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Impacts of Structural Social Capital and Cognitive Social Capital on the Psychological Status of Survivors of the Yaan Earthquake

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Abstract

The Yaan earthquake occurred in April 2013, which measured 7.0 on the Richter scale, caused 196 people died, 11,470 injured and USD 6.9 billion economic loss. The Yaan area were also severely affected by the Wenchuan earthquake in 2008. This research examined the impacts of structural social capital (social association) and cognitive social capital on the psychological status (depression, life satisfaction) of survivors of the Yaan earthquake. Based on a survey of 495 respondents, structural equation models were constructed to test the mediation effects of cognitive social capital on the relationships between structural social capital, depression, and life satisfaction of respondents with disaster impact as a control variable. This study also examined the paths of impact of the three components of cognitive social capital (sense of community, trust, and social connectedness) on survivors' psychological status. The findings indicated the following. 1) The disaster impact had negative effect on cognitive social capital ($\beta = -.15$, $p < 0.05$), but no effect on structural capital ($\beta = -.06$, n.s.); disaster impact also had positive effect on depression ($\beta = .16$, $p < 0.01$) and negative effect on life satisfaction ($\beta = -.13$, $p < 0.05$). 2) Structural social capital had positive effect on cognitive social capital ($\beta = -.35$, $p < 0.001$) and cognitive social capital had negative effect on depression ($\beta = -.44$, $p < 0.001$). Structural social capital had indirect effect but no direct effect on depression. The impact of structural social capital on depression was fully mediated by cognitive social capital. 3) Cognitive social capital had positive effect on life satisfaction ($\beta = .44$, $p < 0.001$). Structural social capital had indirect effect but no direct effect on life satisfaction. The impact of structural social capital on life satisfaction was fully mediated by cognitive social capital. 4) Sense of community has a positive effect on life satisfaction ($\beta = .72$, $p < 0.05$), but no effect on depression. 5) Trust has a negative effect on depression ($\beta = -.41$, $p < 0.05$), but no effect on life satisfaction. 6) Social connectedness has a negative effect on depression ($\beta = -.16$, $p < 0.05$), but no effect on life satisfaction. The research highlighted the importance of building and maintaining cognitive social capital in a community affected by disaster. It also makes recommendations for social workers to improve trust and social connectedness in the pre-disaster and disaster relief phases to buffer depression. After a disaster, it is recommended to facilitate a sense of community to improve the life satisfaction of survivors.

Keywords Disaster impact · Structural social capital · Cognitive social capital · Sense of community · Trust · Social connectedness · Depression · Life satisfaction · Disaster survivors

Introduction

Social capital is one important theme in recent literature on the survivors of a disaster. Social capital is critical for the community to withstand disaster and rebuild infrastructure and social ties (Aldrich 2012b; Hawkins and Maurer 2010; Reininger et al. 2013). It exists in different forms, for example, bonding social capital was found to be important for immediate support (Norris et al. 2002b; Beggs et al. 1996), whereas bridging and linking social capital offered pathways to long-term survival and wider neighborhood and community revitalization (Hawkins and Maurer 2010).

Recently, many researchers have focused on the impacts of social capital on the psychological status of disaster survivors. They argue that the interaction between the social context and individual psychosocial resources such as coping and social support are contingent on social capital, which significantly impacts the mental health status of survivors (Flores et al. 2014; Hu et al. 2015; Kawachi and Berkman 2001; Wind et al. 2011; Wind and Komproe 2012).

Furthermore, structural social capital should be distinguished from cognitive social capital, because of the different impacts on health outcomes. Structural social capital refers to the externally observable behaviors and actions of actors within the network, while cognitive social capital refers to the appreciation of this community (Harpham 2008). Hikichi et al. (2017a, b) found that structural social capital might have positive impacts on cognitive social capital of the disaster survivors. They found that those 2011 Great East Japan Earthquake survivors under group relocation preserve higher social participation and informal socializing which reduced the risk of cognitive decline, when compared to those individually relocated survivors. In general, a higher level of cognitive social capital is associated with better mental health, and higher structural social capital is sometimes associated with poorer mental health (De Silva et al. 2005, 2007).

For survivors of a disaster, Wind et al. (2011) observed that cognitive social capital might protect against symptoms of depression, while structural social capital (i.e., participation in social structures) may be associated with an excess of anxiety disorders. These studies contributed by indicating the distinct effects of cognitive and structural social capital on mental health. However, we still have little knowledge on why different types of social capital generate diverse effects on mental health. A recent study by Tsuchiya et al. (2017) showed that low social capital increased large-scale house destruction.

Some researchers revealed that structural social capital could predict cognitive social capital in disaster settings (Rung et al. 2017). These findings suggest the influence of structural social capital on the psychological status of survivors of a disaster by mediating cognitive social capital. Given that existing studies determined ambiguous and weak associations between structural social capital, testing the mediating role of cognitive social capital can help understanding the pathways through which structural social capital affects the recovery of survivors.

In this research, we focused on the impacts of structural and cognitive social capital on two psychological statuses, namely depression and the life satisfaction of survivors of a disaster. Depression is an affective disorder in which the prevailing emotional mood of a person is negatively distorted or inappropriate to the circumstances and sustained over a particular period (Zung 1973). Life satisfaction is an overall assessment of feelings and attitudes about one's life at a particular point in time ranging from negative to positive (Diener 1984). Exposure to a disaster increases the risk of depression for affected people (Person et al. 2006). Some scholars argue that a disaster does not affect individuals' life satisfaction (Berger 2010), while others suggest a sizable and significant negative impact (Luechinger and Raschky 2009).

This paper aims to fill the theoretical gap by investigating the mediating effect of cognitive social capital on the impact of structural social capital on depression and life satisfaction. The second objective is to address the knowledge gap in terms of the mechanism of the impacts of cognitive social capital on the psychosocial status of survivors of a disaster by exploring its three components, namely sense of community, trust, and social connectedness.

Studies have been conducted in China to examine the psychological or mental status of survivors of earthquakes. These focused on psychological problems such as post-traumatic stress disorder (PTSD), depression, and health-related wellbeing (Fan et al. 2011; Jia et al. 2010; Ke et al. 2010; Li et al. 2011; Wen et al. 2012; Xu and He 2012; Xu and Song 2011). Few discussed the impacts of structural and cognitive social capital on the depression and life satisfaction of earthquake survivors. Using evidence-based research, this paper aims to fill the empirical gap regarding the mechanisms of the impacts of structural social capital, sense of community, trust, and social connectedness on depression and the life satisfaction of survivors of an earthquake, as well as the magnitude of these impacts. The results of this study will inform social workers about effective strategies to reduce the risk of depression and enhance the life satisfaction of these survivors.

Literature Review

Disasters affect individuals, families, and communities at different levels and affect the physical, psychological, and spiritual outcomes of survivors (Erikson 1976; Myers 1994; Rosenfeld et al. 2010). For survivors, significant loss of life, widespread damage to property, serious and ongoing economic difficulties for the community, and intentional human causes tended to trigger severe, long-lasting, and pervasive psychological problems (Freedy et al. 1993; Green 1995; Adams et al. 2002; Norris et al. 2002a, b). While most academics acknowledge that exposure to disaster increases the risk of depression (Person et al. 2006), its impacts on life satisfaction are still being debated (Berger 2010; Luechinger and Raschky 2009).

Social Capital and Psychological Status of Disaster Survivors

The concept of social capital is discussed and applied in different fields. Putnam (1993, 167) defined social capital as "features of social organization such as trust, norms, and networks that can improve the efficacy of society by facilitating coordinated actions."

Disaster studies have applied social capital at the individual level (resources accessed through social networks) and community level (trust, collective action, and public goods) to understand the role and functions of social cohesion and networks during and after a catastrophe (Aldrich and Meyer 2015; Joshi and Aoki 2014). Recent studies confirm that bonding, bridging, and linking social capital are critical for the community to withstand disaster and rebuild the infrastructure and social ties affected. Furthermore, these aspects are important for successful policy implementation (Aldrich 2012a, b; Hawkins and Maurer 2010; Joshi and Aoki 2014).

In recent research on health and disaster, researchers recognized the need to distinguish between structural and cognitive social capital, as they have different impacts on psychological status (Harpham 2008). Structural social capital refers to the externally observable behaviors and actions of actors within the network, for example, patterns of civic engagement and the presence of community linkages. Cognitive social capital refers to the appreciation of these community linkages in terms of trust, mutual help, sharing, and reciprocity. Higher levels of cognitive social capital were associated with better mental health (Harpham 2008; Villalonga-Olives, and Kawachi, I 2015), while associations between community social capital and mental health outcomes were ambiguous for structural social capital (De Silva et al. 2005).

In a study on survivors in a flood-affected town in England, Wind et al. (2011) associated cognitive and structural social capital with mental health through individual appraisal processes, social support, and coping behavior. These individual factors were contingent on social capital. After including individual characteristics, cognitive social capital was negatively related to mental health problems. However, structural social capital was only associated with a higher level of anxiety, but not with PTSD or depression. Furthermore, a higher level of social support was an important factor in post-disaster mental health, and perceived support mediated the long-term effects of distress due to disaster exposure and post-disaster support (Norris and Kaniasty 1996).

In a recent study on the impacts of the Deepwater Horizon oil spill, Rung et al. (2017) associated structural social capital (neighborhood association participation) with an increased level of cognitive social capital (sense of community and community control). This was associated with a higher level of social support, which predicted a lower level of depression. These results indicate that the cognitive aspects of social capital may be a consequence of structural aspects. In other words, structural components of social capital might predict cognitive social capital. This sequential relationship explains the ambiguous and weak associations between structural social capital and mental health (De Silva et al. 2005, 2007; Wind and Komproe 2012). These findings imply that cognitive social capital may mediate structural social capital and the psychological status of disaster survivors.

Different paths of the impacts of structural and cognitive social capital on the mental health of the disaster survivors have been suggested. The first path hypothesis is that structural and cognitive social capital exert independent but positive effects on mental health. Eriksson (2011) proposes that structural social capital provides the resources necessary for collective action while cognitive social capital creates the right ambiance to engage in collective action. Through collective action, community members can increase control over their lives and environment. This increased control over post-disaster demands may mitigate individual mental health.

The second path hypothesis is that the impact of structural social capital on mental health is influenced by its impact on cognitive capital. Rung et al. (2017) discover that cognitive social capital is a consequence of structural social capital whereas cognitive social capital has a direct significant impact on the depression of the survivors of a disaster.

Different Aspects of Cognitive Social Capital and its Impacts

Chamlee-Wright and Storr (2011) claimed that social capital in the process of post-disaster recovery refers to social networks and available resources, and more important, is a form of collective narratives that reflect cognitive perception of the community. Different aspects of cognitive social capital may have different impacts on different aspects of the psychological status of disaster survivors, and as such, deserve more detailed examination.

In health studies, sense of community (Buckner 1988; Harpham et al. 2006 and trust (Kawachi et al. 1997) were identified as two major components and indicators of cognitive social capital. Fujiwara and Kawachi (2008) associated perceptions of a higher level of trust in neighbors with a lower risk of depression during a follow-up survey, while the structural dimensions of social capital were not associated with depression.

Social connectedness, another significant component of cognitive social capital, is also worthy of attention for its impact on the psychological status of disaster survivors. Social connectedness refers to the degree to which a person experiences belongingness, attachment, relatedness, togetherness, or entrenchment in one's social relationships. Social connectedness pertains to subjective feelings and attitudes towards oneself in relation to the social context, rather than specific social relationships. Lee and Robbin (1995) suggested that low social connectedness increased individuals' isolation, which can impair the ability to function effectively. Baumeister and Leary (1995) proposed that low belongingness might lead to feelings of social isolation, alienation, and loneliness. The need for belongingness is more than the need for social contact, and is satisfied by interpersonal interactions of "stability, affective concern, and continuation into a foreseeable future" (Baumeister and Leary 1995, 500).

Santini et al. (2015) conducted a systematic review of the association between social relationships and depression. They identified the significant protective effects of perceived emotional support; perceived instrumental support; and large, diverse social networks. Little evidence was found for the relation between social connectedness and depression, as was also the case for negative interactions. Other scholars indicated that social connectedness may have a positive impact on well-being (Lee et al. 2008).

Hypotheses

Based on the above literature review and discussion, the following research hypotheses among survivors of the Yaan earthquake were postulated.

H1a: Disaster impact has negative effect on structural social capital;
H1b: Disaster impact has negative effect on cognitive social capital;
H1c: Disaster impact has positive effect on depression.

H1d: Disaster impact has negative effect on life satisfaction.
H2: Structural social capital has positive effect on cognitive social capital.
H3: Cognitive social capital has negative effect on depression.
H4: The negative effect of structural social capital on depression is mediated by cognitive social capital.
H5: Cognitive social capital has positive effect on the life satisfaction of survivors of the Yaan earthquake.
H6: The positive effect of structural social capital on life satisfaction are mediated by cognitive social capital.
H7: Depression has negative effect on life satisfaction.
H8a: Disaster impact has negative effect on social association.
H8b: Disaster impact has negative effect on sense of community.
H8c: Disaster impact has negative effect on trust.
H8d: Disaster impact has negative effect on social connectedness.
H8e: Disaster impact has positive effect on depression.
H8f: Disaster impact has negative effect on life satisfaction.
H9a: Social association has positive effects on sense of community.
H9b: Social association has positive effect on trust.
H9c: Social association has positive effect on social connectedness.
H10a: Sense of community has negative effect on depression.
H10b: Trust has negative effects on depression.
H10c Social connectedness has negative effect on depression.
H11a: Sense of community has positive effect on life satisfaction.
H11b: Trust has positive effect on the life.
H11c: Social connectedness has positive effect on life satisfaction.
H12: Depression has negative effect on life satisfaction.

The Hypotheses 1a to 7 are summarized in Fig. 1, which treat cognitive social capital as a single variable. Hypotheses 8a to 11c are summarized in Fig. 2, which treat cognitive social capital as three individual variables: sense of community, trust and social connectedness.

Methods

Research Participants

The Yaan earthquake occurred on April 20, 2013. The center of the earthquake, which measured 7.0 on the Richter scale, was near Lushan County, Yaan, Sichuan Province, China. As a result of the earthquake, 196 people died, 21 went missing, and 11,470 were injured (China Earthquake Administration 24/04/2013). Furthermore, 26,411 buildings collapsed and 142,449 were severely damaged (Caixin April 21, 2013a). The total economic loss was estimated at USD 6.9 billion (Caixin April 24, 2013b). The areas affected by the Yaan earthquake were also previously hit and damaged by the Wenchuan earthquake. The epicenter of Lushan County was one of 41 counties severely affected by the Wenchuan earthquake (Ministry of Civil Affairs 2008).

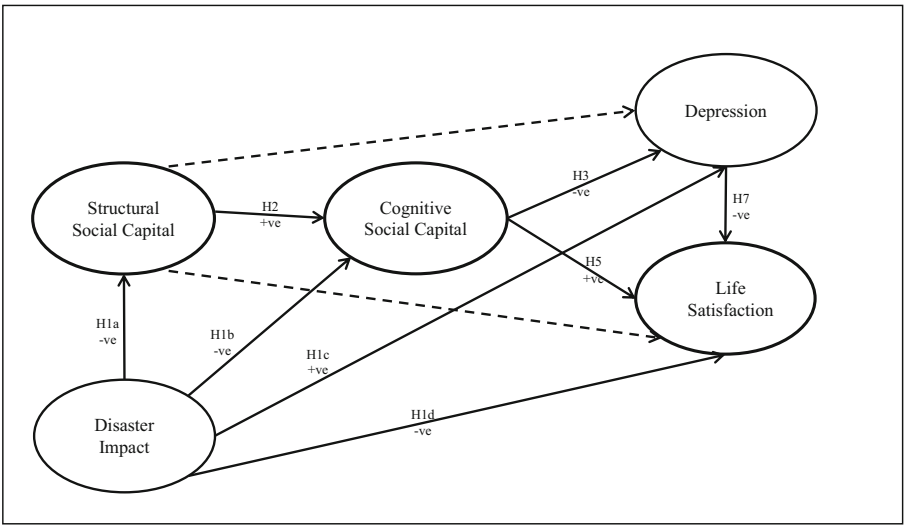


Fig. 1 Hypothesized structural model 1: Mediation of cognitive social capital for impacts of structural social capital on depressions and life satisfaction

In order to understand the impact of the earthquake and its interaction with social (social capital, community resilience), psychological (personal resilience), economical (financial strain), and political (satisfaction over relief work) factors on psychological status of the survivors of the Yaan earthquake, the authors designed a survey to measure these effects with reference to major indexes developed above. Participants in this research were aged 18 years or more, and were survivors of the 2013 Yaan earthquake. The survey was conducted in four communities in Lushan County, the epicenter of the earthquake, as mentioned. The communities were purposely selected as the researchers could gain access to them. Furthermore, residents could be contacted through the social

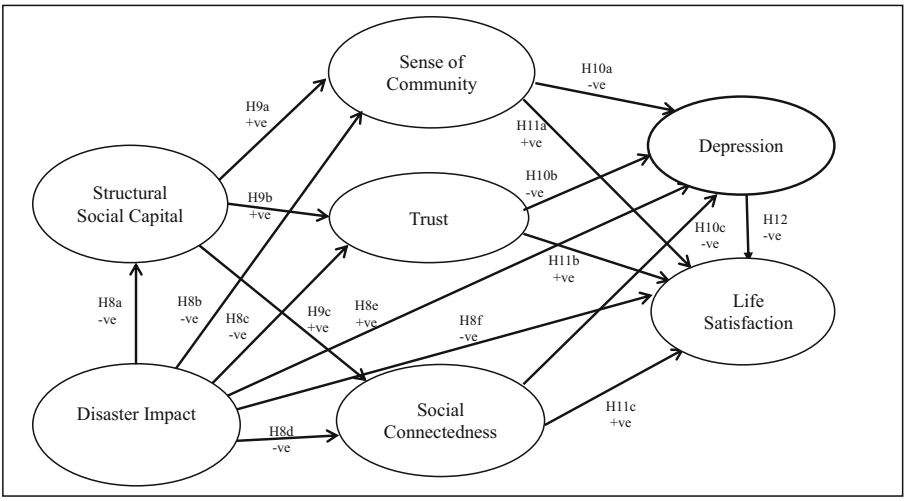


Fig. 2 Hypothesized structural model 2: Mediation of sense of community, trust, & social connectedness for impacts of structural social capital on depressions and life satisfaction

welfare agencies working in these communities. A non-probability sampling method was employed based on time and resource constraints. Moreover, obtaining a full list of residents is impractical in probability sampling. Therefore, no response rate could be calculated. The researchers approached and interviewed people mainly in the activity rooms of social work agencies and in respondents' homes. Among the 520 questionnaires collected (67.9% female), 495 completed questionnaires were confirmed as valid cases.

Procedures

The data was collected in June 2014 through face-to-face interviews using a questionnaire written in Chinese. Eight interviewers, each having either a bachelor or master's degree in social work or sociology and able to speak local dialects, were recruited and trained to conduct the interviews. Among the 495 completed questionnaires, around 70 were either completely or partly filled out by the respondents according to their preference. The interviewers checked all self-completed questionnaires for completeness. Each interview lasted approximately 25 to 45 min.

Data collection was conducted after the Social and Behavioural Research Ethics Committee of the second author's university approved the study. The researchers instructed the interviewers to stop asking questions and focus on participants' emotional needs when respondents reacted by crying or similar. Before the interview, informed oral consent was obtained from the participants, because of the unfamiliarity of the culture when dealing with written consent. The interviewers informed participants that they could quit at any time during the interview. The anonymity and confidentiality of replies were also emphasized to encourage honest responses.

Measures

Disaster impact was measured by using a three-item scale developed by the authors to measure the extent of negative impact of disaster on the survivors. The first item "Relative or friend injured/died" was measured by the question "Whether your relative or friend injured or died in the earthquake". Participants' responses were classified in a logical scale (0 = No, 1 = Relative or friend injured or died). The second item "Family member injured/died" was measured by the question "Whether your family member injured or died in the earthquake", with similar logical scale of the first item. The third item "Life Threatened" was measured by the question "Do you feel that your life was threatened in the earthquake". Participants rated this item in a logical scale (0 = No, 1 = Yes). In this research, Cronbach's alpha for disaster impact was 0.49.

Structural social capital was measured using the five-item Social Association Scale, which was adapted from the Social Network and Association Scales developed by Wang et al. (2014). The original scale includes four aspects of social networks and association in the community: size of social network (2 items), broad connection (2 items), assistance from and trust in workmates (2 items), assistance from group and association (1 item), and interest representation of group and association (1 item). The item "trust in workmates" was removed from this scale and added to another that measures trust. The two items on the size of the social network were dropped after the confirmatory factor analysis (CFA) test in the structural equation modeling (SEM)

model, because the loading weight was too low. We renamed the five-item scale the Social Association Scale, because it excluded the items on social network. Examples of the five items are as follows: "Among cultural, recreational, and leisure groups/organizations in your community, how many possess broad social connection?" "How many of these groups or organizations will help you if you ask?" Participants rated the items on a five-point Likert scale (for the items about size: 1 = a few, 2 = less than average, 3 = average, 4 = more than average, and 5 = a lot. For other items: 1 = none, 2 = a few, 3 = some, 4 = most, and 5 = all). A higher score on the Social Association Scale means more and stronger association in the community and higher structural social capital. In this research, Cronbach's alpha for structural social capital (Social Association Scale) was 0.78.

Cognitive social capital was measured according to respondents' perception of three aspects, namely sense of community, trust, and social connectedness.

Sense of community was defined as "a feeling members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (McMillan and Chavis 1986, 9). This was measured by employing the eight-item Brief Sense of Community Scale (BSCS), which was designed to assess the dimensions of needs fulfillment, group membership, influence, and emotional connection defined in the model by McMillan and Chavis. Following the recommendations by Peterson et al. (2006), positively worded items were included in the BSCS. All items were designed to refer to respondents' neighborhoods, and a five-point Likert response format ranging from "1 = strongly disagree" to "5 = strongly agree" was used. The scale was translated into Chinese and validated in previous research on survivors of the Wenchuan earthquake by Huang and Wong (2014). Item 5, "I have a say about what goes on in my neighborhood," was dropped after the CFA test in the SEM model, because it did not construct the concept well and had a low loading weight. In this research, Cronbach's alpha for sense of community was 0.84.

Trust was measured using two items, namely trust in general and trust in co-workers. In this research, Cronbach's alpha for trust was 0.46, as the scale combined the measurement of two dimensions of trust—general trust and trust in co-workers. Although the reliability of the scale is low, it is acceptable for measuring trust based on its face validity.

Social connectedness is considered an attribute of the self that reflects cognitions of enduring interpersonal closeness with the social world. Lee and Robbin (1995) characterized social connectedness as a type of relational schema or "cognitive structure representing regularities in patterns of interpersonal relatedness." The Social Connectedness Scale (SCS) developed by Lee and Robbin (1995) measures three aspects of belongingness, namely connectedness (4 items), affiliation (3 items), and companionship (1 item). Examples of the items are as follows: "Even among my friends, there is no sense of brother/sisterhood." "I do not feel related to anyone." The Chinese version used was translated by the authors. Participants rated the items on a six-point Likert scale (1 = strongly agree and 6 = strongly disagree). A higher score on the SCS means that respondents have a higher level of connectedness, affiliation, and companionship. Cronbach's alpha for the scale was .86 in this research.

Depression was measured using the ten-item Center for Epidemiologic Studies Depression Scale (CES-D). The Chinese version of the CES-D used in this study

was translated and validated by Wong (2009). Participants rated items on a four-point Likert scale (1 = seldom or never, 2 = now or then, 3 = regular, 4 = often). Research indicated that the 10-item CES-D could be used in lieu of the 20-item version (Cheng and Chan 2005; Zhang et al. 2012). Cronbach's alpha for the scale was 0.86 in this research.

Life satisfaction was measured using the five-item Satisfaction with Life Scale (SWLS) developed by Diener et al. (1985). The Chinese version of the SWLS translated by Shek (1998) was utilized. The respondents were asked to indicate their degree of agreement with each item on a six-point Likert scale ranging from "1 (strongly disagree)" to "6 (strongly agree)." The Chinese version of the SWLS demonstrated good reliability and validity in previous studies (e.g., Huang 2012; Huang and Wong 2014; Sachs 2003; Shek 1998). In this research, Cronbach's alpha for the SWLS scale was 0.78.

Data Analyses

An SEM analysis was employed to test the hypothesized models. SEM is theory driven and uses multiple measures for each latent construct to reduce measurement error in individual indicators, which increases the accuracy of results (Kline 2015). Given our a priori model, confirmatory SEM analysis assisted with model fit. Second, SEM was used to test specific hypothesized directional relations among the latent constructs for overall model fit. Although several models with good fit were run, the most parsimonious using our specified indicators was adopted as the final model. A sample size of 200 was determined as sufficient to detect relatively conservative estimates using SEM (Kline 2015). The present model was assessed using various model fit indices recommended by Hu and Bentler (1998, 1999) for maximum-likelihood based models. These were the Tucker-Lewis Index (TLI) (values close to or greater than .95), Comparative Fit Index (CFI) (values close to or greater than .95), standardized root-mean-square residual (SRMR) (values less than or equal to .08), and the root-mean-square error of approximation (RMSEA) (less than or equal to .06). The model was refined by referring to the modification indices. A few pairs of error terms under the same first-order factors were covaried. We assessed mediation by testing direct and indirect effects between depression and 1) structural social capital and 2) cognitive social capital. We also assessed mediation by testing direct and indirect effects between life satisfaction and 1) structural social capital, and 2) cognitive social capital, and 3) depression. In the first SEM model, the latent variable of cognitive social capital was modeled as a single latent variable with three scales: sense of community, trust, and social connectedness. In the second SEM model, cognitive social capital was modeled as three latent variables: sense of community, trust, and social connectedness.

Results

Descriptive Findings

As seen in Table 1, the final sample consisted of 495 survivors (67.9% female) aged between 18 and 92 years (M = 50.84, SD = 16.57). Most were not well educated, with

Table 1 Participant demographic characteristics ($N = 495$)

Variables	%	M (SD)	Range
Gender			
Male	32.1	–	–
Female	67.9	–	–
Age	–	50.84(16.57)	18–92
Marital Status			
Married	83.0	–	–
Single	6.9	–	–
Widowed	9.1	–	–
Divorced	1.0	–	–
Years of formal education	–	6.27(3.78)	0–17
Self-perceived health			
Very poor	4.4	–	–
Poor	15.6	–	–
Neutral	39.6	–	–
Good	25.5	–	–
Very good	14.9	–	–
Disaster Impact (life threaten in the earthquake)			
No	23.8		
Yes	76.2		
Disaster impact (death or injury of friends)			
No	74.9		
Yes	25.1		
Disaster impact (death or injury of family members)			
No	87.5		
Yes	12.5		

an average of 6.27 years of formal education. Furthermore, 83% indicated that they were married, and 9.1% were widowed. The self-perceived health condition of the respondents was very poor (4.4%), poor (15.6%), neutral (39.6%), good (25.5%), or very good (14.9). Among the survivors, 76.2% indicated that their lives had been threatened, 25.1% reported injury/death of friends/relatives and 12.5% reported injury or death of family members. The descriptive findings for the latent variables are summarized in Table 2. Table 3 provides the correlations of these variables.

We used AMOS 22 to test hypotheses 1a to 7 by building the first SEM (Model 1), in which disaster impact was defined as an exogenous factor and structural social capital, cognitive social capital, depression, and life satisfaction as endogenous factors (see Fig. 1). To further investigate the impacts of different components of cognitive social capital on depression and life satisfaction, we constructed the second model (Model 2), in which disaster impact was defined as an exogenous factor and structural social capital, sense of community, trust, social connectedness, depression, and life satisfaction as endogenous factors (see Fig. 2).

Table 2 Descriptive statistics for latent variables (N = 495)

Variables	Scale Reliability (Cronbach's α)	M(SD)	Range
1. Disaster Impact	.49	1.14(0.84)	0–3
2. Structural Social Capital	.78	12.48(4.45)	5–23
3. Sense of Community	.84	25.95(4.63)	9–35
4. Trust	.46	7.41(1.32)	2–10
5. Social Connectedness	.86	28.75(8.47)	0–40
6. Cognitive Social Capital	.67	25.53(5.14)	9–32
7. Depression	.86	9.10(6.24)	0–28
8. Life Satisfaction	.78	20.23(5.54)	5–30

Final Model 1: Cognitive Social Capital as a Single Latent Variable

The results indicated an acceptable model fit for Final Model 1, which treated cognitive social capital (CSC) as a single latent variable: $\chi^2 = 1133.661$ (df = 699, $p < .001$), $\chi^2/df = 1.622$, TLI = .934, CFI = .940, SRMR = .0590, RMSEA = .035 (.032–.039), PCLOSE =1. Specifically, final Model 1 explained 15% of the variance of CSC, 24% of depression, and 36% of life satisfaction (see Fig. 3).

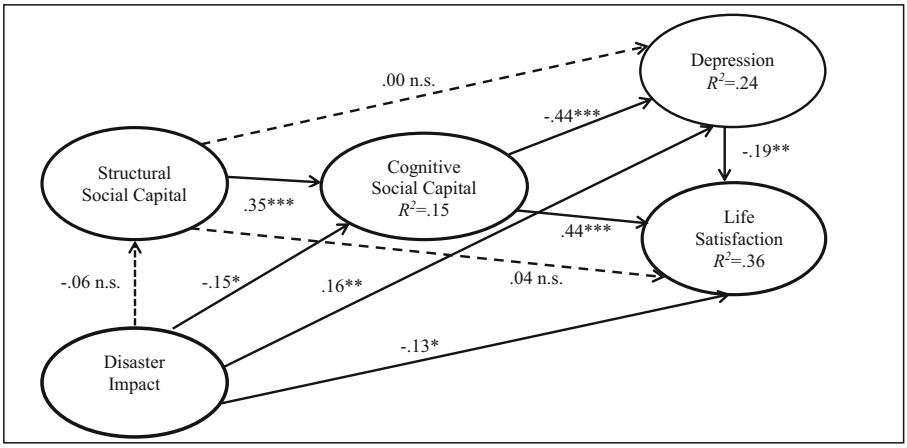
Table 4 summarizes data for the total, direct, and indirect effects of major variables on depression (DEP) and life satisfaction (LS) by bootstrap test (two tailed significance BC) in the Final Model 1. The model showed that disaster impact did not have significant total effect on structural social capital (SSC) (β = −.274, $p = .258$) and cognitive social capital (CSC) (β = −.360, $p = .258$). Hypotheses 1a and 1b were rejected. Disaster impact had positive total effect on depression (β = .16, $p < .01$) and negative total effect on life satisfaction (β = −.13, $p < .05$). Hypotheses 1c and 1d, which postulated the negative effect of disaster impact on CSC, positive effect on depression and positive effect on life satisfaction were supported.

Table 3 Matrix of correlation coefficients (N = 495)

Variable	1	2	3	4	5	6	7	8
1. Disaster Impact	–							
2. Structural Social Capital (Social network)	−.04	–						
3. Sense of community	−.06	.24**	–					
4. Trust	−.17**	.19**	.49**	–				
5. Social connectedness	−.06	.24**	.37**	.31**	–			
6. Cognitive Social Capital	.01	.24**	.41**	.41**	.23**	–		
7. Depression	.21**	−.17**	−.36**	−.34**	−.32**	−.24**	–	
8. Life satisfaction	−.18**	.20**	.44**	.29**	.11*	.27**	−.38**	–

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)



Note: * p <0.05 **p <0.01 ***p<0.001

Fig. 3 Final model 1: cognitive social capital as one latent variable

SSC had a positive effect on CSC (β = .35, $p < .001$) so Hypothesis 2 was supported. CSC had a negative effect on depression (β = −.44, $p < .001$) and positive effect on life satisfaction (β = .44, $p < .001$) so Hypotheses 3 and 5 were respectively supported. The direct effect of SSC on depression and life satisfaction were both insignificant.

SSC had no direct effect on DEP (β = .003, $p = .907$), but did demonstrate a negative indirect effect on DEP (β = −.160, $p = .004$). Furthermore, CSC had a negative total effect (β = −.682, $p = .007$) and direct effect on DEP (β = −.682, $p = .007$). As such, Hypothesis 4, which postulates that the negative effect of SSC on DEP is mediated by CSC, was supported. Moreover, as SSC had no direct effect on DEP, CSC fully mediated the effect of SSC on DEP.

The results also confirmed that CSC had a positive total effect (β = .862, $p = .007$) and positive direct effect (β = .729, $p = .041$) on LS. Thus, Hypothesis 5 that CSC has positive effect on LS was supported.

While SSC had no direct effect on LS (β = .033, $p = .363$), it had a positive indirect effect (β = .185, $p = .006$) and a positive total effect on LS (β = .172, $p = .005$). Therefore, Hypothesis 6, which states that the positive effect of SSC on LS is mediated by CSC, was supported. Moreover, as SSC had no direct effect on LS, CSC fully mediated the effect of SSC on LS.

In Final Model 1, DEP had a negative total effect on LS (β = −.195, $p = .016$). Hypothesis 7, which postulates that DEP has negative effect on LS among survivors of the Yaan earthquake, was supported (Fig. 4).

Final Model 2: Cognitive Social Capital as Three Latent Variables

For Final Model 2, in which CSC was treated as three latent variables: sense of community, trust and social connectedness, the model fit was acceptable: $\chi^2 = 1133.661$ (df = 699, $p < .001$), $\chi 2/df = 1.621$, TLI = .934, CFI = .940, SRMR = .058, RMSEA = .035 (0.32–.039), PCLOSE =1. Model 2 explained 11% of the variance of

Table 4 Total effect, direct and indirect of structural social capital and cognitive social capital on depression and life satisfaction in SEM Model 1

	Total Effect		Direct Effect		Indirect Effect	
		Bootstap Two Tailed Significance (BC)		Bootstap Two Tailed Significance (BC)		Bootstap Two Tailed Significance (BC)
Disaster Impacts ➜ Structural Social Capital	−.274	$p = .258$	−.274	$p = .258$	.000	–
Disaster Impacts ➜ Cognitive Social Capital	−.360	$p = .258$	−.316	$p = .020$	−.044	$p = .191$
Disaster Impacts ➜ Depression	.780	$p = .006$	.535	$p = .041$	.245	$p = .008$
Disaster Impacts ➜ Life Satisfaction	−.898	$p = .006$	−.474	$p = .092$	−.424	$p = .006$
Structural Social Capital ➜ Depression	−.107	$p = .018$	.003	$p = .907$	−.160	$p = .004$
Structural Social Capital ➜ Life Satisfaction	.172	$p = .005$	.033	$p = .363$	.185	$p = .006$
Cognitive Social Capital ➜ Depression	−.682	$p = .007$	−.682	$p = .007$	.000	–
Cognitive Social Capital ➜ Life Satisfaction	.862	$p = .006$	.729	$p = .041$	.088	$p = .006$
Depression ➜ Life Satisfaction	−.195	$p = .016$	−.195	$p = .016$	.000	–

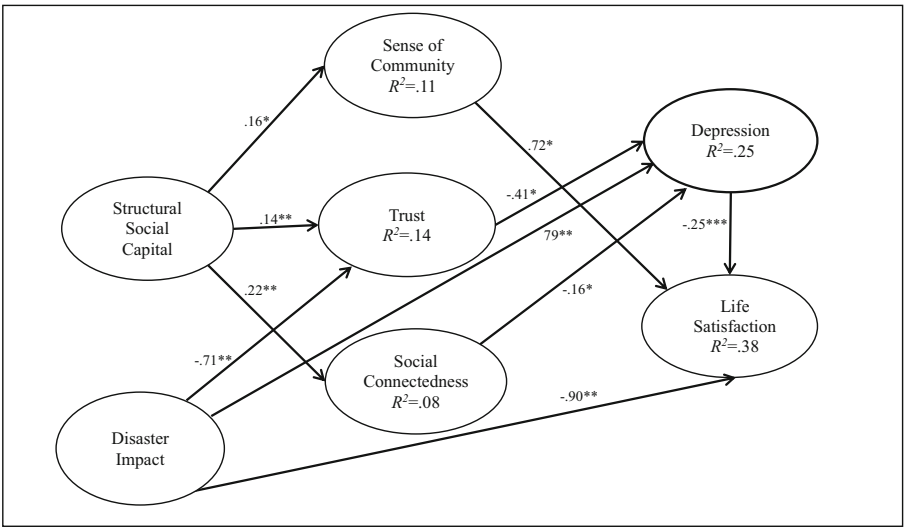


Fig. 4 Final Model 2: cognitive social capital as three latent variables

sense of community, 14% of trust, 8% of social connectedness, 25% of depression, and 38% of life satisfaction.

Table 5 summarizes data for the total, direct, and indirect effect of major variables on depression (DEP) and life satisfaction (LS) by bootstrap test (two tailed significance BC) in the Final Model 2. The results for Model 2 confirmed that disaster impact did not have significant total effect on SSC (β = −.275, p = .258), sense of community (β = −.273, p = .068), and social connectedness (β = −.248, p = .227), Hypotheses 8a, 8b

Table 5 Total effect, direct and indirect of structural social capital, sense of community, trust and social connectedness on depression and life satisfaction in SEM Model 2

	Total Effect		Direct Effect		Indirect Effect	
Disaster Impact ➔ Trust	−.373	p = .005	−.670	p = .009	−037	p = .163
Disaster Impact ➔ Depression	.784	p = .018	.442	p = .279	.342	p = .009
Disaster Impact ➔ Life Satisfaction	−.904	p = .005	−.534	p = .060	−.370	p = .008
Structural Social Capital ➔ Sense of Community	.159	p = .015	.159	p = .015	.000	–
Structural Social Capital ➔ Trust	.136	p = .005	.136	p = .005	.000	–
Structural Social Capital ➔ Social Connectedness	.217	p = .007	.217	p = .007	.000	–
Structural Social Capital ➔ Depression	−.107	p = .018	−.012	p = .812	−.096	p = .009
Structural Social Capital ➔ Life Satisfaction	.173	p = .005	.061	p = .088	.113	p = .008
Sense of Community ➔ Depression	−.026	p = .985	−.026	p = .985	.000	–
Sense of Community ➔ Life Satisfaction	.726	p = .050	.719	p = .049	.007	p = .935
Trust ➔ Depression	−.411	p = .025	−.411	p = .025	.000	–
Trust ➔ Life Satisfaction	.073	p = .785	−.038	p = .905	.112	p = .023
Social Connectedness ➔ Depression	−.164	p = .021	−.164	p = .021	.000	–
Social Connectedness ➔ Life Satisfaction	−.072	p = .279	−.116	p = .128	.045	p = .024
Depression ➔ Life Satisfaction	−.195	p = .016	−.195	p = .016	.000	–

and 8d were rejected. Disaster impact had significant negative total effect on trust (β = −.708, $p = .005$) and LS (β = −.904, $p = .006$), while it had positive total effect on DEP (β = .784, $p = .005$). Thus, Hypotheses 8c, 8e and 8f were supported.

The results of Model 2 also indicated that SSC had significant total effects the on the three components of cognitive social capital: sense of community (β = .159, $p = .015$), trust (β = .136, $p = .005$), and social connectedness (β = .217, $p = .007$); Hypothesis 9a, 9b, and 9c were thus supported.

Sense of community had no total effect on DEP (β = −.026, $p = .985$). Thus, Hypothesis 10a was rejected. Rather, trust had negative total effect on DEP (β = −.411, $p = .025$), supporting Hypothesis 10b. Furthermore, social connectedness had a negative total effect on DEP (β = −.164, $p = .021$), supporting Hypothesis 10c. In short, while trust and social connectedness had negative effects on depression, sense of community did not have a significant effect on depression.

For LS, Final Model 2 showed that sense of community had a positive total effect (β = .726, $p = .050$) and positive direct effect (β = .719, $p = .049$), supporting Hypothesis 11a. Trust had no significant total effect (β = .073, $p = .785$) and no direct effect on LS (β = .038, $p = .905$), but had a positive indirect effect via DEP on LS (β = .112, $p = .023$). Thus, Hypothesis 11b was rejected. Social connectedness had no significant negative total effect on LS (β = −.072, $p = .279$) and no significant negative direct effect on LS (β = −.116, $p = .128$), as well as no significant positive indirect effect on LS via DEP (β = .045, $p = 0.24$). As such, Hypothesis 11c was rejected. In Final Model 2, DEP had a negative total effect on LS (β = −.195, $p = .016$). Hypothesis 12, which postulates that DEP had negative effect on LS among survivors of the Yaan earthquake, was supported.

In short, while sense of community had positive total and direct effect on life satisfaction, trust did not have direct effect but had indirect positive effect on life satisfaction via the effect on depression. On the contrary, social connectedness had no total and no indirect effect on life satisfaction.

Discussion

Using the data of survivors at Yann earthquake, we confirmed that the disaster impact induced by the earthquake had negative effects on cognitive social capital but not structural social capital of the survivors. Disaster impact also directly influenced depression and life satisfaction. We kept disaster impact in both SEM models as a control variable to delineate the effects of disaster impact on the dependent variables (structural social capital and cognitive social capital) and independent variables (depression and life satisfaction).

In a community affected by disaster, the impact of the disaster on social capital can vary. On the one hand, a disaster that brought about loss of lives and damaged infrastructure limited the association and participation of survivors and decreased their structural social capital. On the other hand, a large disaster might enable people to form new social capital, which is necessary for collective action to cope with the effects of the disaster (Yamamura et al. 2015). Therefore, a disaster may lead to a lower level of structural social capital, but at the same time may stimulate a higher level of cognitive social capital among survivors. The specific context of

the disaster-affected community contributes to the different mediator roles of cognitive social capital in different communities.

In the case of Yaan, the disaster impact did not lead to a lower level of structural social capital but lead to a higher level of cognitive social capital. Firstly, it may due to the fact that Yaan also experienced the Wenchuan earthquake in 2008, which had already lowered the social association among residents in Yaan. Secondly, in the Yaan earthquake, the loss of lives and damage to property and infrastructure were moderate, while the negative effects on structural social capital before and after the disaster were limited. Therefore, the influence of social capital on mental health was made through the impact of cognitive social capital, but not the impact on structural social capital in the case of Yaan. It echoes the case of Britain described by Wind and Komproe (2012).

We associated cognitive social capital with the lower depression and higher life satisfaction of survivors of the Yaan earthquake, which echoes the general observations of previous researchers (Harpham 2008; Villalonga-Olives, and Kawachi, I 2015). De Silva et al. (2007) argued that the impacts of structural social capital on mental health are mixed and culturally specific. In the context of the aftermath of a major disaster, individuals' perceptions of the social network (cognitive social capital), rather than the social network per se, significantly impacts the psychological status of survivors.

In this study, we found that structural social capital significantly impacts cognitive social capital, and in turn, cognitive social capital significantly impacts the depression and subjective life satisfaction of Yaan earthquake survivors. The confirmation of Hypotheses 4 and 6 and the results implied that cognitive social capital fully mediates the impacts of structural social capital on depression and life satisfaction of the survivors of a disaster. The mediation effect of cognitive social capital explains its association with better mental health, while the association between structural social capital and mental health outcomes is ambiguous (De Silva et al. 2005; Harpham 2008). These results suggest that structural social capital influences the psychological status of disaster survivors through the pathway of cognitive social capital.

Other than treating cognitive social capital as a single variable, we further examined the mechanism and dynamics of the impacts of three components of cognitive social capital, namely sense of community, trust, and social connectedness, on the psychological status of survivors of the disaster. We positively associated sense of community with life satisfaction, but not with depression. Furthermore, trust is negatively associated with depression, but not with life satisfaction. We also negatively associated social connectedness with depression.

Wind et al. (2011) found that feelings of cohesiveness may protect survivors of a disaster against depression. Our results suggest that we should distinguish between different types of feelings of cohesiveness and its impacts on depression. Only social connectedness can protect survivors of a disaster against depression, while sense of community cannot achieve this protective function. Our results clarify the unclear findings on the association between social connectedness and depression by Santini et al. (2015). The protective function of trust on depression is even stronger than that of social connectedness. Having a trusting relationship and being connected to a cognitive structure are key for survivors of a disaster to decrease the risk of depression.

Sense of community has the greatest positive effect on life satisfaction of the three components of cognitive social capital. The effect of sense of community on life satisfaction occurs mainly through the direct path. While the Final Model 2

accounts for 38% of the variance of life satisfaction, sense of community accounts for 16% of the variance of the life satisfaction of survivors. Ditchman et al. (2016) attained similar results. They found that sense of community contributed to 11% of the variance in the life satisfaction of adults with brain injuries. Thus, improving the sense of community seems an effective strategy in improving the life satisfaction of the survivors of a disaster.

For survivors of the Yaan earthquake, trust has a less positive effect on life satisfaction, and this effect occurs indirectly via depression. Our results echoed those of Yamamura et al. (2015) for the Great East Japan earthquake in 2011. They argued that social trust was a substitute for formal institutions and markets, which mitigated the effect of disaster-related shock on psychological conditions such as happiness. Our results highlight that this can be attributed to the protective function of trust against depression for survivors, which indirectly contributes to the positive effect of trust on subjective well-being (life satisfaction and happiness). However, further research is needed to examine this mechanism and dynamic.

Implications

The above results indicate that for survivors of the Yaan earthquake, the impacts of structural social capital on depression and life satisfaction are fully mediated by cognitive social capital. These findings have important practical implications for service agencies and civic organizations responsible for disaster relief and recovery. In facing the impacts of a disaster on the psychological status of survivors, it is more effective and efficient to enhance cognitive social capital (i.e., sense of community, trust, and social connectedness) of the community than merely rebuilding structural social capital (formal membership of civic groups or association) as remedial measures. Building and maintaining cognitive social capital in a disaster-affected community can effectively lower the adverse impacts of depression and improve the life satisfaction of residents in the aftermath of the disaster. Frontline workers can help survivors build cognitive social capital by forming shared values in the community and creating norms of behavior through group work. However, we also found that cognitive social capital is a consequence of structural social capital. Therefore, building structural social capital (e.g., by facilitating the formation of social association and networks) in the pre-disaster phase is an effective long-term strategy to develop cognitive social capital, which prevents and mitigates the negative impacts of a disaster.

Our results imply that of the three components of cognitive social capital, workers and volunteers in disaster management should pay attention to maintaining and improving trust and social connectedness in the community in the pre-disaster and disaster relief phases to lower the risk of depression among survivors. Given that three components of cognitive social capital affect depression and life satisfaction through different mechanisms, workers may adopt distinct strategies to help survivors when reducing their risk of depression or aiming to increase their life satisfaction.

In the reconstruction and rehabilitation phase after the disaster, workers should facilitate the formation of the sense of community of the reconstructed or new community after the rebuilding or relocation process, as this affects the long-term life satisfaction of survivors. Workers should pay attention to survivors who demonstrate a low level of social connectedness, especially relatives and friends barely impacted in

the disaster, which may have higher level of depression. Workers can help them to build social connectedness with new social networks through leisure and group activities to protect them from being depressed. This supports the recommendation of Huang and Wong (2013), namely that groups and activities like recreational and informal social functions, which facilitate the connectedness of survivors at risk of depression, can effectively decrease the possibility of their isolation and loneliness and thus, reduce their risk of depression.

Conclusion

Our research confirms the importance of cognitive social capital for disaster survivors. The study revealed that the impact of structural social capital on depression and life satisfaction is fully mediated by cognitive social capital. This study deepens understanding of the impacts of cognitive social capital on depression and life satisfaction by specifying the impacts of three components, namely sense of community, trust, and social connectedness. For disaster survivors, a sense of community has a direct and significant positive effect on life satisfaction, trust has a direct and significant negative effect on depression, and social connectedness has a negative effect on depression. These findings provide new insights and significant practical implications for disaster workers in helping survivors.

Limitations and Future Research Opportunities

This research had several limitations. First, the participants were residents of four towns affected by the earthquake. The sample was small and not randomly selected. As such, the generalizability of the findings is limited. Future studies may apply random sampling and include research participants from more areas. Second, this study was cross-sectional. It prohibited a conclusion on the directionality of relationships. Future studies with a qualitative or longitudinal design with repeated surveys may help establish causal relationships. Third, this research applied a self-reported measure that could reflect reporting biases or personal bias such as those related to social desirability. In this regard, future studies using other measures should be conducted. Fourth, the construction of structural social capital and cognitive social capital is an initial attempt in the Chinese context, and further validation of these scales using different respondents is needed. Future studies can expand the current scale and include more items to develop a more comprehensive scale to examine the relationship with psychological status among survivors of a disaster.

Despite the limitations, this research was pioneering, given that no research examines the mediation effect of cognitive social capital on the effects of structural social capital on the psychological status of survivors of a disaster. Furthermore, no other studies delineate the impacts of the three components of cognitive social capital, namely sense of community, trust, and social connectedness. For future studies, we can focus on how the different components of cognitive social capital interact with individual factors such as resilience and cultural beliefs. This could provide a more comprehensive and sophisticated model to determine the psychological status of survivors of a disaster.

Compliance with Ethical Standards

Conflict of Interest The authors declare that there is no potential conflicts of interest with the journal *Applied Research in Quality of Life*.

Ethical Approval It is a research involving Human Participants and it gained ethic approval from the second author's institution.

Informed Consent The survey gained informed consent verbally from the respondents.

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