, with a consistency of 0.99, indicates that high government support, public support, official media support, social media support, and family and friends support and high anxiety and a high infection risk perception led to a high PTG. In particular, the previous results of PLS show that the independent impact of social media support on PTG does not exist. However, according to configuration analysis, support from social media may play a positive role in predicting a high PTG, which is related to other predictive factors.

4.4. NCA findings

Table 5 presents the analysis results of the necessary conditions to achieve the PTG of tourists after the COVID-19 pandemic. In line with the suggestion of Dul (2016), the predictor with a consistency exceeding 0.9 is regarded as a necessary condition for PTG. The findings reveal that the necessary social support predictors for PTG were government support, public support, and family and friends support. In addition, the perception of infection risk was a necessary condition for tourists to grow during the COVID-19 epidemic. The results of the NCA, PLS-SEM and fsQCA mutually confirm and supplement each other, and once again they prove the impact of social support and infection risk perception on tourists' PTG.

In the empirical analysis of this research, the results of PLS-SEM reveal the net impact of social support, psychological distress, and infection risk perception on tourists' travel risk aversion, altruistic behavior, and social identity. The net effect of social support was consistent with the findings of Zhou et al. (2020), who indicated that during the pandemic, social support was positively correlated with PTG and that different dimensions of social support played different roles. The configuration model predicts all the antecedent recipes of tourists' high PTG. Compared with the PLS results, it provides more detailed information and richer insights (Taheri et al., 2019). Unlike the findings of a single sufficient condition analysis, the fsQCA results show that social media support, psychological distress variables, and infection risk perception may have predictive effects for a high PTG, which are related to other factors. In this sense, the analysis results of the configuration model prove the complex nature of the interdependence of the factors that influence PTG. Finally, the NCA of this study can provide useful guidance for motivating tourists to experience a high PTG and cope with the collective trauma of COVID-19.

5. Conclusion and implications

First, this study demonstrates that even under the life-threatening and traumatic situations stemming from the COVID-19 pandemic, the growth of tourists in many aspects could be observed, and this proves the adaptability and growth of tourists. Given this, we should not ignore the ability to evaluate tourists' posttraumatic behavior and explain the tourism phenomenon from the perspective of positive psychology. Second, the results of PLS show the net effects of social support, psychological distress, and infection risk perception on the three constructs of PTG. Although the different dimensions of social support and psychological distress contributed differently to growth, public support and family and friend support had a significantly positive impact on travel risk aversion, social identity, and altruistic behavior. According to the results, anxiety had a positive effect on travel risk aversion, and this seems to confirm the fact that growth and psychological pain coexisted during the pandemic.

Third, the fsQCA results verify the complexity characteristics of PTG. Based on the infection risk perception, demographic characteristics, and related variables of social support and psychological distress, this study proposes four configurational models to predict a high PTG. Nineteen combinations of antecedents leading to a high score of PTG were

Table 5
Results of NCA.

Predictor condition	Consistency	Coverage	Predictor condition	Consistency	Coverage
gender	.721	.900	official media support	.881	.979
~gender	.339	.884	~official media support	.276	.972
marriage	.346	.909	social media support	.856	.981
~marriage	.714	.888	~social media support	.307	.987
age	.425	.980	**family and friends support**	**.948**	**.966**
~age	.733	.977	~ family and friends support	.200	.988
education	.686	.946	anxiety	.537	.987
~education	.453	.988	~anxiety	.625	.977
income	.279	.969	depression and irritability	.305	.990
~income	.823	.919	~ depression and irritability	.841	.961
government support	**.942**	**.959**	somatization	.268	.988
~government support	.198	.981	~ somatization	.871	.954
public support	**.935**	**.967**	**infection risk perception**	**.926**	**.954**
~public support	.214	.982	~ infection risk perception	.212	.991

Note: Necessary conditions are highlighted in bold. The symbol ~ indicates a negation condition.

obtained, and this met the requirements of consistency and coverage. These causal recipes provide multiple intervention paths for improving tourists' PTG to help them cope with the trauma of COVID-19. Finally, this study identified the necessary conditions for the development of PTG during the pandemic. The results suggest that government support, public support, and family and friends support are necessary social support conditions for achieving a high PTG. The three constructs of psychological distress were not a necessary condition for PTG, but certain dimensions (such as anxiety) were sufficient antecedents for PTG. On the contrary, infection risk perception was necessary in predicting the PTG of a tourist, but it was not a sufficient condition.

5.1. Theoretical contributions

There are several theoretical implications in this study. First, this study introduces PTG into the field of tourism research, emphasizing the growth of tourists after struggling with crises and challenging traumatic events. It not only deepens the current understanding of the PTG of tourists but it also expands the literature on the impact of the COVID-19 pandemic on tourists' psychology and behavior. The second contribution is the investigation of the sufficient antecedent factors that directly affect tourists' travel risk aversion, social identity, and altruistic behavior. The results clarify the significance of social support and also reveal the positive influence of anxiety on PTG.

Third, the study contributes contextually and theoretically to the extant literature on positive psychology. Previous works pay more attention to the impact of traumatic events such as cancer and natural disasters, and they do not fully explore the trauma of epidemics. In this sense, this study echoes the call for more research on PTG after the COVID-19 outbreak. This is the first empirical study to incorporate infection risk perception, demographic characteristics, social support, and psychological distress into the configurational model for predicting PTG. Finally, the research paradigm that combines PLS-SEM and fsQCA adopted in this study provides important inspiration for investigating tourists' PTG and its predictive factors during other similar major trauma events. SEM analysis, fsQCA, and NCA can comprehensively evaluate the net effects, optimal causal recipes, and necessary conditions, and this is a practical and effective combination of analysis methods.

5.2. Practical implications

This research provides an increased understanding of the behavior changes of tourists and how to promote PTG during a COVID-19 pandemic. This kind of knowledge is very important for tourism management agencies, government departments, and psychological consultants. Given that travel risk aversion is a form of adaptive growth of tourists after the COVID-19 trauma, tourism managers and marketing agency employees should work together to reduce the perception of infection risk. For example, in order to attract tourists, it is necessary to expand the types of travel insurance available, provide a safe catering and accommodation environment, and release the timely information on health and destination safety issues through multiple channels. In addition, the development of altruistic behaviors helps to encourage tourists to protect wildlife and the environment during travel.

Social identity and altruistic behavior can cause tourists to consciously safeguard social interests and abide by health guidelines. Government departments should offer material support and information support that are conducive to tourists mastering relevant knowledge about COVID-19, effectively enhancing their sense of security and control and improving their social identity. Additionally, the government may need to widely publicize and support voluntary activities, cultivate tourists' awareness of social responsibility, and improve the perception of public support, all of which contribute to the development of altruistic behavior. The results of this study can also be useful in orienting psychological interventions for tourists after a traumatic event. In the process of psychological assistance, people should be encouraged to face adversity and pay attention to the social support they have received. Individuals can be guided to rebuild their understanding of trauma, thereby reducing their negative psychological distress and promoting their growth.

5.3. Limitations and paths for future research

The data collection for this study started on February 19, 2020, which was about 1 month after the outbreak of COVID-19 in China. Although the PTG of tourists can be observed, we chose a limited time period, and it could not fully reflect the dynamic change process. With the rollout of vaccinations, the environment of COVID-19 is constantly evolving and changing. And travelers' psychology and behavior will evolve and change accordingly. Future research can conduct longitudinal analysis to explore the development process of PTG over time. Another limitation is that the current research mainly focuses on three aspects of tourists' PTG and the influence of several limited factors on PTG. Other types of benefits, such as pro-environmental behaviors, could be considered in future studies. At the same time, exploring the role of moderating factors (such as tourism habits, geographic factors and cultural customs) on tourists' PTG is an important direction for future research on major traumatic events. In addition, Chinese tourists were chosen as the research subjects. Due to differences in cultural background, epidemic situation, and prevention and control strategies, the results can only be explained to a certain degree. Future research can be conducted and verified in other various contexts. Lastly, although appropriate research methods were adopted to investigate the PTG of tourists during COVID-19, more face-to-face interviews and qualitative research are necessary.

Credit author statement

Li Cheng: Conceptualization, Methodology, Resources, Writing-Review & Editing, Supervision, Funding acquisition. **Lijun Liu:** Methodology, Validation, Data Curation, Writing Original Draft, Writing - Review & Editing.

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Impact statement

This research has universal warning value to people. As Friedrich Nietzsche said, "That which does not kill us, makes us stronger." This study demonstrates that even under the life-threatening and traumatic situations stemming from the COVID-19 pandemic, the growth of tourists in many aspects could be observed, and this proves the adaptability and growth of tourists. Therefore, in the traumatic environment, we should actively respond and seek help through various ways. We need to actively deal with the anxiety, sadness and pain caused by trauma, and learn to be grateful and cherish our health, family, friends and daily life. In addition, the results help to remind the government and health institutions to pay more attention to people's mental health in the context of the COVID-19 pandemic. People should be encouraged to face adversity and pay attention to the social support they have received. Thus, they can rebuild their understanding of trauma, thereby reducing their negative psychological distress and promoting their growth.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tourman.2021.104474.

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