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## Original Article

## A conceptual model of posttraumatic growth of nursing students with a disabled parent

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## ABSTRACT

**Objectives:** To examine a conceptual model of posttraumatic growth (PTG) with the inclusion of family resilience as a mediator, and social support, individual resilience, maternal care, and family members' intimacy after trauma as protective factors.

**Methods:** A cross-sectional questionnaire survey was carried out in a sample of 134 college nursing students who had a parent with a non-congenital disability. The Socio-demographic Information Questionnaire, the Chinese version of Perceived Social Support Scale (PSSS), 10-item Connor-Davidson Resilience Scale (CD-RISC10), Parental Bonding Instrument (PBI), Family Resilience Assessment Scale (FRAS) and the Posttraumatic Growth Inventory (PTGI) were used to collect data.

**Results:** Results showed that social support, individual resilience, maternal care, and family members' intimacy after trauma positively predicted family resilience ( $\beta = 0.41, 0.20, 0.20, 0.22$ , all  $P < 0.01$ ), respectively, and indirectly predicted PTG through family resilience. Family resilience positively predicted PTG ( $\beta = 0.25, P < 0.01$ ). Moreover, individual resilience directly positively predicted PTG ( $\beta = 0.25, P < 0.001$ ).

**Conclusions:** Family resilience could facilitate PTG in nursing students in the face of parental disability. Interventions to promote PTG among college nursing students who have experienced parental disability should consider individual or family resilience-based intervention.

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## What is known?

- Nursing students who have experienced traumatic events have a certain level of posttraumatic growth (PTG).
- Positive parental bonding or parental-child relationships are in conjunction with children's or adolescents' well-being.

## What is new?

- Positive parental bonding was related to resilience and PTG among nursing students of parents with physical disabilities.
- Maternal Care through students' resilience had an indirect association with PTG.
- These results highlight the importance of comprehensively taking into account nursing students' positive parental bonding

(especially Maternal Care), resilience, and PTG in taking targeting measures to enhance their coping skills in the future clinical work.

## 1. Introduction

More than one billion people, or about 15% of the world's population, live with some form of disability. In China, more than 6.34% of residents have lifelong physical and mental disabilities – either at birth or due to accidents [1]. Indeed, physical disability ranks first among the types of disabilities caused by accidents in China. Non-congenital physical disabilities caused by accidents affect not only the disabled person but also the physical and mental health of their family members [2].

Posttraumatic growth (PTG) refers to positive psychological changes resulting from challenging or traumatic events [3]. For example, some children do not experience disability themselves but are related to those with disabilities [4]. Substantial research has been conducted on the effects of children's disabilities on

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parents [5], but few have examined children's perspectives [6]. Several studies have found that children of parents with disabilities can be negatively affected socially, physically, and emotionally throughout their development and into adulthood [7,8]. While these children can experience negative effects such as post-traumatic stress symptoms (PTSS), they can also experience positive developmental changes including PTG [9].

These effects are particularly relevant for nursing students, whose mental health is related to their well-being and future quality of clinical work. For example, prior work has shown that resilient nursing students who experience traumatic events themselves gain more PTG [10]. However, to our knowledge, no studies have been conducted on PTG in nursing students with parents with disabilities. A general model of PTG was proposed by Tedeschi and Calhoun [3] to identify variables associated with the magnitude or duration of the PTG response. The model includes individual characteristics (e.g., sociodemographic variables), environmental resources (e.g., family support), and emotional and cognitive challenges produced by a traumatic event. Moreover, studies have confirmed that environmental characteristics (e.g., family functioning), distress responses, social support, positive outcomes, and demographic variables are associated with PTG [11–14].

Resilience, or “hardiness” [15], which has been referred to as a “protective factor,” is an individual's ability to “bounce back” and “move on” with life after experiencing stressful events. For PTG to occur, a person must exhibit resilience and return to healthy functioning before moving to a state of more effective functioning [16,17]. Studies have consistently found a positive relationship between individual resilience and PTG [10,18]. The environmental resources such as social support have been consistently found to be associated with PTG [3,18,19]. However, research on the association between social support and PTG in college nursing students that have parents with disabilities has not been conducted. Besides, in the family context, early parent-child relationships and subsequent parent-child attachments that are positive and secure contribute to positive outcomes for children in high-risk situations [20]. Prior studies show that warm mother-child interactions promote cognitive development in preschool children [21]. Particularly, warm mother-child interactions predict the psychological adjustment of individuals who have experienced a traumatic event [22–24]. As PTG is a positive adjustment to traumatic events, it could theoretically be associated with qualities of maternal care. A positive style of maternal care may reflect supportive parent-child interactions and is considered a protective factor in the development of family resilience [25]. Therefore, empirical evidence of a relationship between maternal/parental care and family resilience is needed. Intimacy among family members after a traumatic event is similar to family support. Consistent with the effects of social support on PTG, family intimacy after a traumatic event might also affect young adults' PTG.

However, in the original model, the family is mostly viewed as the context for individual growth, rather than as a resilient unit that is associated with individuals' PTG. Family resilience is defined as the capacity of the family to rebound from adversity, resulting in a strengthened, more resourceful and more confident mentality [26]. Empirical studies have shown that family resilience is related to positive outcomes in children [27], including international adoptees [28]. Amatea, Smith-Adcock, and Villares [29] reported that family resilience positively influenced children's academic performance and Coyle [30] found that resilient families facilitated resilience in children. However, this research does not examine the importance of family resilience in families with parents who have

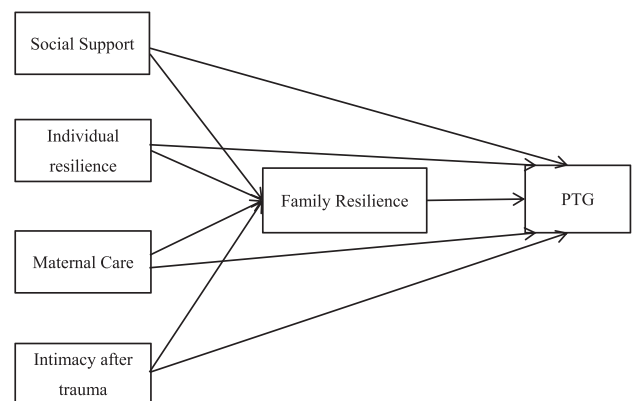
disabilities or the PTG of nursing students. Meanwhile, Walsh [31] described that attention to the framework for family resilience (e.g., belief systems, organizational patterns, and communication processes) could reduce vulnerability and risk, and it could foster resilience during recovery from traumatic loss. In other words, family resilience may be a mediator of positive outcomes in response to traumatic events.

Family resilience may be predicted by individual characteristics and environmental resources, according to Bronfenbrenner's [32] theoretical framework, which is used to understand the protective factors of family resilience across individual, family, and community levels [25,32]. In line with the protective factors characterized by Benzie and Mychasiuk [25], individual resilience may be a protective factor for family resilience. However, there are no published studies on the relationship between individual and family resilience in nursing students that have parents with disabilities. Social support is an important component of the family resilience framework [33]. It is noteworthy that perceived and received support show different patterns of association for post-trauma adjustment, with perceived support consistently showing better post-trauma adjustment, among both adults and children [34]. Intimacy among family members after a traumatic event as another family environmental factors was found to be associated with family resilience [35].

Given the previous research on this topic, we hypothesized that family resilience could mediate the relationship between other predictors (individual characteristics and environmental resources) and PTG in nursing students that have a parent with disabilities. Thus, based on previous models of PTG and family resilience, as well as empirical findings, we aimed to examine the PTG path of family resilience as a mediator on those protective factors, including individual resilience, maternal care, social support, and family members' intimacy after trauma and PTG.

The overall goal of the current study was to provide empirical evidence for whether and how protective factors contribute to family resilience, facilitating PTG in nursing students (see Fig. 1). The following hypotheses and research question were set forth.

Hypothesis: (1) Greater individual resilience, positive social support, positive maternal care, and greater family intimacy after trauma will be associated with greater family resilience and PTG; (2) Greater family resilience will positively predict nursing



Note: PTG, Posttraumatic growth. The total scores of the Family Resilience Assessment Scale and the Posttraumatic Growth Inventory were used in this model.

Fig. 1. The hypothesis model of post-traumatic growth of nursing students with a disabled parent

students' PTG; (3) Protective factors will have indirect as well as direct effects on PTG through family resilience.

Research Question: How, if at all, do protective factors contribute to family resilience, which further affects nursing students' development?

Using this multifaceted approach, we examined nursing students' views of the PTG and the effect of their parents' disabilities on family resilience.

## 2. Material and methods

### 2.1. Design and sample

The study participants consisted of 134 college students aged 18–23 years ( $M = 19.11$ ,  $SD = 1.15$ ), who had at least one parent with a disability and included 120 females (89.6%), and 14 males (10.4%). All participants were Han Chinese in ethnicity and had no religion (the majority of participants were Han Chinese from Shandong province). Most (61.2%) of the participants had fathers with a disability, and only 6.0% had parents who were both disabled.

A cross-sectional investigation was conducted with 3,000 college nursing students from two occupational schools in Shandong province. With the permission and help of the deans and class teachers of the nursing schools, paper-and-pencil questionnaires were delivered to college students in the study-by-oneself classes. Therefore, all questionnaires were completed in classrooms. Students were told that they could skip any questions or exit the survey at any time and the anonymous survey could protect their privacy. Written informed consent was obtained from all of the participants. The investigation was approved by the college leaders and followed the guidelines of Shandong University's ethics committee and all instruments used in this study were authorized by the authors except the open assessed scales. Finally, 2,600 questionnaires were returned, and the response rate was 86.7%.

After questionnaires were retrieved and Basing on the objective of the study, firstly, we screened for students with disabled parents by asking self-report questions, such as "Does your father and/or mother have a lasting physical disability (because of a traffic accident or a non-congenital cause)?" Only students who reported that they had a parent with a lifelong, non-congenital physical disability, mainly caused by accidents, and who were living with the disabled parent, were enrolled in the study. Several groups of students were excluded from this study, including those who had a single parent and/or sibling with disabilities, those with parents with other physical and mental health problems, and those with parents who suffered from other traumatic events. Finally, only 134 college students in this study (Fig. 2).

### 2.2. Measures

#### 2.2.1. Socio-demographic Information Questionnaire

Socio-demographic information included the participants' sex, age, residence (countryside, suburban, and city), whether they had sibling(s), parental occupations (unemployed, physical worker, and professional worker), family monthly income (RMB), and trauma-related factors. The trauma-related factors included a parent with a disability (father, mother, or both parents). The participants rated the severity of the trauma on a ten-point scale from 1 (*not serious*) to 10 (*extremely serious*). The time after the trauma (months) was measured by an open question, "How long has it been since the traumatic event happened?". The level of intimacy among the family members after the trauma was assessed by the question,

"How do you feel about the intimacy between your family members after the trauma?" Participants respond to this question by choosing 1 (*more distant*), 2 (*no change*), or 3 (*closer*). This item is the same as the item used in Sixbey's [35] study on family resilience.

#### 2.2.2. The Perceived Social Support Scale (PSSS) (Chinese version)

The PSSS scale is a self-report instrument consisting of 12 items measuring perceived social support from 3 domains: family, friends, and a significant other [36]. PSSS is used worldwide and has adequate psychometric properties. We used the Chinese version [37] that has an internal consistency of 0.89 for the overall scale.

#### 2.2.3. The ten-item Connor-Davidson Resilience Scale (CD-RISC10) (Chinese version)

The CD-RISC10 scale consists of 10 self-rated items [38], which measures individual resilience. In this study the Chinese version of CD-RISC10 was used with the permission of Dr. Davidson. Higher scores indicate greater resilience. The scales' reliability and validity with the Chinese population have been well documented in a study by Wang et al. [39]. Cronbach's  $\alpha$  of the overall scale in this study was 0.90.

#### 2.2.4. Parental Bonding Instrument (PBI) (Chinese version)

Maternal care was measured by PBI, a widely used measure of parent-child bonding [40]. We used the 23-item Chinese version of the PBI [41] with a three-factor model (care, control, and autonomy) to test nursing students' parental bonding. The measure is "retrospective," such that respondents (over 16 years of age) answer the questions based on how they remember their parents during their first 16 years of life. The measure is completed for both mothers and fathers separately. Only the maternal care subscale (Cronbach's  $\alpha = 0.72$ ) was used as a protective factor in the current analysis.

#### 2.2.5. Family Resilience Assessment Scale (FRAS) (Chinese version)

The FRAS was used to assess family resilience [35]. The 54-item self-report FRAS includes six subscales: Family Communication and Problem Solving, Utilizing Social and Economic Resources, Developing a Positive Outlook, Family Connectedness, Family Spirituality, and Ability to Making Meaning of Adversity; higher scores indicate higher family resilience. The psychometric properties of the Chinese version (FRAS-C) are well documented. In this study, the Family Spirituality (4 items) subscale was eliminated because none of the participants expressed a religious belief. The final version of the FRAS-C used in this study consisted of 48 items and 5 subscales and Cronbach's  $\alpha$  for the overall inventory was 0.94.

#### 2.2.6. Posttraumatic Growth Inventory (PTGI) (Chinese version)

The Posttraumatic Growth Inventory (PTGI) [17], which is used to measure positive changes after trauma, consists of 21 items. The five subscales include: Relating to Others, New Possibilities, Personal Strength, Spiritual Change, and Appreciation of Life. The PTGI has acceptable validity, internal consistency, and test-retest reliability for both American [17] and Asian participants [42]. Similar to previous studies [19], the Spiritual Change subscale was eliminated from the inventory because none of the participants expressed a religious belief. The final version of the PTGI consisted of 19 items with 4 subscales, with a total score ranging from 0 to 95. In this study, the internal consistency (Cronbach's  $\alpha$ ) of the overall inventory was 0.93.

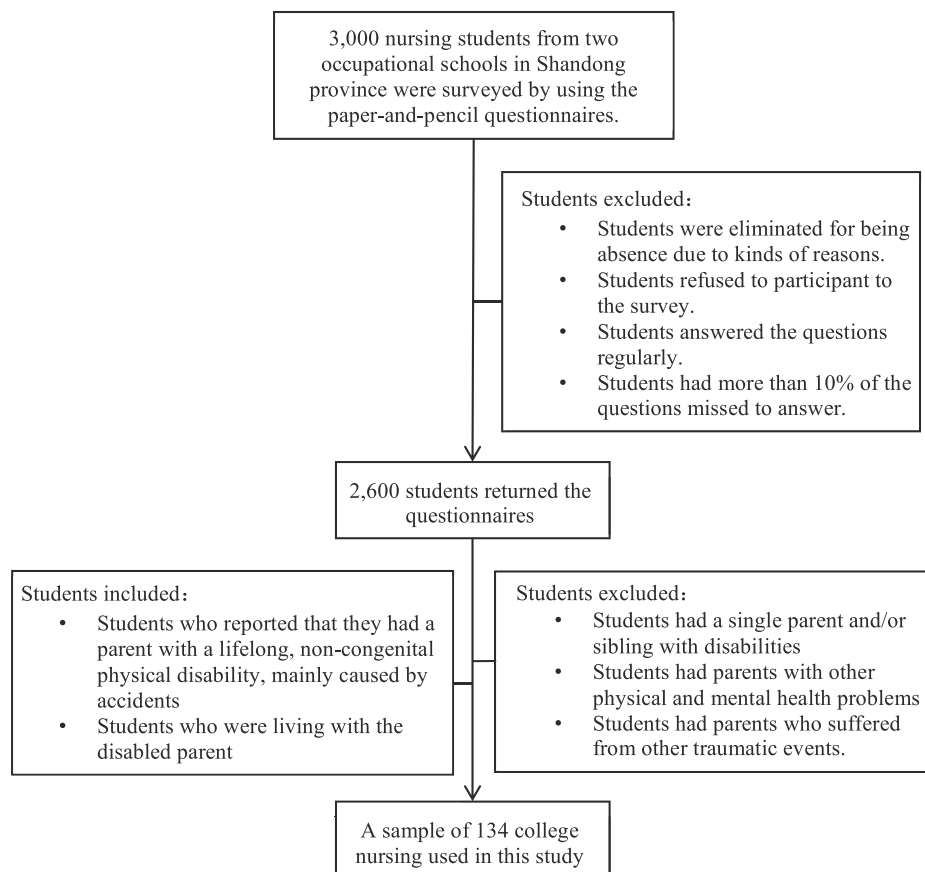


Fig. 2. The process of selecting the study participants.

### 2.3. Statistical strategy

Descriptive statistics were used to summarize participants' characteristics and study variables. One-way ANOVAs and *t*-tests were used to examine the non-adjusted associations between the sociodemographic factors and family resilience/PTG. Pearson's correlations were calculated to examine associations among study variables. A structural equation modeling (SEM) approach was used to examine the theoretical model of the pathways that link the protective factors to PTG through family resilience. Seven fit indices were used to assess the best model fit [43,44]: the chi-square test, the chi-square/*df* ratio, the normed fit index (NFI), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), the 90% confidence intervals (CI), the Akaike Information Criterion (AIC), and the standardized root mean square (SRMR). All analyses were performed using Stata13 (College Station, TX: StataCorp LP) and the 2-tailed level of significance was set at  $P < 0.05$ .

## 3. Results

### 3.1. Descriptive statistics

The length of time that participants experienced their parents' disability ranged from 2 to 240 months. The majority (76.1%) of participants reported that their family intimacy became closer after the traumatic event. Other sample characteristics are presented in Table 1. The means and standard deviations (SD) of the study

variables are shown in Table 2.

The one-way ANOVA showed significant differences in PTG for residence and fathers' occupations ( $P < 0.05$ ). Significant differences in family resilience and PTG were found for the level of intimacy among the family members after the trauma ( $P < 0.05$ ). No significant differences in family resilience and PTG were found for the other socio-demographic variables ( $P > 0.05$ ).

### 3.2. Correlations among the study variables

The relationships among the study variables are presented in Table 2. All of the variables were positively correlated with each other ( $P < 0.05$ ), except for individual resilience and maternal care.

### 3.3. Results of structural equation modeling of PTG

SEM analyses showed that the baseline model did not fit well, as some paths have non-significant coefficients. The direct path-coefficients from perceived social support, maternal care, and intimacy after trauma to PTG were not significant. Fig. 3 presents the final results of the SEM, after deleting the direct paths for social support, maternal care, and intimacy. The deviance statistics between the baseline model and the final model showed that there were no significant differences ( $P = 0.054$ ). Fig. 3 shows that individual resilience and family resilience directly and positively predicted PTG, while social support, maternal care, and intimacy after trauma indirectly and positively affected PTG through the

**Table 1**  
Participants' characteristics and descriptive analyses of the study variables (n = 134).

Characteristics	n (%)	Family resilience			Posttraumatic growth		
		Mean ± SD	t/F	P	Mean ± SD	t/F	P
Sex							
Females	120 (89.6)	142.63 ± 18.00	0.28	0.779	60.24 ± 16.76	0.93	0.353
Males	14 (10.4)	141.21 ± 15.61			55.69 ± 15.78		
Residence							
Countryside	103 (85.7)	141.48 ± 17.03	1.68	0.191	59.86 ± 15.31	3.14	0.047
Suburban	14 (10.5)	150.43 ± 22.31			64.86 ± 22.50		
City	5 (3.8)	139.20 ± 16.53			43.40 ± 22.27		
Siblings							
Yes	21 (15.7)	143.35 ± 18.28	0.24	0.811	57.70 ± 14.56	-0.61	0.545
No	113 (84.3)	142.31 ± 17.68			60.16 ± 17.06		
Father's occupation							
Unemployed	11 (8.2)	152.18 ± 17.24	2.32	0.102	66.20 ± 11.28	3.73	0.027
Physical worker	116 (86.6)	141.96 ± 17.53			60.14 ± 15.59		
Professional worker	7 (5.2)	135.29 ± 17.85			44.86 ± 30.22		
Mother's occupation							
Unemployed	16 (12.1)	146.75 ± 14.51	0.96	0.385	61.00 ± 17.35	0.75	0.473
Physical worker	112 (84.8)	141.98 ± 18.12			59.72 ± 16.14		
Professional worker	4 (3.0)	134.00 ± 17.10			49.75 ± 28.05		
Family income (CNY/month)							
≤5000	35 (30.4)	143.82 ± 17.21	1.95	0.125	64.20 ± 12.19	1.54	0.209
5001–10000	41 (35.7)	137.05 ± 15.78			57.94 ± 17.03		
10001–30000	25 (21.7)	144.24 ± 18.54			60.42 ± 11.88		
>30000	14 (12.2)	148.36 ± 18.21			55.71 ± 19.56		
Disabled person							
Father	82 (61.2)	143.08 ± 17.99	0.15	0.864	59.46 ± 17.91	0.22	0.807
Mother	44 (32.8)	141.86 ± 18.16			60.95 ± 14.73		
Both parents	8 (6.0)	140.00 ± 13.51			57.12 ± 14.01		
Perceived trauma severity							
1–4	16 (14.5)	147.74 ± 16.22	0.71	0.494	58.73 ± 19.52	0.77	0.464
5–7	43 (39.1)	141.33 ± 16.64			56.61 ± 17.97		
8–10	51 (46.4)	142.21 ± 20.67			61.18 ± 16.94		
Time after trauma (months)							
≤6	8 (7.3)	148.00 ± 20.38	1.41	0.235	64.88 ± 11.92	0.74	0.565
7–12	10 (9.2)	137.80 ± 8.13			63.00 ± 13.86		
13–36	41 (37.6)	145.00 ± 19.34			60.98 ± 17.60		
37–60	17 (15.6)	134.56 ± 19.53			54.64 ± 15.46		
>60	33 (30.3)	144.35 ± 16.68			61.00 ± 17.36		
Intimacy after trauma							
More distant	9 (7.7)	118.37 ± 10.68	12.74	<0.001	54.89 ± 16.65	4.75	0.010
No change	19 (16.2)	136.21 ± 16.29			51.26 ± 18.63		
Closer	89 (76.1)	146.57 ± 16.72			62.63 ± 14.66		

**Table 2**  
Means, Standard Deviation, Cronbach's  $\alpha$  Coefficients and Correlation Coefficients among the Study Variables.

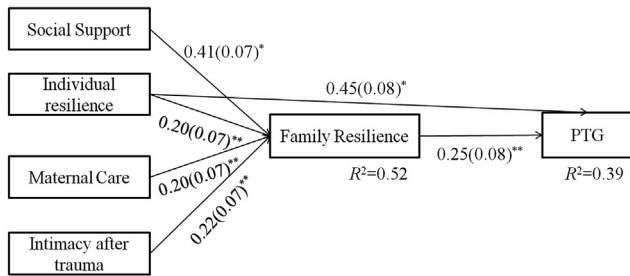
Variables	Mean ± SD	Cronbach's $\alpha$	Correlations(r)				
			1	2	3	4	5
1. Posttraumatic growth	59.78 ± 16.67	0.93	–				
2. Family resilience	142.48 ± 17.71	0.94	0.39**	–			
3. Individual resilience	26.04 ± 6.33	0.90	0.52**	0.42**	–		
4. Maternal care	22.22 ± 4.02	0.72	0.21*	0.39**	0.12	–	
5. Perceived social support	65.85 ± 10.26	0.89	0.42**	0.60**	0.36**	0.28*	–

Note: \*\* $P < 0.01$ ; \* $P < 0.05$ .

mediation of family resilience. Fig. 3 includes all of the significant path coefficients while controlling for residence and father's occupation. The revised model had very good fit indicators (chi-square [5] = 8.53,  $P = 0.129$ , chi-square/df ratio = 1.71, NFI = 0.94, CFI = 0.97, RMSEA = 0.08, 90% CI [0.000–0.172], AIC = 4540.34, and SRMR = 0.03) and explained 52.2% and 38.8% of the variance in family resilience and PTG, respectively.

#### 4. Discussion

This study tested a conceptual model of PTG by including family resilience as a mediator of PTG among college nursing students whose parents had a physical disability. Greater individual resilience, more social support, positive maternal care, and closer intimacy after trauma were associated with greater family resilience. However, only individual resilience was a direct positive predictor



Note: \*  $P < 0.001$ , \*\*  $P < 0.01$ ; PTG, Posttraumatic growth. The total scores of the Family Resilience Assessment Scale and the Posttraumatic Growth Inventory were used in this model and the standardized coefficients with their standard error are shown on each path.

Fig. 3. The modified model of post-traumatic growth of nursing students with a disabled parent.

of PTG, which does not fully support our hypothesis. Greater family resilience was positively associated with nursing students' PTG and it mediated the relationship between protective factors and PTG. These findings answered the research question by showing that protective factors contributed to family resilience, which affected nursing students' psychological development. These findings confirmed Tedeschi and Calhoun's [3] PTG model, which predicts that individual characteristics and environmental resources are associated with PTG.

Research on PTG with the inclusion of family functioning is relatively new [11,45]. This study adds to our understanding of the PTG pathway and confirms the theoretical premise [27,30] that family resilience is related to positive outcomes in children. Family resilience is a relatively new concept in positive psychology and empirical studies on it are scarce.

The conceptual model of PTG used in this study showed that individual resilience directly and positively affects PTG, which is consistent with previous studies [10,18]. Indeed, individual resilience was one of the most important predictors found in the best-fit model. This finding confirms the assumption that individual resilience and a return to healthy status must occur before PTG is facilitated [25,32]. However, other protective factors (social support, maternal care, and family members' intimacy after trauma) were indirectly associated with PTG in families with a disabled parent. Social support had an indirect effect on participants' PTG, which is inconsistent with some previous studies [3,19], but is consistent with studies of parents of children undergoing surgery for congenital diseases [18]. Positive maternal care and closer intimacy among family members indirectly predicted PTG, which is consistent with previous studies that reported that maternal care was a predictor of psychological adjustment in individuals who experienced a traumatic event (e.g. Ref. [24]). Similarly, greater intimacy among family members after a trauma indirectly and positively affected students' PTG. Further studies are needed to identify patterns of social support, maternal care, and family members' intimacy after a trauma that is associated with PTG in larger and more diverse samples.

Murray Bowen's family systems theory holds that individuals are inseparable from their network of relationships in the family. This study found that family resilience mediated the relationships between individual resilience, maternal care, intimacy after

trauma, and personal growth. These findings indicate those vulnerable families could foster empowerment by building mutual support among their members, thereby promoting other family members' development. Positive maternal care positively predicted family resilience and indirectly predicted nursing students' PTG. This new finding indicates that maternal care can play a role in both the family's and the individual's recovery after a traumatic event. This may be due to the traditional cultural values that still exist in China (e.g., "men outside the home, women inside"). In such a context, women may make greater contributions to the family, and play a pivotal role in family relationships. Moreover, family resilience mediated relationships between social support and students' PTG, indicating that more social support resources for the whole family could benefit individual family members. Although previous studies have reported that social support can protect people in crisis from a variety of pathological states (e.g. Refs. [46,47]), few studies have found an association between social support and family resilience after trauma. This study found that social support is a protective factor for family resilience, which would support its role as a key component of Walsh's [33] family resilience framework.

#### 4.1. Implications for practice

In this study, the conceptual model of PTG with family resilience as a mediator extends our knowledge base to guide clinical practice, which indicated that protective factors that predict family resilience can be used to promote PTG. Therefore, it is an important challenge for educators, social psychologists and mental health nurse practitioners to enable families to become and stay healthy. They are called to serve as an advocate for creating individual and family resiliency-building networks, which includes promoting protective factors and reducing risks especially inherent in vulnerable families. Further, to promote nursing students' growth, social psychologists and mental health nursing practitioners should create family resiliency-building networks by promoting intimacy among family members, encouraging maternal care, providing social support, and reducing risks. Resilient nursing students and those with the ability to bounce back from adversities will be able to effectively cope with workplace adversities in their future career.

#### 4.2. Limitations

There are several limitations in this study that can be addressed in future research. First, PTG and family resilience were measured using self-report instruments, which may have a subjective bias. Hence, future studies should include the perspectives of other family members to gain a more objective picture of family resilience. To measure individuals' actual PTG, future studies should identify biomarkers and explore the effects of family resilience on children's biological and psychological outcomes. Second, a single-item question was used to test the family member's intimacy after trauma. Thus, future studies should use instruments with well-established psychometric properties. Third, the study's cross-sectional design prevents an examination of growth over time. Therefore, a longitudinal design could be used in future studies. Additionally, as there are more female nursing students than male nursing students in Chinese universities, this study mainly included female nursing students. Therefore, larger and more diverse samples, especially those including a more representative gender split, are needed to establish the generalizability of the conceptual model

to other populations. Because of these limitations, caution is needed in applying these findings to other student or young adult populations.

### Conflicts of interest

There are no conflicts of interest to declare.

### Author's contribution

Conception and design: Yuli Li; Acquisition of data, analysis and interpretation of data: Yuli Li, Huayu Bai, Fenglan Lou; Drafting and writing of manuscript: Yuli Li, Huayu Bai, Fenglan Lou, Fenglin Cao. Revision of manuscript: Yuli Li, Huayu Bai, Fenglan Lou, Fenglin Cao.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2019.09.002>.

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