



BASIC RESEARCH ARTICLE



# Perceived social support, emotional self-disclosure, and posttraumatic growth in children following a typhoon: a three-wave cross-lagged study

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## ABSTRACT

**Objective:** We aimed to elucidate the temporal relationship between perceived social support, emotional self-disclosure and posttraumatic growth (PTG) in children.

**Method:** The super typhoon Lekima occurred on August 10, 2019, in China. Three waves of self-report questionnaires were administered to children at 3 months (T1,  $N=1596$ ), 15 months (T2,  $N=1072$ ), and 27 months (T3,  $N=483$ ) following the typhoon. The main analysis was based on data from 351 children who completed all three waves of assessment. We constructed cross-lagged panel models to examine temporal associations between perceived social support, emotional self-disclosure, and posttraumatic growth.

**Results:** Controlling for trauma exposure, age, gender, monthly income of family and parental marital status, results revealed that perceived social support at T1 and T2 was longitudinally related to emotional self-disclosure and PTG at T2 and T3. Emotional self-disclosure at T1 and T2 positively connected with perceived social support and PTG at T2 and T3. However, PTG did not relate to subsequent perceived social support. Mediation analyses revealed that perceived social support at T1 was positively connected with PTG at T3 through emotional self-disclosure at T2, and that emotional self-disclosure at T1 was positively connected with PTG at T3 through perceived social support at T2.

**Conclusions:** These results demonstrated that perceived social support and emotional self-disclosure were mutually reinforcing, and both could facilitate PTG among children. Post-disaster psychological interventions could work to enrich social support resources and encourage children's emotional self-disclosure.

## Apoyo social percibido, autorrevelación emocional y crecimiento postraumático en niños tras un tifón: un estudio longitudinal de tres olas con modelo de panel cruzado diferido

**Objetivo:** Nuestro objetivo fue esclarecer la relación temporal entre el apoyo social percibido, la autorrevelación emocional y el crecimiento postraumático (PTG, por sus siglas en inglés) en niños.

**Método:** El supertifón Lekima ocurrió el 10 de agosto de 2019 en China. Se administraron cuestionarios de auto-reporte a los niños en tres momentos: a los 3 meses (T1,  $N=1596$ ), 15 meses (T2,  $N=1072$ ) y 27 meses (T3,  $N=483$ ) después del tifón. El análisis principal se basó en datos de 351 niños que completaron las tres evaluaciones. Construimos modelos de panel cruzado diferido para examinar las asociaciones temporales entre el apoyo social percibido, la autorrevelación emocional y el crecimiento postraumático.

**Resultados:** Controlando la exposición al trauma, la edad, el género, el ingreso mensual familiar y el estado civil de los padres, los resultados revelaron que el apoyo social percibido en T1 y T2 se relacionó longitudinalmente con la autorrevelación emocional y el PTG en T2 y T3. La autorrevelación emocional en T1 y T2 se asoció positivamente con el apoyo social percibido y el PTG en T2 y T3. Sin embargo, el PTG no se relacionó con el apoyo social percibido posterior. Los análisis de mediación mostraron que el apoyo social percibido en T1 estaba positivamente relacionado con el PTG en T3 a través de la autorrevelación emocional en T2, y que la autorrevelación emocional en T1 se asoció positivamente con el PTG en T3 a través del apoyo social percibido en T2.

**Conclusiones:** Estos resultados demostraron que el apoyo social percibido y la autorrevelación emocional se refuerzan mutuamente y que ambos pueden facilitar el PTG en los niños. Las intervenciones psicológicas posteriores a desastres podrían enfocarse en fortalecer los recursos de apoyo social y fomentar la autorrevelación emocional en los niños.

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## PALABRAS CLAVE

Apoyo social percibido; autorrevelación emocional; PTG; niños; modelo de panel cruzado diferido

## HIGHLIGHTS

- The study explored prospective associations of perceived social support, emotional self-disclosure, and posttraumatic growth using longitudinal data.
- Perceived social support and emotional self-disclosure had bidirectional associations and both can promote posttraumatic growth in children.
- Post-disaster psychological interventions could work to enrich social support resources and encourage children's emotional self-disclosure.

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## 1. Introduction

Major natural disasters could elicit posttraumatic reactions in children, such as posttraumatic stress symptoms, anxiety, and depression (Belleville et al., 2021; Pfefferbaum et al., 2015). In addition to these negative psychological reactions, studies have found that individuals who experienced natural disasters can resume normal functioning (Saeed & Gargano, 2022) and even exhibit better functioning than they did before the trauma (Marshall et al., 2020; Mesidor & Sly, 2019). Here, Tedeschi and Calhoun (2004) considered positive changes in self, interpersonal relationship, and philosophy of life as posttraumatic growth (PTG). PTG has been highlighted to be one of the typical positive psychological reactions after trauma (Amiri et al., 2021). Extant study has indicated a positive association or a nonsignificant relationship between PTSD and PTG among adolescents following trauma (Zhou et al., 2018). This suggested that positive health endpoints are not the opposite of negative endpoints (Zhou & Wu, 2022). Thus, while conducting research on PTSD, it is equally essential to prioritize studies on PTG, which represents the process of positive psychological changes following adversity.

Existing studies found that the prevalence of PTG in children was 60.2% 1 year after the Wenchuan earthquake (Zhou et al., 2018) and 46.13% 8.5 years after this disaster (Wu et al., 2018). Nevertheless, not all children exhibit PTG following natural disasters. Thus, understanding the factors that promote PTG is of theoretical and intervention importance. According to the model of thriving through relationships (Feeney & Collins, 2015), disclosure and perceived social feedback may promote thriving. Recent studies found positive associations between perceived social support, emotional self-disclosure and PTG (Mesidor & Sly, 2019; Zhen et al., 2022). Thus, the aim of this study was to examine the longitudinal relationships between perceived social support, emotional self-disclosure, and PTG in children following the typhoon Lekima.

### 1.1. Perceived social support and emotional self-disclosure may predict PTG

Perceived social support refers to the subjective experience of being respected, understood, and supported by others (Sarason et al., 1991). According to the model of thriving through relationships (Feeney & Collins, 2015), social support nurtures personal strength, helps in attaining new abilities, and promotes self-efficacy. Specifically, perceived social support relates to the experience of safety (Zhen et al., 2018), which can help individuals explore, understand, and accept the posttraumatic world (Tedeschi & Calhoun, 1996, 2004; Zhou et al., 2017). Accordingly,

studies have found that the effect of social support from family and friends on PTG was significant one year after an earthquake in children (Zhou et al., 2017). Nevertheless, the potential mechanism through which perceived social support influences PTG remains unclear.

Emotional self-disclosure is defined as the process of expressing emotional experiences about oneself or events to others (Berry & Pennebaker, 1993; Snell et al., 1988). The model of thriving through relationships emphasizes the potential mediating role of emotional self-disclosure in the relationship between perceived social support and positive psychological reactions (Feeney & Collins, 2015). It is suggested that social support encourages emotional communication (Zhen et al., 2018). To illustrate, when individuals perceive others' willingness to listen, understand, and support, they are more likely to express their emotions (Feeney & Collins, 2015). Zhen et al. (2018) found that social support can positively predicate self-disclosure after a flood in adults. Moreover, talking about emotional experiences may promote deliberate cognitive processing and integration of traumatic memories (Lee & Ahn, 2023; Zhou et al., 2017). Further, emotional self-disclosure could lead to regaining meaning (Pennebaker & Francis, 1996) and forming a more resilient self (Hemenover, 2003), which serve as potential processes in fostering PTG. For example, Lee and Ahn (2023) found that emotional self-disclosure promotion programmes can facilitate PTG in college students. In light of these, perceived social support may have an indirect effect on PTG through emotional self-disclosure. However, few studies investigated the temporal associations between perceived social support, emotional self-disclosure, and PTG in children, especially after natural disasters.

### 1.2. PTG may predict perceived social support and emotional self-disclosure

In contrast with the model of thriving through relationships, the action growth model (Hobfoll et al., 2007) suggests that PTG encourages survivors to actively seek help to cope with traumatic events. In addition, PTG brings about positive changes in interpersonal relationships (Tedeschi & Calhoun, 2004). Specifically, individuals may re-evaluate and adjust their values of interpersonal relationships and thus perceive more social support.

PTG could also encourage emotional exchange. In fact, emotional self-disclosure may offer opportunities for help and understanding (Rimé, 2009), generate a sense of belonging, intimacy (Levi-Belz, 2016), and trust (Lee & Ahn, 2023; Weber et al., 2004), and may be associated with higher perceived social support. Therefore, we hypothesized that PTG could influence

subsequent perceived social support through emotional self-disclosure.

### 1.3. The current study

Extant studies have several limitations. First, most studies used a cross-sectional design, making it difficult to reveal the longitudinal association between perceived social support, emotional self-disclosure, and PTG. The cross-lagged panel model (CLPM) can be used to examine the influence of variables in the longitudinal study (Orth et al., 2020). In the empirical researches, CLPM is one of the most commonly used methods to examine potential bidirectional temporal associations between constructs and it accommodates mediation analysis (Zhu et al., 2020). Second, while Feeney et al.'s (2015) model proposed that emotional self-disclosure may be a mediating mechanism of perceived social support predicting PTG, empirical evidence is scarce. Third, most studies focused on adults or adolescents (Ning et al., 2023), whereas associations between constructs could be different in children. In fact, children can be more susceptible to trauma given their developing cognitive and emotional capacities (Ferris & O'Brien, 2022). To address these gaps, we used a longitudinal design to examine the mediation role of emotional self-disclosure in the relationship of perceived social support and PTG in children. We hypothesized reciprocal associations between perceived social support and PTG and that emotional self-disclosure would serve as a mediator in their bidirectional relationship.

## 2. Methods

### 2.1. Participants and procedures

The super typhoon Lekima struck Wenling City, Zhejiang Province, China, on August 10, 2019. The typhoon was extremely strong in terms of wind speed, which reached 52 m per second near the centre. The typhoon caused significant loss of life and property, with 57 reported deaths, over 2 million citizens urgently relocated, and approximately 8.4 billion USD damages. This study focused on children who lived in the most severely impacted area of the typhoon (i.e. Wenling City). Ethical approval was obtained from Zhejiang University. The local educational institutions assisted in our recruitment process by selecting three primary schools to participate. All students were informed of the aim of the study and were free to decide whether to participate; they could also withdraw from the longitudinal assessment at any time. Written informed consent was obtained from both the participants and their guardians. Trained psychology postgraduate students supervised the assessment by reading the instructions, solving

students' questions, and providing counselling services to those who were in need.

We conducted three waves of assessment 3 (T1, November 2019), 15 (T2, November 2020), and 27 (T3, November 2021) months after Super Typhoon Lekima. 1596 children at T1, 1072 (67.17%) children at T2 and 483 (30.26%) children at T3 completed the self-report questionnaires. Main analysis was conducted with children who completed all three waves ( $N = 351$ ). Of the main analysis sample ( $N = 351$ ), 164 (46.72%) were boys, 162 (46.15%) were girls, and 25 (7.12%) did not report their gender. Mean age was 9.55 years ( $SD = 0.659$ ; range = 9–12 years), and 47 (13.39%) did not report their age. As for their parents' marital status, 316 (90.03%) lived with both parents, 23 (6.55%) lived with divorced parents, and 12 (3.42%) did not report their parents' marital status. As for monthly income of families, 74 (21.08%) had a monthly income <5000 RMB, 215 (61.25%) had a monthly income >5000 RMB while 90 (25.64%) reported a monthly income >10,000 RMB and 62 (17.66%) did not report their family income. A monthly income of 8047.25 RMB represents an average level in China (Chinese National Bureau of Statistics, 2021).

### 2.2. Measures

#### 2.2.1. Trauma exposure

Trauma exposure represents the severity of exposure to the traumatic scenario. Here, trauma exposure was assessed using a self-developed trauma exposure scale (Huang et al., 2024), which was adapted from other typhoon exposure scales and was used in previous studies (e.g. Chan & Rhodes, 2014; Hall et al., 2019). The scale showed excellent applicability for these studies. This scale comprises 10 items, including trapped, injured, deaths, witnessing others affected, and collapsing homes or other facilities. For example, 'I was injured during the typhoon Lekima'. All items were rated as 0 for 'no' or 1 for 'yes'. Higher total scores indicate more severe trauma exposure ranging from 0 to 10.

#### 2.2.2. Posttraumatic growth

PTG was assessed using a modified version of the Posttraumatic Growth Inventory (PTGI) (Zhou et al., 2015). This questionnaire had good reliability and validity in adolescents following natural disasters (e.g. Li et al., 2024; Sun et al., 2023; Zhou et al., 2015). In this study, items were rated on a six-point Likert scale from 0 (no change) to 5 (a very great degree of change), i.e. 'I found that I was stronger than I thought'. Participants were instructed to respond in accordance with their perceived positive changes following the Lekima typhoon and total score of scale was used. The scale exhibited high reliability and

construct validity at all three timepoints (T1/T2/T3: Cronbach's  $\alpha = 0.96/0.97/0.98$ ,  $\chi^2/df = 3.26/3.57/3.86$ ; the comparative fit index, CFI = 0.91/0.92/0.94; the Tucker–Lewis Index, TLI = 0.90/0.91/0.93; the root mean square error of approximation, RMSEA = 0.08/0.09/0.09; the standardized root mean square residual, SRMR = 0.04/0.04/0.04).

### 2.2.3. Emotional self-disclosure

Emotional self-disclosure was assessed by the Chinese version of Distress Disclosure Index (Zhen et al., 2018), which revised from Kahn and Hessling (2001). The scale consisted of 12 items revolving around the oral form, e.g. 'When I am in a bad mood, I will talk to my friends'. Responses were rated on a 5-point Likert from 0 (totally disagree) to 4 (totally agree). The scale exhibited good reliability and construct validity at T1/T2/T3: Cronbach's  $\alpha = 0.74/0.81/0.84$ ,  $\chi^2/df = 5.37/5.31/6.35$ , CFI = 0.92/0.90/0.89, TLI = 0.83/0.86/0.84, RMSEA = 0.11/0.11/0.12, SRMR = 0.10/0.11/0.13. This measure showed excellent applicability for traumatized individuals following natural disasters (Zhou et al., 2022).

### 2.2.4. Perceived social support

Perceived social support was assessed by the perceived social support questionnaire developed by Zimet et al. (1988). Some items in the original questionnaire measured perceived support from leaders. We changed the expression of these corresponding items to measure perceived social support from teachers. Our previous study showed that this questionnaire has excellent applicability for individuals traumatized by natural disasters (Wang et al., 2022). The scale had 12 items, assessing social support from family, friends, and significant others, e.g. 'I was able to get emotional help and support from my family when I needed it'. Responses were rated from 1 (totally disagree) to 7 (totally agree). The scale exhibited high reliability at all three timepoints (T1: Cronbach's  $\alpha = 0.92$ ; T2: Cronbach's  $\alpha = 0.93$ ; T3: Cronbach's  $\alpha = 0.96$ ) and good construct validity at T1/T2/T3 ( $\chi^2/df = 3.94/3.95/6.09$ , CFI = 0.93/0.94/0.93, TLI = 0.91/0.93/0.91, RMSEA = 0.09/0.09/0.12, SRMR = 0.05/0.04/0.04).

## 2.3. Statistical analysis

Little's missing completely at random (MCAR) test was used to explore the pattern of missing data. The results demonstrated that data were completely missing at random,  $\chi^2 = 338.510$ ,  $df = 375$ ,  $p = .912$ . Complete Case Analysis (CCA) is considered relatively reliable when missing is MCAR, that is, when missingness is not related to any observed or unobserved variables (Ross et al., 2020). In addition, as suggested by Pan and Zhan (2020), a random attrition rate of 40% or less is necessary in yielding accurate results in a

longitudinal study. Considering the high dropout rate (69.73% at T3) and the non-significant Little's missing completely at random test, we only included adolescents who consecutively participated in all three measurement waves ( $N = 351$ ) in the main analysis. In addition, we reported a supplementary analysis using the maximum likelihood estimation with Full Information Maximum Likelihood (FIML) estimator with all participants ( $N = 1596$ ). Results using these two approaches to handle missing data were presented and discussed.

First, we calculated descriptive statistics for each variable and partial correlations between variables using SPSS version 26.0. In addition, we compared values of main variables at T1 between participants who finished all three waves of assessment with participants who dropped out of the study (see supplemental materials Table S5). The results showed that missingness was significantly associated with age, whereas missingness was not associated with gender, PTG, emotional self-disclosure, perceived social support, and trauma exposure at T1. In addition, as trauma exposure, age, gender, monthly income of family, and parents' marital status could potentially be associated with main variables, these variables were also included as control variables (Li et al., 2024; Zhou et al., 2016). Further, we used Mplus 8.3 software to conduct main and supplementary analyses (Muthén & Muthén, 1998–2017). A measurement invariance test was conducted to ensure the constructs of interest were stable over time. Then, controlling for trauma exposure, age, gender, monthly income of family and parents' marital status, two separate autoregressive cross-lagged models were constructed. The first model examined the bidirectional associations between perceived social support and PTG. The second model added emotional self-disclosure into the first model and tested bidirectional associations between perceived social support, emotional self-disclosure, and PTG. The two full models both included stability paths within variables across time (i.e. autoregressive paths), concurrent associations among variables within each assessment wave, and associations among variables across time (i.e. cross-lagged paths). Based on previous studies (Orth et al., 2020), the use of cross-wave equality constraints increases precision of estimates and improves clarity of interpretation in complex models with missing data and covariates. Therefore, we constructed competing models in CLPM analyses: the unconstrained baseline model (Model [M]1), separately constrained time invariance on the autoregressive stabilities and on the cross-lagged effects to form M2 and M3, and constrained time invariance on the autoregressive stabilities and cross-lagged effects to form M4. After selecting the most parsimonious model based on model comparison, indirect paths were tested.

Bootstrapping (5000 bootstraps) was used to test the values and significance of indirect effects in cross-lagged panel models. The indirect effect size is statistically significant if the 95% bias-corrected confidence interval for the parameter estimate does not contain 0, indicating a mediating effect.

In this study, model fit indicators included  $\chi^2/df$ , CFI, TLI, RMSEA, and SRMR. A model was considered a good fit to the data when the RMSEA  $\leq 0.06$ , CFI or TLI  $\geq 0.95$ , or SRMR  $\leq 0.08$ , while cutoff values for adequate model fit are RMSEA  $\leq 0.08$  or CFI or TLI  $\geq 0.90$  (Browne & Cudeck, 1992). In model comparison, the most suitable model was selected basing on the chi-square difference test for nested models and Bayesian information criterion (BIC) values for non-nested models (Satorra & Bentler, 2001). We also referred to the values of  $\chi^2/df$ ,  $\Delta CFI$ , and  $\Delta RMSEA$  (Cheung & Rensvold, 2002), and the model fit indicators (CFI, TLI, RMSEA, and SRMR) when selecting models. We reported standardized regression coefficients ( $\beta$ s) and  $p$  values throughout.

### 3. Results

#### 3.1. Descriptive statistics and partial correlations among main variables

Table 1 shows the results of the descriptive statistics and partial correlations among the main variables after controlling for trauma exposure, age, gender, monthly income of family and parents' marital status. Findings revealed that except for the correlation between PTG at T1 and emotional self-disclosure at T2 and T3, and the correlation between perceived social support at T1 and PTG at T2, all other correlations were significant and positive.

#### 3.2. Longitudinal measurement invariance

Measurement invariances for perceived social support, emotional self-disclosure, and PTG across the three waves were examined in separate confirmatory factor analyses. All models fit well (see Table S1 of the Supplemental Materials). Acceptable metric invariance was supported ( $|\Delta CFI| < 0.01$ ,  $|\Delta RMSEA| < 0.015$ ), which indicated that factor loadings did not change across time points, and the constructs of perceived

social support, emotional self-disclosure, and PTG were stable across the three waves (Chen, 2007).

#### 3.3. CLPM analysis of the longitudinal associations between perceived social support and posttraumatic growth

Cross-lagged panel models of perceived social support and posttraumatic growth in the three waves were examined with trauma exposure, age, gender, monthly income of family and parents' marital status as control variables. The results showed that M4 was selected as the most parsimonious model based on insignificant  $\chi^2$  difference test results ( $p = .074-.128$ ) and model fit indices (see Table 2 and Table S2 of the Supplemental Materials). M4 fitted the data well (CFI = 0.968, TLI = 0.919, SRMR = 0.041, RMSEA = 0.039 [0.000, 0.067]). The model (see Figure 1) indicated that perceived social support at T1 and T2 were positively associated with PTG at T2 and T3, respectively. PTG at T1 and T2 were positively associated with perceived social support at T2 and T3, respectively. Autoregressive paths of perceived social support and PTG were positive and significant. The results supported the hypothesis of a bidirectional cross-lagged relationship between PSS and PTG.

Subsequently, emotional self-disclosure was included and CLPM of perceived social support, emotional self-disclosure, and PTG was analysed. M4 was selected as the most parsimonious model based on insignificant  $\chi^2$  difference test results ( $p = .140-.744$ ) and model fit indices (see Table 2 and Table S2 of the Supplemental Materials). M4 fitted the data well (CFI = 0.989, TLI = 0.968, SRMR = 0.031, RMSEA = 0.028 [0.000, 0.053]). Perceived social support at T1 and T2 were positively associated with PTG at T2 and T3, respectively. Emotional self-disclosure at T1 and T2 were positively associated with PTG at T2 and T3, respectively. According to the standardized bootstrap estimates and 95% confidence intervals, the mediation of emotional self-disclosure at T2 existed between perceived social support at T1 and PTG at T3 ( $\beta = 0.021$ ,  $SE = 0.009$ , 95% CI: [0.002, 0.039]), and the mediation of perceived social support at T2 existed between emotional self-disclosure at T1 and PTG at T3 ( $\beta = 0.019$ ,  $SE = 0.009$ , 95% CI: [0.002, 0.036]).

**Table 1.** Descriptive statistics and partial correlations for the observed variables ( $N = 351$ ).

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. T1 Perceived Social Support	66.34	16.06	1.00								
2. T2 Perceived Social Support	69.19	15.41	.56***	1.00							
3. T3 Perceived Social Support	73.29	14.71	.41***	.52***	1.00						
4. T1 Emotional Self-disclosure	27.21	9.67	.46***	.42***	.31**	1.00					
5. T2 Emotional Self-disclosure	29.76	10.49	.35**	.57***	.38***	.55***	1.00				
6. T3 Emotional Self-disclosure	32.87	10.35	.21*	.37***	.37***	.44***	.56***	1.00			
7. T1 PTG	54.72	32.54	.37***	.29**	.24*	.29**	.05	.01	1.00		
8. T2 PTG	65.11	32.53	.19	.42***	.29**	.26*	.29**	.25*	.25*	1.00	
9. T3 PTG	66.32	36.62	.34**	.47***	.46***	.25*	.30**	.41***	.30**	.41***	1.00

Note. Controlled for trauma exposure, age, gender, monthly income of family and parents' marital status. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

**Table 2.** Model comparison and fit for the CLPM ( $N = 351$ ).

Model	Cross-Lagged Panel Models for perceived social support and PTG						Cross-Lagged Panel Models for perceived social support, emotional self-disclosure, and PTG					
	$\chi^2(df)$	CFI	TLI	SRMR	RMSEA/90%CI	$\Delta CFI$	$\chi^2(df)$	CFI	TLI	SRMR	RMSEA/90%CI	$\Delta CFI$
M1	24.026 (14)	0.970	0.904	0.035	0.045 [.006,.075]	/	28.325 (19)	0.998	0.949	0.028	0.037 [.000,.064]	/
M2	29.970 (16)	0.959	0.885	0.043	0.049 [.020,.077]	−0.011	24.688 (22)	0.984	0.940	0.034	0.041 [.008,.065]	−0.014
M3	25.965 (16)	0.970	0.917	0.037	0.042 [.000,.071]	0.011	33.319 (25)	0.989	0.965	0.032	0.031 [.000,.056]	0.005
<b>M4</b>	<b>30.720 (18)</b>	<b>0.968</b>	<b>0.919</b>	<b>0.041</b>	<b>0.045</b> <b>[.000,.067]</b>	<b>−0.002</b>	<b>38.119 (28)</b>	<b>0.987</b>	<b>0.962</b>	<b>0.031</b>	<b>0.032</b> <b>[.000,.056]</b>	<b>−0.002</b>

Note. Bold indicates the most parsimonious model. M1 = fully unconstrained model; M2 = model with time invariance constraints on the autoregressive stabilities; M3 = model with time invariance constraints on the cross-lagged effects; M4 = model with time invariance constraints on the autoregressive stabilities and cross-lagged effects.

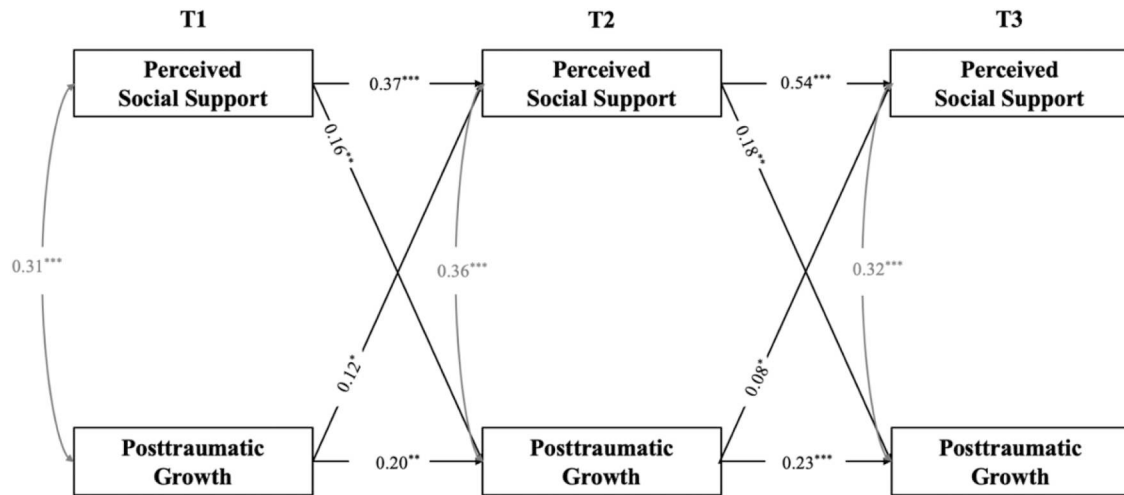
Meanwhile, we compared the result using only cases that completed all three waves of assessment ( $N = 351$ , see Figure 2) and cases that participated in one or two waves of assessment ( $N = 1596$ , see supplemental materials Table S3, Figure S4). M4 of the all cases ( $N = 1596$ ) showed a good model fit: CFI = 0.997, TLI = 0.990, SRMR = 0.034, RMSEA = 0.014 [0.000, 0.027]. The results showed that the indirect effect of perceived social support at T1 on PTG at T3 via emotional self-disclosure at T2 was 0.013 ( $p = .014$ ), while the indirect effect of emotional self-disclosure at T1 on PTG at T3 via perceived social support at T2 was 0.024 ( $p = .001$ ). Both results indicated that there were bidirectional associations between perceived social support and emotional self-disclosure at T1-T2 and T2-T3.

#### 4. Discussion

This longitudinal study explored the relationship between perceived social support, emotional self-disclosure, and PTG in children following Super Typhoon Lekima. The findings indicated that perceived social support was positively associated with subsequent PTG directly and perceived social support could predict PTG through emotional self-disclosure. Moreover, emotional self-disclosure had a stable and positive predictive effect on PTG. These findings suggested that perceived social support and emotional self-disclosure were mutually reinforcing in realizing PTG, which supported the model of thriving through relationships (Feeney & Collins, 2015). PTG had a significant predictive role on social support before including emotional self-disclosure, however, this significant effect diminished after including emotional self-disclosure. There results not only addressed the gaps mentioned above, but also provided insights for short- and long-term post-disaster interventions for children.

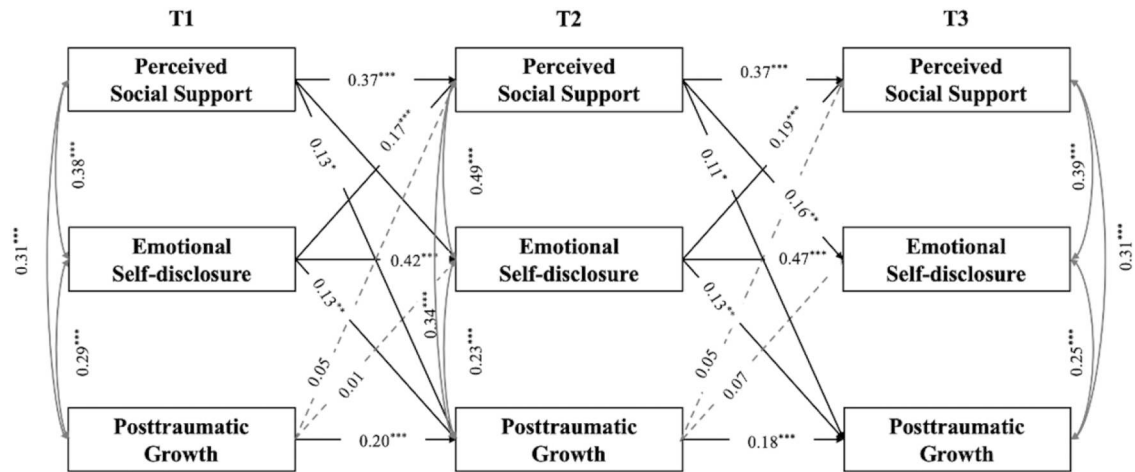
Specifically, there was a bidirectional relationship between perceived social support and PTG before including emotional self-disclosure. According to the model of thriving through relationships (Feeney & Collins, 2015), it could be that children benefited from perceived social support. As a result, they are able to view traumatic events and the world more objectively and positively (Teixeira et al., 2019), and achieve PTG (Zhou et al., 2017). Conversely, PTG makes trauma survivors may have more trust of others' care and support as reliable resources. Therefore, PTG could also foster social support after trauma.

For the mediation paths, perceived social support at T1 indirectly influenced PTG at T3 through the mediating role of emotional self-disclosure at T2. It could be that social support activated children's desire to express their emotions because they believed that they were accepted and recognized (Zhen et al.,



**Figure 1.** Cross-lagged panel model for perceived social support and posttraumatic growth.

Note.  $N = 351$ . \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Dotted lines represent non-significant paths; solid lines represent significant paths.



**Figure 2.** Cross-lagged panel model for perceived social support, emotional self-disclosure, and posttraumatic growth.

Note.  $N = 351$ . \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Dotted lines represent non-significant paths; solid lines represent significant path.

2018). Further, emotional self-disclosure promotes integration of fragmented memories, meaning reconstruction, and reappraisal of the traumatic experiences. Thus, PTG was promoted.

Furthermore, perceived social support at T2 mediated the relationship between emotional self-disclosure at T1 and PTG at T3. Self-disclosure of emotions could elicit empathy and emotional resonance in others (Bareket-Bojmel & Shahar, 2011), and motivate them to provide support. More importantly, self-disclosure in the Chinese culture often implies seeking social help. Therefore, emotional self-disclosure can help children establish emotional connections with others and enable them to receive more encouragement and informative feedback from others. This makes traumatized children perceive more positive changes in interpersonal relationship and obtain more suggestions in dealing with the traumatic events, eventually leading to PTG.

It is interesting to note that the bidirectional cross-lagged effect between perceived social support and PTG was no longer significant after including emotional self-disclosure. Contrary to our initial hypothesis and the action growth model (Hobfoll et al., 2007), PTG did not predict subsequent emotional self-disclosure and perceived social support across T1 to T3. A possible explanation is that PTG stimulated individuals to disclose their emotions to promote closer bond with others in a transient situation. However, sustained emotional self-disclosure may exert more stress on the listeners and discount the quality of interpersonal relationships (Jourard, 1964), and thus individual with PTG may be less revealing to others.

It should be noted that this study has several limitations. First, our study did not distinguish between different sources of social support (e.g. friend, family, teacher), whereas the relationship between perceived social support and PTG could

differ as found in previous studies (Sun et al., 2023). Similarly, other forms of disclosure can be included to further understand the mechanism between perceived social support and PTG. Second, this study mainly included participants residing in specific areas. The generalizability of the results therefore is limited. Future studies could expand the sample to include people from different regions, cultural backgrounds, and age groups to increase the ecological validity. Third, aside from PTG, negative psychological reactions (e.g. posttraumatic stress disorder, PTSD) are also prevalent in children after natural disasters. Although previous studies have found correlations between PTSD and PTG (e.g. Wang et al., 2024; Zhou & Wu, 2022), this study mainly focused on PTG and did not include PTSD. Future studies could include PTSD to investigate and compare different influencing mechanisms of PTG and PTSD. Finally, self-report questionnaires were used and only 351 cases that completed all three waves of assessment were included in the mediation analysis. The relatively high rates of missing data could cause some bias in the results. Future studies should better track their participants.

Despite these limitations, the study exhibited theoretical and clinical implications. This study supported the model of thriving through relationships (Feeney & Collins, 2015) and emphasized the importance of interpersonal resources and emotional self-disclosure in posttraumatic growth. In the long term, emotional self-disclosure also can strengthen the establishment of intimate and trust-based relationships with others. Furthermore, this study also indicated that PTG is a functional outcome in long term, suggesting that it may be realized gradually over time since trauma.

Regarding practical implications, perceived social support and emotional self-disclosure can strengthen connections with others and eventually promote PTG. Specialists should cultivate children's awareness of social support resources. Also, it is crucial for targeted interventions to cultivate children's abilities of emotional self-disclosure, such as their oral skills, to help individuals better express the feelings about the traumatic events. For specific interventions, it could enhance perceived social support by foster a sense of belonging and security and teach knowledge as of whom to contact and which tools to use in times of adversity. Also, it is crucial for interventions to cultivate children's abilities of emotional self-disclosure, such as including awareness-building exercises, followed by therapist-guided practices of the expression of their disaster-related and current emotions. According to our results, helping children perceive more support and express their emotions could be mutually reinforcing, and these two processes both facilitate posttraumatic growth.

## 5. Conclusion

This study supported the model of thriving through relationships (Feeney & Collins, 2015) and suggested that perceived social support and emotional self-disclosure were two important facilitating predictors of PTG, wherein perceived social support improve the level of PTG through the mediating role of emotional self-disclosure and emotional self-disclosure also promote the realization of PTG through the mediating role of perceived social support. Perceived social support and emotional self-disclosure have mutually reinforcing effects and this further strengthens PTG.

## Authors' contribution statements

Zijian He, Yifan Li, and Xiao Zhou contributed to the study conception and design. Material preparation, data collection and analysis were performed by Zijian He, Yifan Li, and Yingying Ye. The manuscript was written by Zijian He, Yifan Li under supervised by Xiao Zhou. All authors read and approved the final manuscript.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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## Ethical approval

This study was approved by the Research Ethics Committee of Department of Psychology and Behavioral Sciences, Zhejiang University.

## Informed consent

Written informed consent was obtained from students' guardians.

## Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## References

- Amiri, H., Nakhaee, N., Nagyova, I., Timkova, V., Okhovati, M., Nekoei-Moghadam, M., & Zahedi, R. (2021). Posttraumatic growth after earthquake: A systematic review and meta-analysis. *International Journal of Social Psychiatry*, 67(7), 867–877. <https://doi.org/10.1177/0020764021995856>
- Bareket-Bojmel, L., & Shahar, G. (2011). Emotional and interpersonal consequences of self-disclosure in a lived, online interaction. *Journal of Social and Clinical Psychology*, 30(7), 732–759. <https://doi.org/10.1521/jscp.2011.30.7.732>
- Belleville, G., Ouellet, M.-C., Lebel, J., Ghosh, S., Morin, C. M., Bouchard, S., Guay, S., Bergeron, N., Campbell, T., & MacMaster, F. P. (2021). Psychological symptoms among evacuees from the 2016 Fort McMurray wildfires: A population-based survey One year later. *Frontiers in Public Health*, 9, 655357. <https://doi.org/10.3389/fpubh.2021.655357>
- Berry, D. S., & Pennebaker, J. W. (1993). Nonverbal and verbal emotional expression and health. *Psychotherapy and Psychosomatics*, 59(1), 11–19. <https://doi.org/10.1159/000288640>
- Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, 21(2), 230–258. <https://doi.org/10.1177/0049124192021002005>
- Chan, C. S., & Rhodes, J. E. (2014). Measuring exposure in hurricane Katrina: A meta-analysis and an integrative data analysis. *PLoS One*, 9(4), Article e92899. <https://doi.org/10.1371/journal.pone.0092899>
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 14(3), 464–504. <https://doi.org/10.1080/10705510701301834>
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 9(2), 233–255. <https://doi.org/10.1207/S15328007SEM09025>
- Chinese National Bureau of Statistics. (2021, January 18). *Resident income and consumption expenditure in 2020*. [https://www.stats.gov.cn/xxgk/sjfb/zxfb2020/202101/t20210118\\_1812464.html](https://www.stats.gov.cn/xxgk/sjfb/zxfb2020/202101/t20210118_1812464.html)
- Feeney, B. C., & Collins, N. L. (2015). A new look at social support: A theoretical perspective on thriving through relationships. *Personality and Social Psychology Review*, 19(2), 113–147. <https://doi.org/10.1177/1088868314544222>
- Ferris, C., & O'Brien, K. (2022). The ins and outs of post-traumatic growth in children and adolescents: A systematic review of factors that matter. *Journal of Traumatic Stress*, 35(5), 1305–1317. <https://doi.org/10.1002/jts.22845>
- Hall, B. J., Xiong, Y. X., Yip, P. S. Y., Lao, C. K., Shi, W., Sou, E. K. L., Chang, K., Wang, L., & Lam, A. I. F. (2019). The association between disaster exposure and media use on post-traumatic stress disorder following typhoon Hato in Macao, China. *European Journal of Psychotraumatology*, 10(1), Article 1558709. <https://doi.org/10.1080/20008198.2018.1558709>
- Hemenover, S. H. (2003). The good, the bad, and the healthy: Impacts of emotional disclosure of trauma on resilient self-concept and psychological distress. *Personality and Social Psychology Bulletin*, 29(10), 1236–1244. <https://doi.org/10.1177/0146167203255228>
- Hobfoll, S. E., Hall, B. J., Canetti-Nisim, D., Galea, S., Johnson, R. J., & Palmieri, P. A. (2007). Refining our understanding of traumatic growth in the face of terrorism: Moving from meaning cognitions to doing what is meaningful. *Applied Psychology*, 56(3), 345–366. <https://doi.org/10.1111/j.1464-0597.2007.00292.x>
- Huang, J. L., Levin, Y., Bachem, R., & Zhou, X. (2024). Gender differences in posttraumatic stress symptoms, marital satisfaction, and parenting behaviors in adults following typhoon Lekima. *Psychological Trauma: Theory, Research, Practice and Policy*, 16(6), 881–891. <https://doi.org/10.1037/tra0001563>
- Jourard, S. M. (1964). *The transparent self*. Van Nostrand.
- Kahn, J. H., & Hessling, R. M. (2001). Measuring the tendency to conceal versus disclose psychological distress. *Journal of Social and Clinical Psychology*, 20(1), 41–65. <https://doi.org/10.1521/jscp.20.1.41.22254>
- Lee, K., & Ahn, S. (2023). Self-reflection, emotional self-disclosure, and posttraumatic growth in nursing students: A cross-sectional study in South Korea. *Healthcare*, 11(19), 2616. <https://doi.org/10.3390/healthcare11192616>
- Levi-Belz, Y. (2016). To share or not to share? The contribution of self-disclosure to stress-related growth among suicide survivors. *Death Studies*, 40(7), 405–413. <https://doi.org/10.1080/07481187.2016.1160164>
- Li, Y., Ye, Y., & Zhou, X. (2024). Optimism, posttraumatic stress disorder, and posttraumatic growth among adolescents: A longitudinal analysis of the mediating effects of adversity belief and affect. *Journal of Happiness Studies*, 25(6), 60. <https://doi.org/10.1007/s10902-024-00770-7>
- Marshall, J., Wiltshire, J., Delva, J., Bello, T., & Masys, A. J. (2020). Natural and manmade disasters: Vulnerable populations. In A. J. Masys, R. Izurieta, & M. Reina Ortiz (Eds.), *Global health security* (pp. 143–161). Springer International Publishing. [https://doi.org/10.1007/978-3-030-23491-1\\_7](https://doi.org/10.1007/978-3-030-23491-1_7)
- Mesidor, J. K., & Sly, K. F. (2019). Religious coping, general coping strategies, perceived social support, PTSD symptoms, resilience, and posttraumatic growth among survivors of the 2010 earthquake in Haiti. *Mental Health, Religion & Culture*, 22(2), 130–143. <https://doi.org/10.1080/13674676.2019.1580254>
- Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus user's guide*. Author.
- Ning, J., Tang, X., Shi, H., Yao, D., Zhao, Z., & Li, J. (2023). Social support and posttraumatic growth: A meta-analysis. *Journal of Affective Disorders*, 320, 117–132. <https://doi.org/10.1016/j.jad.2022.09.114>
- Orth, U., Clark, D. A., Donnellan, M. B., & Robins, R. W. (2020). Testing prospective effects in longitudinal research: Comparing seven competing cross-lagged models. *Journal of Personality and Social Psychology*, 120(4), 1013–1034. <https://doi.org/10.1037/pspp0000358>
- Pan, Y., & Zhan, P. (2020). The impact of sample attrition on longitudinal learning diagnosis: A prolog. *Frontiers in Psychology*, 11, 1051. <https://doi.org/10.3389/fpsyg.2020.01051>
- Pennebaker, J. W., & Francis, M. E. (1996). Cognitive, emotional, and language processes in disclosure. *Cognition and Emotion*, 10(6), 601–626. <https://doi.org/10.1080/026999396380079>
- Pfefferbaum, B., Jacobs, A. K., Griffin, N., & Houston, J. B. (2015). Children's disaster reactions: The influence of exposure and personal characteristics. *Current Psychiatry Reports*, 17(7), 56. <https://doi.org/10.1007/s11920-015-0598-5>

- Rimé, B. (2009). Emotion elicits the social sharing of emotion: Theory and empirical review. *Emotion Review*, 1(1), 60–85. <https://doi.org/10.1177/1754073908097189>
- Ross, R. K., Breskin, A., & Westreich, D. (2020). When Is a complete-case approach to missing data valid? The importance of effect-measure modification. *American Journal of Epidemiology*, 189(12), 1583–1589. <https://doi.org/10.1093/aje/kwaa124>
- Saeed, S. A., & Gargano, S. P. (2022). Natural disasters and mental health. *International Review of Psychiatry*, 34(1), 16–25. <https://doi.org/10.1080/09540261.2022.2037524>
- Sarason, B. R., Pierce, G. R., Shearin, E. N., Sarason, I. G., Waltz, J. A., & Poppe, L. (1991). Perceived social support and working models of self and actual others. *Journal of Personality and Social Psychology*, 60(2), 273–287. <https://doi.org/10.1037/0022-3514.60.2.273>
- Satorra, A., and Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika*, 66(4), 507–514. <https://doi.org/10.1007/BF02296192>
- Snell, W. E., Miller, R. S., & Belk, S. S. (1988). Development of the emotional self-disclosure scale. *Sex Roles*, 18(1–2), 59–73. <https://doi.org/10.1007/BF00288017>
- Sun, R., Yang, X., Wu, X., & Zhou, X. (2023). Sometimes less is more: Switching influence of social support on post-traumatic growth over time after a natural disaster. *Journal of Youth and Adolescence*, 52(1), 218–228. <https://doi.org/10.1007/s10964-022-01668-4>
- Tedeschi, R. G., & Calhoun, L. G. (1996). The posttraumatic growth inventory: Measuring the positive legacy of trauma. *Journal of Traumatic Stress*, 9(3), 455–471. <https://doi.org/10.1002/jts.2490090305>
- Tedeschi, R. G., & Calhoun, L. G. (2004). TARGET ARTICLE: “posttraumatic growth: Conceptual foundations and empirical evidence.”. *Psychological Inquiry*, 15(1), 1–18. [https://doi.org/10.1207/s15327965pli1501\\_01](https://doi.org/10.1207/s15327965pli1501_01)
- Teixeira, C., Santos, C., Diogo, R., Gonçalves, A., Freire, F., Catarina Almeida, T., & Ramos, C. (2019). Posttraumatic growth and cognitive and emotional processing from disclosure in the aftermath of a traumatic event. *Annals of Medicine*, 51(sup1), 193–193. <https://doi.org/10.1080/07853890.2018.1562765>
- Wang, W., Li, Y., Yuan, H., & Wu, X. (2024). Interaction between posttraumatic stress symptoms and posttraumatic growth among adolescents who experience an earthquake: A repeated longitudinal study. *Applied Psychology: Health and Well-Being*, 16(2), 615–631. <https://doi.org/10.1111/aphw.12507>
- Wang, X., Ji, W., Xu, Y., & Zhou, X. (2022). Social support, posttraumatic growth, and prosocial behaviors among adolescents following a flood: The mediating roles of belief in a just world and empathy. *Current Psychology*, 42, 31528–31535. <https://doi.org/10.1007/s12144-022-04147-y>
- Weber, K., Johnson, A., & Corrigan, M. (2004). Communicating emotional support and its relationship to feelings of being understood, trust, and self-disclosure. *Communication Research Reports*, 21(3), 316–323. <https://doi.org/10.1080/08824090409359994>
- Wu, X., Wang, W., Zhou, X., Chen, Q., & Lin, C. (2018). Investigation on mental health state of adolescents after 8.5 years of Wenchuan Earthquake. *Psychological Development and Education*, 34(1), 89–89.
- Zhen, B., Yao, B., & Zhou, X. (2022). How does parent–child communication affects posttraumatic stress disorder and growth in adolescents during the COVID-19 pandemic? The mediating roles of self-compassion and disclosure. *Journal of Affective Disorders*, 306, 1–8. <https://doi.org/10.1016/j.jad.2022.03.029>
- Zhen, R., Quan, L., & Zhou, X. (2018). How does social support relieve depression among flood victims? The contribution of feelings of safety, self-disclosure, and negative cognition. *Journal of Affective Disorders*, 229, 186–192. <https://doi.org/10.1016/j.jad.2017.12.087>
- Zhou, X., Huang, J., & Zhen, R. (2022). Intergenerational effects of posttraumatic stress symptoms in family: The roles of parenting behavior, feelings of safety, and self-disclosure. *Journal of Social and Personal Relationships*, 39(9), 2782–2800. <https://doi.org/10.1177/02654075221088923>
- Zhou, X., & Wu, X. (2022). Posttraumatic stress disorder and growth: Examination of joint trajectories in children and adolescents. *Development and Psychopathology*, 34(4), 1353–1365. <https://doi.org/10.1017/S0954579421000213>
- Zhou, X., Wu, X., Fu, F., & An, Y. (2015). Core belief challenge and rumination as predictors of PTSD and PTG among adolescent survivors of the Wenchuan earthquake. *Psychological Trauma: Theory, Research, Practice, and Policy*, 7(4), 391–397. <https://doi.org/10.1037/tra0000031>
- Zhou, X., Wu, X., Zeng, M., & Tian, Y. (2016). The relationship between emotion regulation and PTSD/PTG among adolescents after the Ya'an earthquake: The moderating role of social support. *Acta Psychologica Sinica*, 48(8), 969. <https://doi.org/10.3724/SP.J.1041.2016.00969>
- Zhou, X., Wu, X., & Zhen, R. (2017). Understanding the relationship between social support and posttraumatic stress disorder/posttraumatic growth among adolescents after Ya'an earthquake: The role of emotion regulation. *Psychological Trauma: Theory, Research, Practice, and Policy*, 9(2), 214–221. <https://doi.org/10.1037/tra0000213>
- Zhou, X., Wu, X., & Zhen, R. (2018). Patterns of posttraumatic stress disorder and posttraumatic growth among adolescents after the Wenchuan earthquake in China: A latent profile analysis. *Journal of Traumatic Stress*, 31(1), 57–63. <https://doi.org/10.1002/jts.22246>
- Zhu, J., Chen, Y., & Su, B. (2020). Non-suicidal self-injury in adolescence: Longitudinal evidence of recursive associations with adolescent depression and parental rejection. *Journal of Adolescence*, 84, 36–44. <https://doi.org/10.1016/j.adolescence.2020.08.002>
- Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, 52(1), 30–41.