



How Does the Quality of Life Affect Individuals' Disaster Preparedness Behaviors? A Moderated Mediation Model-Based Case Study

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Abstract

This study examined how the quality of life (QoL) affects an individual's disaster preparedness behavior (PB); furthermore, it also considered and examined the mediating effects of trust in government (GT) and the moderating effects of self-efficacy (SE). One way analysis of variance (ANOVA) was applied to test the differences in QoL, GT, SE, and PB, by socio-demographic, and the study hypotheses were verified by using hierarchical regression analysis based on 1682 samples. The Johnson–Neyman technique was used to test the conditional effects of SE on QoL and PB. All the hypotheses presented in this study were supported: (1) QoL had a positive effect on PB; (2) QoL had a positive effect on GT; (3) GT had a positive effect on PB; (4) GT mediated the relationship between QoL and PB; (5) SE moderated the relationship between QoL and PB. Specifically, when SE was high, the positive relationship between QoL and PB increased; (6) SE moderated the relationship between GT and PB. Specifically, when SE was high, the positive relationship between GT and PB increased; and (7) SE moderated the indirect effect of QoL on PB. Specifically, when SE was high, the mediating effect of GT on the relationship between QoL and PB increased. This study makes significant contributions in terms of identifying the mechanisms of QoL on PB based on the moderated mediation model. Improving individuals' QoL is not only an important societal goal, but also an effective way to enhance people's positive behavioral outcomes. Therefore, QoL improvement should be considered in the top-level design of government policies, and it should also be regarded as an important indicator of government performance assessment.

Keywords Quality of life · Disaster preparedness behavior · Trust in government · Self-efficacy

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1 Introduction

It is a consensus among scholars and practitioners that the most effective way to reduce disaster losses is to ensure that appropriate preparation and protection measures are taken by the affected populations themselves. Previous studies have identified many factors that could motivate an individual's disaster preparedness behavior; these include past experiences (Diekmann et al. 2007; Paek et al. 2010), exposure in terms of newspaper, magazine, radio, TV, Internet, etc. (Hong et al. 2019; Murphy et al. 2009; Paek et al. 2010), and protection responsibility for own safety (McNeill et al. 2013; Yong et al. 2017). Other studies have focused on the psychological factors, such as risk perception, self-efficacy, response efficacy, etc. (Martin et al. 2007; Murphy et al. 2009; Poussin et al. 2014; Tang and Feng 2018; Zhu and Yao 2019). Moreover, quality of life (QoL), especially in terms of health, has also received attention from many scholars. Quality of life was defined “*as individuals’ perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a broad ranging concept, incorporating in a complex way individuals’ physical health, psychological state, level of independence, social relationships, personal beliefs and their relationships to salient features of the environment*” (WHOQOL Group 1995).

Health-related QoL is individual's perceived physical health and mental health, and it is an important component of QoL (Gill and Feinstein 1994; WHOQOL Group 1995; CDCP 2000). Several studies have verified that Health-related QoL can significantly affect individual disaster preparedness behavior. For example, Eisenman et al. (2009) conducted a random-digit-dial telephone survey of Los Angeles County's population and found that people who had excellent perceived health status were significantly more likely to practice household disaster preparedness. Bethel et al. (2011) examined the data from the Behavioral Risk Factor Surveillance System and found that people who had fair to poor perceived health were less likely to practice household disaster preparedness. Tomio et al. (2012) conducted a survey in Japan and found that people who had less perceived health were more reluctant to take emergency preparedness. Strine et al. (2013) examined the data from the Behavioral Risk Factor Surveillance System and found that people with self-reported impaired mental health were less likely to be prepared for a disaster.

Positive psychology is an important aspect of the QoL approach tradition (Keyes et al. 2012). Other than mental health, other positive psychology factors, such as satisfaction, subjective well-being, and happy also been considered as prominent aspects of QoL (Shin and Johnson 1978; Snoek 2000; Cruice et al. 2003; Diener et al. 2003; Ferrell et al. 2003; Iwasaki 2006; Abdel-Khalek 2010). Positive psychology's core idea suggests that positive psychological factors can promote prosocial behavior, organizational citizenship behavior, cooperation behavior, and better job performance (Baron and Bronfen 1994; Barsade 2002; Borman et al. 2001; Eisenberg et al. 1991; Lyubomirsky et al. 2005; Organ and Ryan 1995; Thoits and Hewitt 2001; Williams and Shiaw 1999). Other than stockpiling behavior, such as prepare flashlight, fire extinguisher, freshwater and emergency food, first aid kit, gas mask, etc. for different types of disasters, disaster preparedness behavior is related to prosocial behavior, organizational citizenship behavior, and cooperation behavior, such as attending training and emergency drills, complying with the policies, teaching relatives what actions to take in case of an emergency, and knowing how to contact and ask designated professionals (local government, Civil Defense, etc.) for information about what the measures to take in an emergency (Hong et al. 2019; Miceli et al. 2008; Murphy et al. 2009). Goudie et al. (2011)

examined the data of 300,000 Americans and found that happier individuals were more likely to practice risk-avoiding behavior. Gowan et al. (2014) examined the data of 695 survey responses and found that spiritual well-being can significantly increase an individual's disaster preparedness behavior. Therefore, we considered that QoL could positively promote individuals to practice disaster preparedness behaviors.

However, the existing literature has seldom discussed the internal mechanisms of QoL impact on individual disaster preparedness behavior—for instance, the existence of any factors that could mediate the relationship and whether there can be any boundary condition for such a relationship. Since disaster preparedness behavior can be considered as one type of cooperation behavior; trust has been shown to have a positive effect on a person's degree of cooperation behavior (Balliet and Van Lange 2013; Earle et al. 2007; Hsu et al. 2007). De Cremer and Tyler (2007) found that trust in authority can positively affect people's cooperation behavior. Allen (2009) conducted a survey of 316 drill participants and found that trust-building between local governments and community members can promote emergency preparedness. Hong et al. (2019) found that trust in government had a positive impact on public health emergency cooperation behaviors. For individuals, their biggest cooperation partner in practicing disaster preparedness behavior is often their government; therefore, we considered that trust in the government might have a positive effect on disaster preparedness behavior. Furthermore, researchers have verified that positive psychological factors which are indicators of QoL can promote trust in the government; for example, Dunn and Schweitzer (2005) found that positive psychological emotions, such as happiness and gratitude, can increase trust. Tov and Diener (2009) found that subjective well-being can promote cooperation and trust within society and between nations. Vigoda-Gadot (2006) and Beeri et al. (2019) both found that public satisfaction can increase trust in the government. Therefore, we considered that QoL could be used to increase individuals' preparedness behavior by increasing their trust in the government.

Moreover, even though other factors can motivate people's behavior, it depends on one's belief that one has the capacity to take appropriate action (Bandura 1997). Self-efficacy is the degree to which an individual believes that he or she can successfully perform a particular behavior (Ajzen 2002; Bandura 1991). We thus considered that self-efficacy would be able to impact an individual's disaster preparedness behavior by acting as a boundary condition for the relationship between QoL and disaster preparedness behavior; furthermore, we considered that people who trusted in their government would be less likely to practice disaster preparedness behavior if they did not have enough self-efficacy (Alessandri et al. 2015). In addition, we also utilized a moderated mediation model, in which the mediating effect of trust in government on the relationship between QoL and disaster preparedness is influenced by the level of self-efficacy.

Therefore, we proposed our hypotheses as follows:

H1: QoL has a positive effect on individual disaster preparedness behavior.

H2: QoL has a positive effect on trust in government.

H3: Trust in government has a positive effect on individual disaster preparedness behavior.

H4: Trust in government mediates the relationship between QoL and individual disaster preparedness behavior.

H5: Self-efficacy moderates the relationship between QoL and individual disaster preparedness behavior. Specifically, when self-efficacy is high, the positive relationship between QoL and individual disaster preparedness behavior increases.

H6: Self-efficacy moderates the relationship between trust in government and individual disaster preparedness behavior. Specifically, when self-efficacy is high, the positive relationship between trust in government and individual disaster preparedness behavior increases.

H7: Self-efficacy moderates the indirect effect of QoL on disaster preparedness behavior. Specifically, when self-efficacy is high, the mediating effect of trust in government on the relationship between QoL and individual disaster preparedness behavior increases.

The theoretical framework of this study is provided in Fig. 1.

2 Methods

2.1 Study Participants

This study utilized data from the 2013 “Taiwan Social Change Survey” (TSCS). As of 2018, TSCS has conducted 62 surveys. The topic of the 2013 TSCS was “Risk Society,” and it was conducted by Academia Sinica’s Institute of Sociology. The data were derived from a sample consisting of 2005 participants; all of them were older than 18. After excluding the missing data 1682 samples were finally retained, including 897 (53.3%) males and 785 (46.7%) females, with a mean age of 44 years ($SD=16.73$). The socio-demographic information for participants is summarized in the first column of Table 1.

2.2 Measures

2.2.1 Quality of Life

According to the measure suggested by Cui and Han (2019), quality of life (QoL) was measured based on three question items: (1) How happy or unhappy would you say you are, on the whole? (*not happy at all to very happy*); (2) All things considered, how satisfied are you with your life as a whole nowadays? (*not satisfied at all to very satisfied*); and (3) How would you say your physical health has been for the past 2 weeks? (*poor to very*

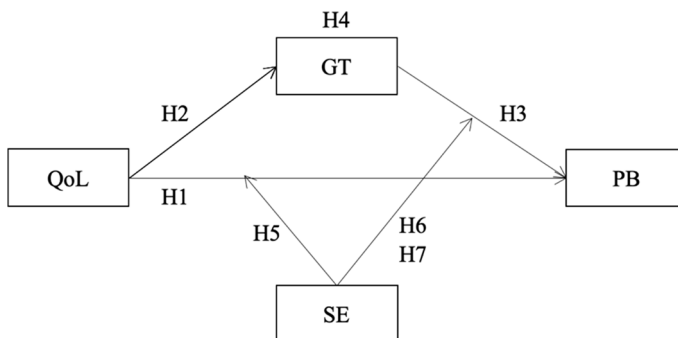


Fig. 1 Theoretical framework

Table 1 Social-demographics, QoL, GT, SE, PB: mean, SD and ANOVA (n = 1682)

Socio-demographics	QoL	GT	SE	PB
All	3.43 (0.76)	3.28 (0.79)	2.38 (1.11)	1.68 (1.44)
<i>Gender</i>				
Men (53.3%, n = 897)	3.44 (0.79)	3.31 (0.80)	2.43 (1.11)	1.71 (1.44)
Women (46.7%, n = 785)	3.43 (0.73)	3.26 (0.77)	2.32 (1.11)	1.64 (1.44)
<i>F</i>	0.061 ^b	1.74 ^a	4.526 ^a	0.927 ^a
<i>P</i>	0.805	0.187	0.034	0.336
<i>Age</i>				
18–29 (24.4%, n = 410)	3.48 (0.74)	3.32 (0.76)	2.54 (1.07)	1.70 (1.40)
30–39 (19.3%, n = 324)	3.37 (0.78)	3.20 (0.81)	2.45 (1.12)	1.65 (1.45)
40–49 (18.1%, n = 305)	3.37 (0.77)	3.20 (0.79)	2.38 (1.09)	1.73 (1.41)
50–59 (18.9%, n = 318)	3.42 (0.74)	3.29 (0.76)	2.32 (1.12)	1.81 (1.54)
60 or older (19.3%, n = 325)	3.51 (0.78)	3.40 (0.81)	2.16 (1.12)	1.50 (1.41)
<i>F</i>	2.270 ^a	3.587 ^a	6.144 ^a	2.028 ^a
<i>p</i>	0.060	0.006	< 0.001	0.088
<i>Education</i>				
< Senior high school (23.5%, n = 396)	3.34 (0.82)	3.24 (0.81)	1.93 (1.02)	1.33 (1.28)
Senior high school (27.6%, n = 465)	3.38 (0.75)	3.21 (0.78)	2.36 (1.15)	1.57 (1.46)
College & bachelor (41.3%, n = 695)	3.50 (0.72)	3.35 (0.78)	2.59 (1.07)	1.89 (1.47)
≥ Master (7.5%, n = 126)	3.61 (0.81)	3.34 (0.75)	2.68 (1.01)	2.05 (1.40)
<i>F</i>	6.517 ^a	3.626 ^a	38.260 ^b	17.917 ^b
<i>p</i>	< 0.001	0.013	< 0.001	< 0.001

Standard deviations are in parentheses

QoL quality of life, GT trust in government, SE self-efficacy, PB disaster preparedness behavior

^aStatistical analysis was performed using One-way ANOVA

^bStatistical analysis was performed using Welch test

good). All the items had a 5-point Likert scale ranging from 1 to 5, which represented the increased degree of each item.

2.2.2 Trust in Government

Similar to measures used in past studies (Christensen and Lægreid 2005; Espinal et al. 2006; Kim 2010; Song and Lee 2016), in this study, trust in government (GT) was measured based on a series of questions about trust in various political and administrative institutions. The question items were as follows: Overall, how much do you trust in (1) the government of Taiwan, (2) the local government, and (3) township administrative office. All the items had a 5-point Likert scale ranging from 1 (*distrust very much*) to 5 (*trust very much*).

2.2.3 Self-Efficacy

Self-efficacy (SE) was measured based on two items that asked respondents the following questions: (1) Do you think you have the ability to control (or deal well with) typhoon

damage to your home if it occurs? (2) Do you think you have the ability to control (or deal well with) earthquake damage to your home if it occurs? All the items had a 5-point Likert scale ranging from 1 (*cannot control at all*) to 5 (*can control*).

2.2.4 Disaster Preparedness Behavior

Disaster preparedness behavior (PB) was measured as follows. Respondents were asked to indicate which of six provided actions they had undertaken for natural disaster prevention: (1) relocate vehicles (cars or motorcycles) or household items to a safe place; (2) get insurance protection against natural disasters; (3) secure cabinets (shelves) or domestic appliances (major appliances) at home; (4) prepare disaster kits; (5) plan or gain awareness about Emergency Evacuation procedures; and (6) attend Emergency Evacuation rehearsals. The total PB score ranged from 0 (*the participant has done none of these things*) to 6 (*the participant has done all of these things*).

Since gender, age, and education were verified that have significant effects on disaster preparedness behaviors in previous studies (Murphy et al. 2009; Paek et al. 2010; McNeill et al. 2013), this study also chose them as control variables.

3 Results

3.1 Preliminary Analysis

We conducted CFA on variables including quality of life, trust in government, and self-efficacy (we did not include disaster preparedness behavior, because it was a single-item construct). The result showed that the Kaiser–Meyer–Olkin value > 0.6 , and Bartlett's Test of Sphericity is significant, indicating that the sample size was adequate. As shown in Table 2, all the loadings of the items were higher than 0.50, all the composite reliability (CR) values were higher than 0.7, and all the average variance extracted (AVE) values were higher than 0.5. Therefore, validity convergence was good. As shown in Table 3, the square root of AVE for each construct was higher than the correlations between it and all other constructs, meaning discriminant validity thus was good (Fomell & Larker, 1981). The correlation coefficients among the variables are reported in Table 3.

These results provided initial support for the hypotheses in this study. Besides, one-way ANOVA was applied to test the difference in QoL, GT, SE, and PB by gender, age,

Table 2 Factor loading of items

Construct	Item	Loading	CR	AVE
QoL	QoL1	0.853	0.811	0.595
	QoL2	0.849		
	QoL3	0.581		
GT	GT1	0.767	0.856	0.665
	GT2	0.880		
	GT3	0.795		
SE	SE1	0.821	0.826	0.703
	SE2	0.856		

Disaster preparedness behavior is a single-item construct

Table 3 Correlations for QoL, GT, SE, PB (n=1682)

Variables	QoL	GT	SE	PB
QoL	0.771			
GT	0.164**	0.815		
SE	0.143**	0.063**	0.838	
PB	0.068**	0.093**	0.095**	–

** $p < 0.01$; * $p < 0.05$; diagonal elements are square roots of AVE

and education. Welch test was also used when the data did not pass the homogeneity test of variance. According to the results of ANOVA, we found a statistically significant difference between those groups who were men and women, the self-efficacy ($p = 0.034$) was higher in men compared to women. Regarding age, the self-efficacy ($p < 0.001$) was higher in younger groups. Regarding education, more educated people had higher level QoL ($p < 0.001$) and self-efficacy ($p < 0.001$), as well as disaster preparedness behavior ($p < 0.001$). The mean, SD, and ANOVA results of QoL, GT, SE, and PB by Socio-Demographics are shown in Table 1.

3.2 Hypothesis Testing

As shown in Table 4, we constructed regression models for GT. The regression model was first constructed using the control variables (Model 1). Next, QoL was entered in Model 2; the result showed that QoL had a positive effect on GT (Model 2, $\beta = 0.154$, $p < 0.01$). Hypothesis 2 was thus supported. After this, the regression model was constructed by using the control variables for PB (Model 3, in Table 5). Next, we entered QoL and constructed Model 4; as a result, QoL had a positive effect on PB (Model 4, $\beta = 0.092$, $p < 0.05$). GT was entered in Model 5, and the result indicated that GT had a positive effect on PB (Model 5, $\beta = 0.130$, $p < 0.01$). Hypotheses 1 and 3 were thus supported.

To test the mediating role of GT between QoL and PB, we followed the testing procedure provided by Zhao et al. (2010). We utilized the PROCESS (Model 4) provided by Hayes (2013). We estimated 5000 bootstrap samples in which the independent variable was QoL, the mediator was GT, and the dependent variable was PB. We also included gender, age, and education as covariates in the model. As shown in Table 6, the results indicated that GT totally mediated the relationship between QoL and PB [indirect effect = 0.0200; 95% CI (0.0062, 0.0372); direct effect = 0.0718, 95% CI (-0.0192, 0.1628)]. Therefore, Hypothesis 4 was supported.

To test the moderating effect of SE on the relationship between QoL and PB, we followed the procedure provided by Aiken and West (1991). We tested the conditional effects

Table 4 Regression results on GT

	Model 1		Model 2	
	β	<i>P</i>	β	<i>P</i>
Gender	-0.026	0.491	-0.029	0.448
Age	0.006**	<0.001	0.005**	<0.001
Education	0.018**	<0.001	0.015**	<0.001
QoL			0.154**	<0.001

Table 5 Regression results on PB

	Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
Gender	-0.022	0.757	-0.023	0.742	-0.019	0.782	-0.017	0.808	-0.014	0.842	-0.012	0.863	-0.006	0.931
Age	0.005*	0.032	0.005*	0.049	0.004	0.090	0.005*	0.044	0.005	0.054	0.005	0.066	0.005	0.053
Education	0.041**	<0.001	0.039**	<0.001	0.037**	<0.001	0.036**	<0.001	0.036**	<0.001	0.035**	<0.001	0.035**	<0.001
QoL	0.092*	0.046	0.092*	0.046	0.072	0.122	0.079	0.090	-0.110	0.268	0.136**	0.002	-0.206*	0.048
GT					0.130**	0.004					0.079*	0.014	-0.395**	0.003
SE							0.076*	0.018	-0.214	0.124	0.084*	0.032		
SE×QoL														
SE×GT													0.144**	<0.001

Table 6 Bootstrap analysis of significance test on mediating effect

Path	Effect	Boot SE	CI=95%		Significance
			LLCI	ULCI	
Direct effect	0.0718	0.0464	-0.0192	0.1628	Not significant
Indirect effect	0.0200	0.0078	0.0062	0.0372	Significant

Boot SE bootstrap standard error, *LLCI* lower limit confidence interval, *ULCI* upper limit confidence interval

of SE by using the Johnson–Neyman technique. First, based on Model 4, we entered SE in order to construct Model 6. Next, we entered the interaction item (SE × QoL) in Model 6 in order to construct Model 7. The results showed that SE had a significant moderating effect on the relationship between QoL and PB (Model 7, $\beta = 0.084, p < 0.05$), which means that the higher the level of SE, the higher the positive effect that QoL impact on PB (Fig. 2a). Figure 2b also shows that the conditional slope of QoL to PB was significantly different from the point SE (transmission) = 2.250 ($p < 0.05$). Hypothesis 5 was thus supported.

We tested the moderating effect of SE on the relationship between GT and PB in the same way and constructed Model 8 and 9. The results showed that SE had a significant moderating effect on the relationship between GT and PB (Model 9, $\beta = 0.144, p < 0.01$), which means that the higher the level of SE, the higher the positive effect that GT impact on PB (Fig. 3a). Figure 3b also shows that the conditional slope of GT to PB was significantly different from the point SE (transmission) = 2.00 ($p < 0.05$).

To test the moderated mediating effect of SE, we used the PROCESS (Model 15) and estimated 5000 bootstrap samples. The moderating effect of SE on the mediating effect of GT with regard to the relationship between the QoL and PB was significant [$\beta = 0.0208$;

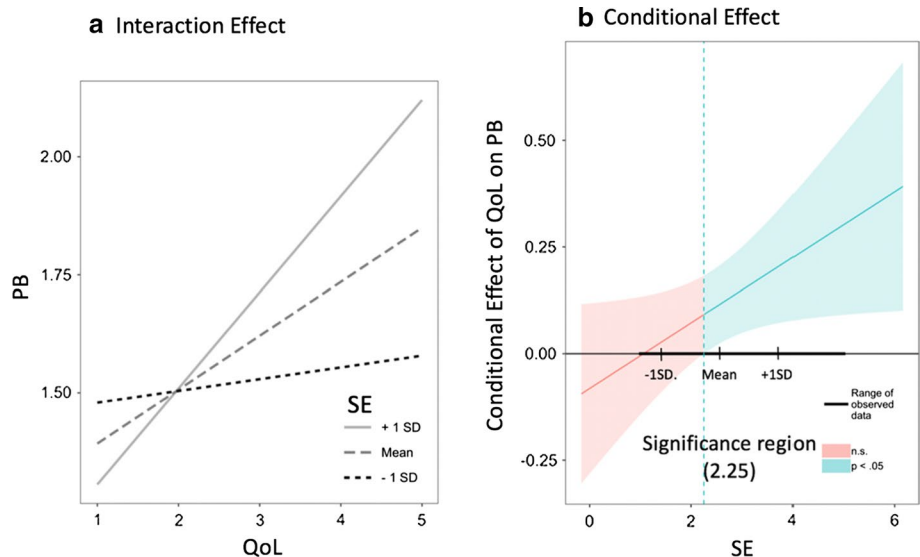


Fig. 2 The moderating effect of SE on the relationship between QoL and PB. **a** Interaction effect of SE and QoL on PB; **b** the conditional effect of QoL on PB. The polygon shaded in blue indicates a 95% CI using the Johnson–Neyman technique. (Color figure online)

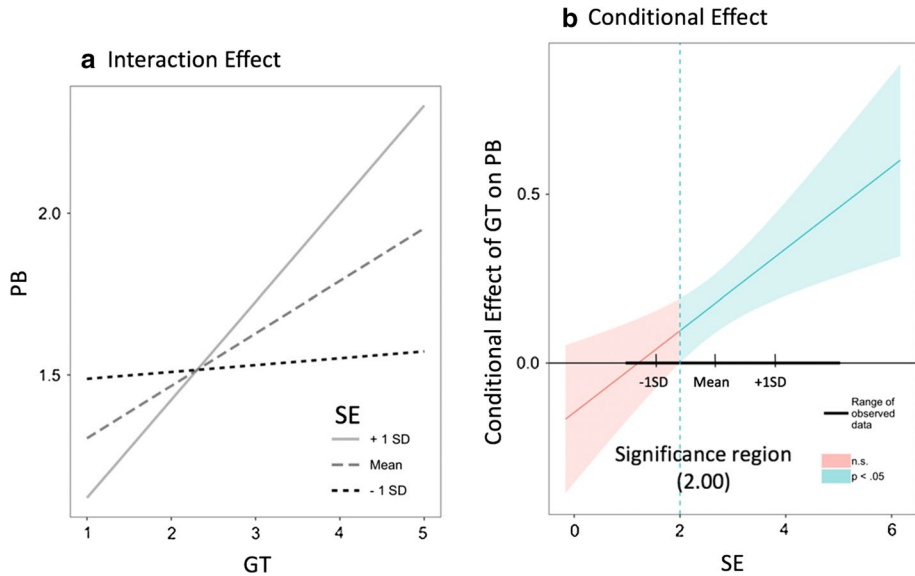


Fig. 3 The moderating effect of SE on the relationship between GT and PB. **a.** Interaction effect of SE and GT on PB; **b** the conditional effect of GT on PB. The polygon shaded in blue indicates a 95% CI using the Johnson–Newman technique. (Color figure online)

95% CI (0.0079, 0.0377)]. This implies that, as self-efficacy increases, the mediating effect of GT on the relationship between the QoL and PB becomes stronger. Specifically, as shown in Table 7, the mediating effect of GT was significant when SE was at a medium level [$\beta=0.0198$; 95% CI (0.0065, 0.0373)] or at a high level [$\beta=0.0429$; 95% CI (0.0206, 0.0735)]. The mediating effect of GT was not significant when SE was at a low level [$\beta=-0.0033$; 95% CI (-0.0227, 0.0145)]. Therefore, Hypothesis 7 was supported.

4 Discussion and Conclusion

This study aimed to examine the impact of QoL, especially in terms of positive psychological factors, on individuals’ disaster preparedness behaviors; furthermore, we also examined the mediating effect of trust in government and the moderating effect of self-efficacy on disaster preparedness behaviors. All the hypotheses of this study were supported. We found that, although QoL had a positive effect on PB, this effect was totally

Table 7 Bootstrap analysis of significance test on moderated mediation effects

Conditions	Mediating effect of GT	Boot SE	CI=95%		Significance
			LLCI	ULCI	
SE at low level	-0.0033	0.0093	-0.0227	0.0145	Not significant
SE at medium level	0.0198	0.0078	0.0065	0.0373	Significant
SE at high level	0.0429	0.0133	0.0206	0.0735	Significant

mediated by GT; this indicated that the positive effect of QoL on PB was only accessible when GT had been enhanced. For both QoL and GT, the effects they had on PB were moderated by SE; this indicated that the positive effects of both QoL and GT were only accessible when individuals had a firm belief in their ability to deal well with disaster situations. Furthermore, the indirect effect of QoL on PB was also moderated by SE; this means that SE functioned as a gatekeeper, which could control the mediating effect of GT on the relationship between QoL and PB. To be more specific, QoL can have a stronger positive impact on PB through GT when SE is higher.

Understanding the influence of QoL on PB can greatly support research on and practice related to this subject. First, the hypothesis that positive psychological factors can help to encourage the development of positive behaviors has been proved again in the scenario of disaster emergency preparedness; our study has provided more detailed influence mechanisms based on a Moderated Mediation Model. Although it is well known that the positive psychological factors (e.g., QoL, GT, and SE) can have positive effects on PB, in this study, we described the internal influence mechanisms underlying these four variables (e.g., GT as a mediator and SE as a moderator). These findings can enrich applied research on positive psychology. Second, we considered PB as a type of cooperation behavior; we did this in order to introduce the influences of QoL and GT better and thus provide a new way of thinking for the interpretation of PB. Third, most of the studies on QoL considered QoL as a dependent variable; they focused on providing explanations for the formation of QoL and neglected the effect of QoL on an individual's social behaviors. In this study, we regarded QoL as a positive psychological factor that can promote individual positive behaviors. We believe that this approach can fill this gap in the field.

In this context, we can refer to various precedents promoted by the United Nations, which recently claimed that the governments should struggle for the pursuit of people's QoL or well-being (Frey and Gallus 2016); one example of this approach is the concept of Gross National Happiness (GNH) (1972), which was first proposed by the fourth King of Bhutan. This concept placed societal happiness at the center of governments' efforts and policies (Tideman 2016; Verma 2017). Increasing individuals' QoL is not only an important societal goal but also an effective way to enhance people's positive behavioral outcomes. Therefore, QoL improvement should be considered in the top-level design of government policies, and it should also be regarded as an important indicator of government performance assessment. Better government performance can enhance people's trust in the government. This, in turn, can help to establish more stable channels for promoting people's positive behaviors, including individual disaster preparedness behaviors. In addition, since SE functions as a gatekeeper, more training and supports with regard to improve an individual's capability of practicing disaster preparedness behaviors should be supplied to the people, and they should be further encouraged to enhance their confidence with regard to disaster prevention.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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