



# The mediating role of coping in the relationship between family function and resilience in adolescents and young adults who have a parent with lung cancer

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## Abstract

**Purpose** Resilience plays an important role in helping individuals to adapt to adversity and improve their psychosocial outcomes. This study aims to examine the mediating role of coping in the relationship between family function and resilience in adolescents and young adults (AYAs) who have a parent with lung cancer.

**Method** A total of 135 AYAs with a lung cancer parent were recruited from a tertiary grade A cancer center in southern China, and investigated using a self-designed general information questionnaire, the Resilience Scale for Chinese Adolescents, the Simplified Coping Style Questionnaire, and the Family Adaptation, Partnership, Growth, Affection, Resolve index.

**Results** The mean score of AYAs' resilience was  $(3.61 \pm 0.49)$ , and its influencing factors included AYAs' years in work, family function, and positive coping. The total effect of family function on resilience was significant (total effect = 0.38, 95% CI [0.048–0.115]), and a positive indirect effect was identified for family function on resilience via positive coping (indirect effect = 0.10, 95% CI [0.005–0.043]).

**Conclusion** Family functioning can facilitate resilience either directly or by promoting positive coping. This study suggests that individualized interventions can be made to improve resilience by promoting family function, or by enhancing positive coping in AYAs with a lung cancer parent.

**Keywords** Resilience · Family function · Coping · Adolescents and young adults

## Introduction

Lung cancer is the most commonly diagnosed cancer as well as the leading cause of cancer death worldwide, and the incidence and mortality rate of lung cancer in China accounts for 35.8% and 37.6% of the world's total morbidity and mortality, respectively [1]. The poor prognosis of lung cancer and serious side effects of the treatment not only affect a wide range of patients themselves but also pose serious toxicity, burden, distress, stress, and hardship to their families. Lung cancer patients' caregivers experience a greater burden of care compared to other types of cancers [2].

Research shows that the incidence and mortality of lung cancer increase rapidly after the age of 35 [3], that is, a considerable number of lung cancer patients are middle-aged and have adolescent and young adult (AYA) offspring. Studies suggested that, compared with other age groups of children, AYAs have been identified as the most vulnerable group and experience the highest level of distress [4, 5]. Moreover, the stigma associated with lung cancer is linked to negative psychological sequela for both patients and AYAs, including anger, fault, and blame. Once a parent is diagnosed with lung cancer, this may disrupt their interactions with children and increase the risk of their offspring suffering adverse psychosocial outcomes, such as fear, depression, disease uncertainty, poor discipline, declining academic performance, and deteriorating family relations [6, 7].

However, there is unexpected evidence that, despite the influence of their parents' cancer, some AYAs still achieve good development, such as a more tenacious and brave character, strengthened family relationships, and increased gratitude and appreciation [7–9]. This dynamic process

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encompassing positive adaptation within the context of significant adversity is called resilience [10].

Resilience is a term used to describe a person's ability to recover easily and quickly from setbacks [11], and it is an important protective factor for mental health. Studies indicate that AYAs' resilience is linked to both their physical and psychological characteristics and those of their parents, such as the AYAs' gender, age, and the parent's gender, tumor stage, and treatment. According to previous studies, the higher the AYAs' level of education, the higher their level of resilience [12], and the more serious the condition of the lung cancer parent, the lower the level of resilience [13] of the AYAs. However, the influence of AYAs' gender and age on their resilience is inconsistent [13–15].

Furthermore, according to the interacting dynamic system of resilience [16], resilience is driven by both internal and external protective factors. Internal protective factors are relatively stable, referring to personality traits, including personal coping, and source of psychological control. External protective factors include the family environment and social support system, which can provide material or spiritual support for the individual. Therefore, coping and family function, which represent internal and external protective factors respectively, are considered important factors influencing resilience.

Some studies have proved that coping and resilience are closely related [17–19]. Coping can be divided into positive and negative coping. Positive coping strategies include problem-focused coping, seeking social support, spending more time with family, or faith in God, and negative coping strategies include emotion-focused coping, worrying, or avoiding social interactions [15]. Several studies highlight that positive coping is beneficial to individuals' resilience and well-being, while negative coping has been found to lead to worse psychosocial outcomes [20–22]. However, little is known about the relationship between the resilience and coping of AYAs with a lung cancer parent.

Family is the most central and enduring source of support for AYAs. Family function refers to the emotional connection between family members, family rules, family communication, and the family system's effectiveness in coping with external events [23]. Theoretically, AYAs with better family function may have fewer internalized and externalized emotional and behavioral problems and better resilience [24, 25]. Some studies have found that family function acts on the pathways of resilience through the mediating effect of coping [26, 27]. However, in the context of AYAs, no study has examined the relationship between family function and resilience, or whether AYAs' coping mediates this relationship.

Although AYAs affected by parental cancer are particularly vulnerable to negative psychosocial outcomes, this group may often be overlooked by both family members and

clinical health professionals. Therefore, the current study investigates the influence of family function and coping on the resilience of AYAs who have a parent with lung cancer. It hypothesizes that better family function is associated with higher resilience, and, specifically, that this relationship is mediated by AYAs' coping style.

## Method

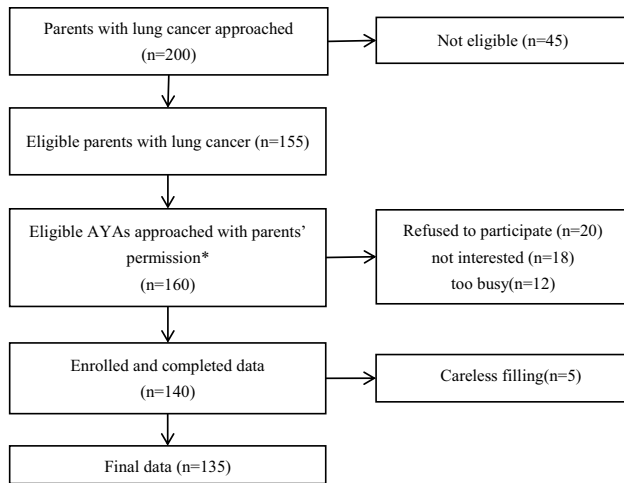
### Study and sample

A cross-sectional study was conducted. The AYAs' eligibility criteria were as follows: (1) father or mother having a diagnosis of lung cancer, (2) 15–28 years old, (3) aware of parents' illness, (4) no significant cognitive dysfunction, (5) voluntarily participating and signing informed consent. The exclusion criteria were AYAs with any other type of cancer, other severe diseases, a history of psychiatric disease, receiving treatment with psychiatric drugs, being aware of their parent's diagnosis for more than 5 years, or participating in psychotherapy studies at the time of enrollment. In order to have a comprehensive understanding of current status, no restrictions were placed in terms of the parent's lung cancer type, stage, or treatment; and multiple offspring in the same family could participate at the same time. A convenience sampling method was used to recruit AYA offspring of lung cancer patients from the department of thoracic surgery and the department of internal medicine in a tertiary grade A cancer center in southern China. Recruitment was conducted from September 2020 to March 2021. The sample size for the multiple regression analysis was approximately 5–10 times the number of independent variables [28]. Based on the literature review, it was estimated that there were 21 independent variables to consider, including gender, age, educational level, income, and the parent's tumor stage. Estimating a 10% turnover rate, the minimum required sample size was 117. A final total of 135 AYAs was recruited. A flowchart of the sample selection procedure is presented in Fig. 1.

### Procedure

Due to the influence of COVID-19, the hospital stipulated that each patient could only have one caregiver in the ward. Therefore, we used paper-based questionnaires for the AYAs attending the hospital, and web-based questionnaires for those who did not.

Approval was obtained from the university and the cancer center. A registered nurse (W.H.P) identified potentially eligible participants from the thoracic surgical and medical wards. When AYAs attended the clinic with their parents, the first researcher explained the purpose, benefit, and risks



**Fig. 1** Participant flow diagram

of the study to them before they signed the informed consent form. Guardians of participants under 18 years old signed on behalf of these children. Each AYA was then instructed to fill out the questionnaires in a quiet room and their parent with lung cancer was asked to complete a general demographic and clinical characteristics questionnaire. Those AYAs who did not attend the hospital were contacted using WeChat and sent the electronic questionnaires. To control the quality of the network questionnaires, we used the following methods: restricting the IP address of the questionnaire filling device to prevent the same participant from filling the same questionnaire repeatedly, setting the age question as the identity filter of participants, and using internal logic and the answer time (> 5 min) to discriminate the data quality. Verbal thanks were given to the participants for their help, and the investigators promised that the information provided would be confidential and anonymous.

## Instruments

### General information questionnaire for the parent with lung cancer

The self-designed general information questionnaire collected demographic and clinical characteristics information from the parent with lung cancer. The demographic information included their age, gender, residence, educational level, marital status, employment status, the form of medical payment, income, and their relationship to the children. The clinical characteristics information gathered included their tumor stage and histology. The demographic characteristics were provided by the lung cancer parents themselves, while the clinical data was filled in by the researcher according to their medical records.

### Socio-demographic questionnaire for AYAs with a lung cancer parent

The socio-demographic questionnaire for AYAs included their gender, age, residence, educational level, marital status, religious faith, work experience, whether they accompanied their parent to hospital, smoking history, relationship to the parent, support from friends.

### The Resilience Scale for Chinese Adolescents (RSCA)

The RSCA was developed by Hu [29] for research into adolescent resilience within an eastern cultural background. The scale contains 27 items and five dimensions: goal focus (5 items), emotional control (6 items), positive cognition (4 items), family support (6 items), and interpersonal assistance (6 items). The Likert 5 scoring method was adopted with 1–5 points representing “completely inconsistent” to “completely consistent,” and the scale scores ranging from 27 to 135, with a higher score indicating better resilience. This scale has good reliability and validity and has been widely used within the Chinese population. In this study, Cronbach’s  $\alpha$  coefficient for the scale was 0.83.

### The Simplified Coping Style Questionnaire (SCSQ)

The SCSQ scale was used to test the coping style of the AYAs. The scale was developed by Xie [30] and is suitable for the Chinese population’s characteristics. It contains two subscales: positive coping and negative coping, with a total of 20 items. If the average score of the positive coping dimension is higher than the score of the negative coping, this means that the respondents mainly adopt the positive coping style, and vice versa. Cronbach’s  $\alpha$  coefficient of the scale was 0.90 in this study.

### The Family Adaptation, Partnership, Growth, Affection, Resolve index (APGAR)

The APGAR scale developed by Smilkstein [31] was used to measure participants’ family function. It contains five aspects: adaptation, partnership, growth, affection, and resolve. Each aspect includes one item, which is scored using a 3-point Likert method of 0–2. A total score of 7–10 is considered to indicate good family function, 4–6 indicates moderate disorder of family function, and 3 or less indicates severe disorder of family function. APGAR is convenient to use and can aptly reflect individuals’ feelings towards their family function. In this study, Cronbach’s  $\alpha$  coefficient of the scale was 0.84.

## Statistical analyses

SPSS version 25.0 software (IBM Corp., Armonk, NY, USA) was used to analyze the data, and the common method bias was used to verify the validity of the results. Statistical significance is denoted by  $p < 0.05$ , and all  $p$ -values are two-sided.

Firstly, descriptive statistics (mean [SD]) were used to analyze continuous variables (i.e., AYAs' age and resilience); frequency (percentage) was used for categorical variables (i.e., AYAs' gender, educational level, and smoking status). Independent  $t$ -test, one-way analysis of variance was used to analyze differences in the resilience of AYAs with different demographic and clinical characteristics. Correlation analysis was performed to analyze the correlation between family function, coping, and resilience.

Secondly, hierarchical multiple linear regression analyses were employed to examine the relationships between family function, coping, and resilience. The hierarchical regressions with resilience as a dependent variable involved three steps: in step one, covariates that were significantly correlated with coping and resilience (i.e., whether the lung cancer patient was the family breadwinner, and AYAs' educational level, and years of working) were entered; in step two, family function was entered; in step three, positive and negative coping were entered.

Thirdly, the mediating effects of positive and negative coping in the relationship between family function and resilience were tested by using the process (version 3.0) macro for SPSS developed by Preacher and Hayes [32]. Bootstrapping techniques using 5000 samples were used for the analysis, which was regarded as providing a more reliable estimate for the small sample size. The significant indirect effect was indicated by a 95% CI of indirect effect without including zero.

## Results

### Participant characteristics

The demographic and clinical characteristics of the samples are shown in Table 1. The mean age of participating AYAs was 23.84 (SD = 3.97, range 15–28). More than half of them were male (56.3%), received college or higher education (64.5%), had siblings (63.7%), and were in work (62.2%), with the average time in work being 2.5 years. Most AYAs had a good relationship with their parent (93.3%). The lung cancer parents had a mean age of 52.79 (SD = 6.60, range 39–66). Around half of them were male (46.7%), employed (53.3%), and the primary breadwinner of the family (48.9%). Most had adenocarcinoma (74.8%), were in tumor stage I

(60.0%), and paid their medical fees partly by themselves (83.7%).

### Resilience, family function, and coping of AYAs with a lung cancer parent

The mean score for AYAs' resilience was 3.61 (SD = 0.49). The mean scores for positive and negative coping were 1.93 ( $\pm 0.66$ ) and 1.12 ( $\pm 0.79$ ), respectively. The mean score for family function was 6.92 ( $\pm 2.20$ ). About 1/6 AYAs ( $n = 19$ ) chose a negative coping style to cope with the effects of their parents' lung cancer, and 5/6 chose positive coping. Family dysfunction (APGAR score  $< 7$ ) was identified in 55 AYAs (40.7%).

### The correlations between resilience, family function, and coping of AYAs with a lung cancer parent

Because the data for family function and coping did not meet the normality prerequisite, Spearman's correlation analysis was performed to examine the relationships between family function, coping, and resilience (see Table 2). The results indicate that family function and positive coping are positively correlated with resilience ( $r = 0.36$ ,  $p < 0.01$ ;  $r = 0.56$ ,  $p < 0.01$ ); however, no correlation was observed between negative coping and resilience. Furthermore, a positive correlation was observed between family function and positive coping ( $r = 0.25$ ,  $p < 0.01$ ).

### Hierarchical regression analyses

Hierarchical regression analyses were used to test the effects of groups of independent variables on resilience (see Table 3). AYAs' years of working significantly correlates with their coping and/or resilience ( $p < 0.05$ ), and was controlled in the hierarchical regression analyses. Family function was found to be significantly associated with positive coping ( $\beta = 0.264$ ,  $p = 0.002$ ), but not with negative coping.

Regarding the resilience scores, after controlling demographic covariates, family function and positive coping were associated with resilience ( $\beta = 0.395$ ,  $p < 0.001$ ;  $\beta = 0.346$ ,  $p < 0.001$ ), whereas negative coping was not associated with resilience.

### Mediating the effect of coping on the association between family function and resilience

The MEDIANTE macro for SPSS was used to examine the mediating effect of coping between family function and resilience, controlling for AYAs' years of working. The model drew on the literature, as shown in Fig. 2. The indirect effect (ab) was estimated as the product of regression

**Table 1** Characteristics of lung cancer parent and AYAs

Lung cancer parents		AYAs	
Variables	Mean (SD)/n (%)	Variables	Mean (SD)/n (%)
Age (years)	52.79 (6.60)	Age (years)	23.84 (3.97)
Gender		Gender	
Male	63 (46.7)	Male	76 (56.3)
Female	72 (53.3)	Female	59 (43.7)
Residence		Residence	
Urban	101 (74.8)	Urban	107 (79.3)
Rural	34 (25.2)	Rural	28 (20.7)
Education		Education	
Elementary school or lower	24 (17.8)	Elementary school or lower	6 (4.4)
Middle or high school	75 (55.5)	Middle or high school	42 (31.1)
College or higher	36 (26.7)	College or higher	87 (64.5)
Marital status		Marital status	
Married	119 (88.1)	Married	34 (25.2)
Widowed/divorced	16 (11.9)	Unmarried	101 (74.8)
Employment status		Religious belief	
Employed	72 (53.3)	Yes	11 (8.1)
Unemployed/retired	63 (46.7)	No	124 (91.9)
Medical payment		Work experience	
Partial self-paying	113 (83.7)	Yes	99 (73.3)
Self-paying	19 (14.1)	No	36 (26.7)
Free medical care	3 (2.2)	Years of working	2.5 (2.6)
Income (RMB per person per month)		Have siblings	
< 5000	76 (56.4)	Yes	86 (63.7)
≥ 5000	59 (43.6)	No	49 (36.3)
The primary breadwinner		Accompany parent in hospital	20 (14.8)
Yes	66 (48.9)	Yes	95 (70.4)
No	69 (51.1)	No	40 (29.6)
Smoking history		Smoking history	
Yes	41 (30.4)	Yes	30 (22.2)
No	94 (69.6)	No	105 (77.8)
Relationship to the children		Relationship to the parent	
Good	126 (93.3)	Good	126 (93.3)
Poor	9 (6.7)	Poor	9 (6.7)
Tumor histology		Number of close friends	
Adenocarcinoma	101 (74.8)	0	7 (5.2)
Squamous cell carcinoma	20 (14.8)	1–2	62 (45.9)
Small cell lung cancer	14 (10.4)	≥ 3	66 (48.9)
Tumor stage			
I	81 (60.0)		
II	21 (15.5)		
III	14 (10.4)		
IV	19 (14.1)		

coefficients predicting coping from family function (a), and resilience from coping (b). Bootstrapping techniques using 5000 samples revealed significant indirect effects for family function on resilience through positive coping. The results are presented in Table 4.

The total effects of family function on resilience were significant, and partial indirect effects via coping were also identified. The direct effects of family function on resilience were significant (point estimate = 1.60, SE = 0.43). In addition, positive indirect effects were found for family function

**Table 2** Correlations among family function, coping and resilience

	M (SD)	Family function	Positive coping	Negative coping	Resilience
Family function	7.16 (2.28)	1			
Positive coping	1.93 (0.66)	0.26**	1		
Negative coping	1.13 (0.80)	0.01	0.23**	1	
Resilience	1.93 (0.66)	0.38**	0.49**	0.17*	1

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

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

on resilience through positive coping (point estimate = 0.59, SE = 0.24, 95% CI [0.167, 1.115]). But no significant indirect effects were found via negative coping.

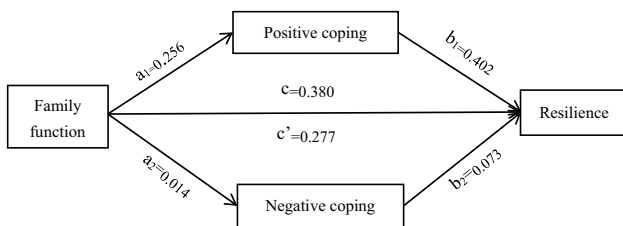
### Discussion

This study is the first to examine the relationship between family function, coping, and resilience, and the mediating role of coping in the relationship between family function and resilience among AYAs with a lung cancer parent. In this study, evidence was found to support the hypothesis that

**Table 3** Hierarchical multiple regression results for predictors of coping and resilience

	Positive coping		Negative coping		Resilience	
	$\beta^*$	P value	$\beta^*$	P value	$\beta^*$	P value
Step 1						
Years of working	0.187	0.030	0.008	0.927	0.303	<0.001
$\Delta R^2$	0.035		<0.001		0.092	
Step 2						
Family function	0.264	0.002	0.014	0.872	0.395	<0.001
$\Delta R^2$	0.070		<0.001		0.155	
Step 3						
Positive coping					0.346	<0.001
Negative coping					0.084	0.243
$\Delta R^2$					0.127	
$R^2$					0.375	
Adjusted $R^2$					0.356	

\*Standardized coefficients



**Fig. 2** The mediating model of family function and resilience

better family function is associated with higher resilience, and that this relationship is partially mediated by AYAs' coping.

Overall, the mean score of AYAs' resilience in this study is  $3.61 \pm 0.49$ , which is similar to the results of Chinese senior high school students with family adversity ( $3.56 \pm 0.59$ ) [33], and general college students ( $3.65 \pm 0.46$ ) [34]. The resilience of AYAs in this study is relatively strong, which is consistent with the previous conclusion that many AYAs

**Table 4** Mediation model testing the direct and indirect effects of family function on resilience via coping

Outcome	Predictor	Mediator	Path a Coef (SE)	Path b Coef (SE)	Path ab: indirect effect of coping on resilience		Path c': direct effect of family function on resilience		Path c: total effect of family function on resilience	
					Coef (SE)	95%CI	Coef (SE)	Coef (SE)		
Resilience	Family function	Positive coping	0.07** (0.02)	8.09*** (1.55)	0.59 (0.24)	(0.167,1.115)	1.60*** (0.43)	2.20*** (0.46)		
		Negative coping	0.005 (0.03)	1.21 (1.23)	0.006 (0.05)	(-0.087,0.149)				

All coefficients (a, b, c', c) were non-standardized coefficients. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

show good psychological adaptation and positive growth through the experience of their parents' cancer [35]. Two reasons could explain this. Firstly, the traditional Chinese culture holds an optimistic and dialectical attitude towards adversity. Confucianism focuses on adopting the path of the golden mean when dealing with problems [36], while Taoism advocates flexibility and promotes peace of mind [37]. Secondly, since 75.6% of parents in our study were in the early stage of cancer, they may probably have a promising prognosis. And this could greatly relieve AYAs' psychological pressure, fear, and distress, and improve their confidence in overcoming predicaments.

Consistent with other studies [38, 39], this study shows that AYAs' years of working is one of the influencing factors on their resilience: the longer the working years of AYAs, the better their resilience results. Because AYAs who had work experience were usually more mature and had richer life experience, they were able to use their experience, skills, and social resources to cope better with the impact of their parent's lung cancer. However, in this study, no significant correlation was found between AYAs' age, educational level, and resilience. A possible explanation for this is the difference in the perceived risk of cancer between different age groups and the parents' protection of relatively young children.

The mediating effect result shows that the direct effect of family function on resilience is the main path (accounting for 72.71% of the total effect), signifying that family function has an important influence on resilience. Family function, as an important external factor, may play a role in the following two ways: one is that good family function can provide a supportive environment to help AYAs acquire emotional support and gain strength from their families, which has a certain buffering effect on negative events; the other is that family can provide problem-solving strategies to help AYAs more easily recover from the traumatic experience. Previous studies have demonstrated an association between family function and resilience in children with autism [39] and high school students [40]. This study extends those prior findings and indicates that a better family function is associated with better resilience in AYAs with a lung cancer parent.

The present study also demonstrates that family function has a positive indirect effect on resilience via positive coping, indicating that coping can be a pathway between family function and resilience. Coping is a behavioral strategy and an important mediating factor to relieve psychological stress [41]. For AYAs with a parent with lung cancer, coping may draw on family and social support and traditional cultural beliefs about life and setbacks. Traditional Chinese culture regards the family as the basic unit of society, and family resource plays a great role in coping with setbacks. Support from the family in the form of encouragement and reassurance could be beneficial to resilience by helping AYAs to

cope well, experience less anxiety and stress, and build up personal and social resources [42]. Setbacks are reinterpreted by Chinese Confucianism from the positive coping view by tempering one's will, cultivating one's character, and improving one's ability [43]. People who adopt positive coping are more likely to focus on solving problems and adjusting themselves, so as to adapt well when confronted with setbacks. This enlightens us that coping guidance programs should be tailored with special attention given to cultural backgrounds and available coping resources.

In conclusion, health professionals taking care of lung cancer patients should also attach importance to their AYA offspring's resilience. Personal resilience plans can be tailored for AYAs to enable them to better manage stress. Health professionals may be able to strengthen AYAs' resilience by conducting coping-based or family function-based interventions, such as workshops and training on family function development, signposting AYAs to existing support mechanisms, or providing them with development programs to improve their coping skills and knowledge.

## Limitations

There are some limitations to this study. Firstly, the cross-sectional study cannot establish a causal relationship between family function, coping, and resilience. Secondly, since Guangzhou is a relatively developed city, and the hospital chosen for the study is a tertiary A class hospital, its inpatients usually have a relatively promising prognosis and good economic conditions, which may compromise the generalizability of the findings. Future studies should conduct multi-center sampling to make the results more representative.

## Implications for oncology care practice

This study suggests that AYAs adapt well to the stressful events of their parents' lung cancer and gain relatively good resilience. This finding highlights the need for attention to be paid to the protective effect of resilience on the mental health of AYAs facing adverse stressful events. The study shows that family function can protect AYAs' resilience either by directly influencing resilience or by affecting their coping style. Therefore, assessing and enhancing family function and coping style may help to improve AYAs' resilience. Family functioning and individual coping-oriented interventions should be considered to promote their healthy growth. Further studies should continue to explore more modifiable risk and protective factors related to the resilience of AYAs, and more evidence-oriented intervention studies are needed to improve psychosocial outcomes for this population.

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**Author contribution** Conceptualization: S.L. and Z.J.E.  
Methodology: S.L. and Y.M.H.  
Data acquisition: Z.J.D., W.H.P., and S.L.  
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Writing—original draft preparation: S.L.  
Writing—review and editing: Z.J.E. and Y.M.H.  
Supervision: Z.J.E. and Z.J.D.  
Final approval of manuscript: all authors.

**Data and materials availability** The data that support the findings of this study are available on request from the corresponding author.

**Code availability** Not applicable.

## Declarations

**Ethics approval** The study was approved by the Regional Ethical Review Board in the Sixth Affiliated Hospital, Sun Yat-sen University (grant number L2019059).

**Consent to participate** All participants aged 15–28 years old had sufficient proficiency in written and spoken Chinese and gave signed informed consent to participate. And the guardians of the subjects under 18 years old signed the informed consent on behalf of their children. All were physically and intellectually capable of completing the study questionnaires.

**Consent for publication** All authors consent to the publication of the manuscript.

**Conflict of interest** The authors declare no competing interests.

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