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The role of parenting stress and perceived social support in affecting family function among families of patients with cleft lip and/or palate: a path analysis based on the family adjustment and adaptation response model

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Abstract

Objectives Family function is important for the normal operation of the family and the development of children. However, existing studies have limited explorations on family function among families of patients with cleft lip and/or palate (CL/P). This study aims to validate a hypothesized model of family function based on the family adjustment and adaptation response model, and identify key variables affecting family function among families of patients with cleft lip and/or palate (CL/P) in China.

Materials and methods The cross-sectional study enrolled 248 families with CL/P patients from two centers in China. The demographic, clinical, family function, resilience, hope, perceived social support, optimism, parenting stress, and coping data were collected. Path analysis was used to investigate the key variables of the family function.

Results Family functions among families of CL/P patients were higher than the Chinese norm in conflict, moral-religious-emphasis, and control. Furthermore, they were lower in expressiveness, independence, achievement orientation, intellectual, cultural orientation, active recreational orientation, and organization. The fitness of the modified path model was evaluated using various measures, including CMIN/DF = 1.954, GFI = 0.914, RFI = 0.801; IFI = 0.919; TLI = 0.909; CFI = 0.917; RMSEA = 0.065. The path analysis showed that perceived social support and parenting stress have a direct positive effect ($\beta = 0.186$) and negative effect ($\beta = -0.384$), respectively. Hope, optimism, perceived social support, coping, and resilience indirectly affect family function. The effects from highest to lowest are hope ($\beta = 0.260$), optimism ($\beta = 0.203$), perceived social support ($\beta = 0.085$), coping ($\beta = 0.055$), and resilience ($\beta = 0.009$). The overall effects of different variables on the family function are as follows: parenting stress ($\beta = -0.384$), perceived social support ($\beta = 0.271$), hope ($\beta = 0.260$), optimism ($\beta = 0.203$), coping ($\beta = 0.055$), and resilience ($\beta = 0.009$).

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Conclusions The family functions of families with CL/P patients are worthy of attention in China. This study showed that parenting stress and perceived social support are key factors that directly affect family function. Coping, hope, resilience, and optimism could indirectly affect family function through parenting stress and perceived social support. Therefore, strategies targeting these two key factors should be implemented to facilitate family function among families with CL/P patients.

Keywords Family function, Parenting stress, Perceived social support, Path analysis, Cleft lip and/or palate

Introduction

Cleft lip and/or palate (CL/P) is a developmental malformation in the craniomaxillofacial region and one of the most common congenital diseases in humans. It is primarily manifested as unilateral or bilateral upper lip and palate fractures, nasal alar collapse, alveolar bone defects, dental dislocation, and craniomaxillofacial malformations [1]. The statistics indicate that the overall global incidence rate of CL/P is about 1/700 [2]. China has a high incidence of CL/P, which is the third highest incidence rate (1.82%) of perinatal malformations [3], and it is increasing year by year [4, 5]. Due to physiological defects, CL/P affects not only the patient's appearance and physiological functions (*e.g.*, articulation, chewing, and swallowing) [6] but also their social and psychological development. Although the development of medical treatment has greatly improved the patient's nasolabial and palatal deformities, there are still quite a few patients who cannot work and live like general population. This might be because of unresolved psychological problems in patients even after improvements in morphology and function [7].

The ecological systems theory emphasizes that [8] the growth and development of children and adolescents are affected by the social environment. Family plays a vital role in the growth of children's mental health, and how the psychological and social behaviors of CL/P patients develop depends largely on family dynamics [9]. The negative family dynamics can affect the establishment of early good parent–child relationships [10, 11], thus seriously affecting the subsequent psychological development of the patient [12]. In a child CL/P patient, the doctor–patient relationship is reflected in the relationship between doctors and patients' families. Therefore, the families of CL/P patients are also the key to determining whether patients can receive treatment in time [13]. Furthermore, children's growth is a long process as their growing needs differ at different stages. If they are not observed and dealt with promptly, patients may gradually deviate from typical physical and mental development [14]. Therefore, the importance of family in the well-being of CL/P patients cannot be overstated. In this study, family refers to the nuclear family and stem family.

The birth of a child with CL/P is often a crisis for the family. Families of these patients may experience significant pressure during the birth, growth, and treatment of children in the following ways: “strike syndrome” after the birth of children [15–17], feeding difficulties [18, 19], growth and development disturbances [20, 21], language disorders [22, 23], academic challenges [24, 25], insufficient comprehension of diseases [26], burden of medical expenses [27, 28] and difficulties in seeking medical treatment [29, 30]. Moreover, the influence of the marriage relationship of the family [25], the physical condition of parents [31], the sense of shame [32, 33], and social isolation [34] cannot be ignored, as these factors reduce the parent's quality of life [35, 36], and are detrimental to the original balance of the family. The family must actively respond and deal with the crisis and use its resources to make adjustments, restore the family's functions and balance, and create an environment conducive to developing and treating patients. Currently, the research on the family function of families of CL/P patients is limited. In this study, family function refers to the ability and effectiveness of a family system in handling emotional connections among family members, family rules, family communication, and dealing with external events and crises.

The family adjustment and adaptive response model (FAAR) [37] was developed to describe how families seek a dynamic balance between demand and resources during times of crisis. As indicated, maintaining the family's balanced functioning depends on whether the family's ability (*e.g.*, various resources and coping behaviors that can be used) can meet their needs (*e.g.*, pressure and tension). The model proposes that the birth of children with disabilities causes various stresses and tensions in their families, leading them to face a crisis. The families deal with the crisis by using their resources and coping behaviors (*e.g.*, actively solving problems or passively avoiding problems) to adjust their family function. Successful adjustment helps families of disabled children to adapt to the crisis. In this model, resources are divided into three types: (1) personal resources like intelligence quotient, educational level, personal traits (such as resilience, hope, optimism), physical and mental health, self-efficacy,

sense of worth, sense of control, and time, (2) family resources including cohesion, adaptability, family organization, and communication skills, (3) social resources such as social support, school support, and policies.

Domestic and foreign research on the family function of children with chronic diseases shows that positive psychological qualities (e.g., hope, optimism, and resilience) [38–40] help restore family function, improve adaptability, and increase social participation. Social support [41], coping [42], and parenting stress [43] all have an impact on family function. These variables are important elements of resources in the FAAR model. Previous studies have demonstrated that perceived social support [44] and hope [45] were positively associated with resilience; perceived social support [46], resilience [47], and hope [48] were related to coping; hope was positively associated with perceived social support [49]. However, these factors have not been verified in the family function of the CL/P patient's families.

As mentioned above, based on the FAAR model and previous studies, this research aimed to identify factors influencing the family function of the CL/P patient's families, which could contribute to provide the framework for family guidance and intervention among CL/P patient's families. This study hypothesizes that perceived social support, hope, resilience, coping, parenting stress, and optimism were all associated with family function. The detailed hypothetical paths and initial model are illustrated in Fig. 1 as below:

Hypothesis 1: Perceived social support, resilience, hope, coping, parenting stress, and optimism can directly affect family function.

Hypothesis 2: Optimism can indirectly affect family function via resilience, hope, perceived social support, coping, and parenting stress.

Hypothesis 3: Hope can indirectly affect family function via resilience, perceived social support, coping for parents, and parenting stress.

Hypothesis 4: Perceived social support can indirectly affect family function via resilience, coping for parents, and parenting stress.

Hypothesis 5: Resilience can indirectly affect family function via coping for parents and parenting stress.

Hypothesis 6: Coping for parents can indirectly affect family function via parenting stress.

Methods

Study design and sample selection

This cross-sectional study was conducted in two CL/P treatment centers in China from April 2019 to July 2020. Patients with CL/P receiving management in the study centers were recruited using the convenience sampling method. When eligible parents attended the study centers for patients' treatment and care, the researchers recruited them after a brief introduction to the study. The inclusion criteria for parents and primary caregivers included (1) those with non-syndromic CL/P patients under 18 years old; (2) those with patients receiving management in the treatment center; (3) those who voluntarily participated in the study; (4) those who were capable

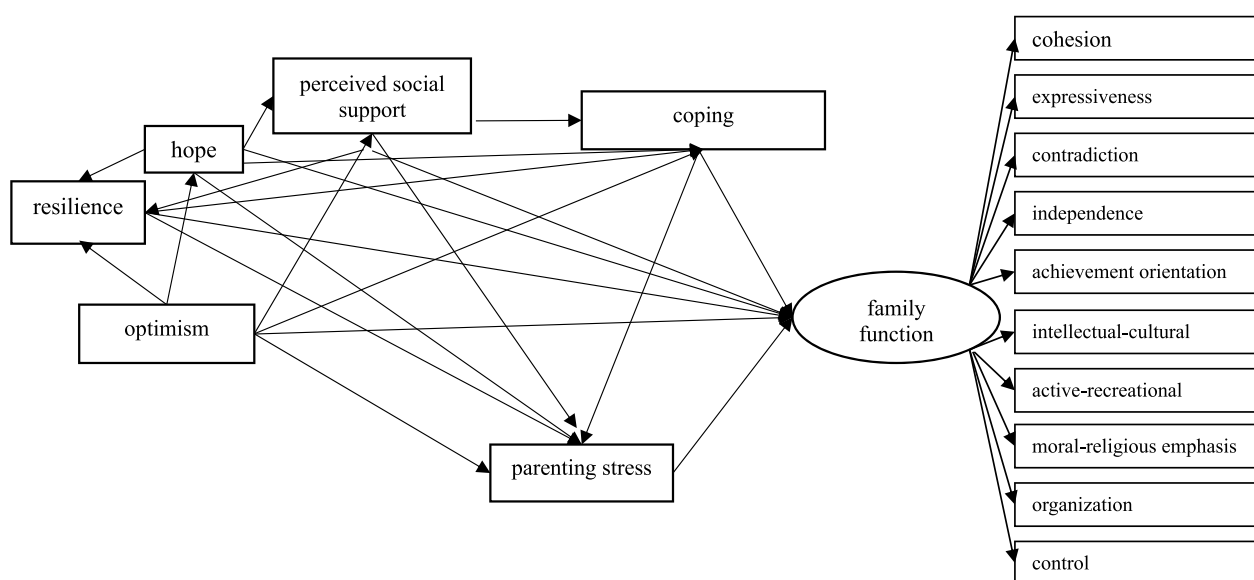


Fig. 1 Initial path of factors influencing the family function of families of patients with cleft lip and/or palate

of understanding and completing the questionnaire. Respondents who had other care tasks, as well as patients with other comorbid serious diseases, were excluded. The strengthening of the reporting of observational studies in epidemiology (STROBE) guidelines was followed in the elaboration of the study.

The sample size of this study was determined by 2 methods. (1) According to the calculation formula of the cross-sectional study:

$$n = \frac{Z_{\alpha}^2}{\delta^2}$$

A pre-test was done to calculate the final sample size, using the following formula: $\alpha=0.05$; $Z_{\alpha}=1.96$; $\sigma=15.39$ (arrived via the pre-test); $\delta=2$. Thus, $n=1.96^2 \times 15.39^2 / 2^2 = 227.47$. The final sample size should be 248–270 to allow a no-response rate of 10–20%. (2) Based on the number of free estimated parameters, Jackson [50] and Bentler and Chou [51] stated that to avoid overfitting due to a small sample size, structural equation modeling should require a sample size of at least 10 times the estimated parameters. According to the hypothetical model of this study, 14 free parameters needed estimation. Therefore, a minimum sample size of 140 was required. Furthermore, after considering a 10–20% non-response rate, the sample size was between 154 and 168. Combining the above two methods, the sample size of the larger range of 248–270 was selected.

Data collection

Data were collected through questionnaires and standardized instruments including a Participant Information Form, Family Environment Scale (FES), Multidimensional Scale of Perceived Social Support (MSPSS), Herth Hope Index (HHI), Resilience Scale-14 (RS-14), Parenting Stress Index-Short Form (PSI-SF), Coping Health Inventory for Parents (CHIP) and Revised Life Orientation Test (LOT-R). Before commencing the data collection, the investigators underwent training from researchers regarding the purpose, significance, data collection methods, precautions, ethical principles of this study, thus ensuring the uniformity in collecting data. The trained investigators provided participants with a comprehensive explanation of the content and purpose of the study. After the caregiver agreed to participate in the study and signed the informed consent form, the investigator distributed the printed questionnaire on the spot in the two treatment centers. Each participant completed the questionnaire survey within 20–30 min. A questionnaire was retrieved after investigators confirmed no missing items in the completed questionnaire. All the information obtained by this research institute remained strictly confidential.

Questionnaire

Demographic and clinical information

Demographic variables included the age of the patient and fathers/mothers, the sex of the patient, whether the patient was an only child, developmental status of the patient, education level of fathers/mothers, job status of fathers/mothers, religious belief of fathers/mothers, monthly income, residence area, family structure, and insurance. Clinical variables include the type of disease and family history with CL/P.

Family Environment scale-Chinese version

Family functioning was measured using the Family Environment Scale (FES). FES was developed in 1981 by Moss [52] and is a 90-item scale with 10 dimensions to reflect the interaction between family members and the overall characteristics of the family environment and changing family functions. It has been widely used in clinical medicine, psychology, sociology, and other disciplines, including chronic disease management, parent-child relationships, bad behavior, and other fields. The 10 dimensions of the scale include cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, moral-religious emphasis, organization, and control. Cohesion refers to the emotional connection between family members, as manifested in mutual support, love, harmony, and harmony between family members. Expressiveness refers to the degree to which family members directly express their emotions, which can either hinder or promote task completion and role commitment. Conflict is defined as the degree to which family members directly express dissatisfaction, anger, and contradiction. Independence is described as the degree of self-esteem, self-confidence, and autonomy of family members. Achievement orientation describes the extent to which routine daily activities, such as work and school, turn into competitive or achievement-oriented activities. The degree to which family members are interested in political, social, intellectual, cultural, and other activities is presented as their intellectual-cultural orientation. The level of social engagement among family members during leisure time is referred to as active-recreational orientation. Moral-religious emphasis refers to how family members recognize and understand the importance of moral ethics, religious beliefs, and values. The extent to which there is a clear organizational structure when allocating family responsibilities and organizing family activities is referred to as organization. Control is defined as the degree to which fixed family rules and procedures arrange family life. Each item received a “yes” or “no” response from respondents, and every dimension

contained nine items. Due to the method of calculating dimensions, FES cannot directly calculate the total score. Therefore, in this study, each dimension was used when analyzing data. The Family Environment Scale-Chinese Version (FES-CV) was introduced in China in 1991 [53, 54] and has been proven to have a good reliability of 0.937 [55]. In this study, Cronbach's α was 0.865.

Perceived social support

The level of perceived social support was assessed using the Chinese version of the Multidimensional Scale of Perceived Social Support (MSPSS) [56], which measures perceived support from three social relationships: family, friends, and significant others. The MSPSS includes 12 items rated on a 7-point scale, where the total score ranges from 12 to 84, with a higher score indicating higher social support. The scale had good reliability and validity among various Chinese populations [57]. In this study, Cronbach's α of the MSPSS was 0.928. Perceived social support refers to parents' subjective appraisal or belief about the support available to them from their social network.

Hope

Hope was assessed using the Herth Hope Index (HHI) [58], which contains three dimensions: temporality and future, positive readiness and expectancy, and interconnectedness. The HHI consists of 12 items, each scoring on a 4-point scale. The total HHI score ranges from 12 to 48, and a higher total score reflects a higher level of hope. The Chinese version of the HHI was found to have good reliability and validity [59]. In the present study, Cronbach's α was 0.854. Hope is described as a positive motivational state that combines parents' goals with the belief that they can achieve those goals.

Resilience

Respondents' resilience was measured using the Resilience Scale-14 (RS-14) [60], which includes 14 items, and each item is rated on a 7-point scale, with a total score ranging from 14 to 98. Higher scores indicate a higher level of resilience. The Chinese version of the RS-14 was used in previous studies, confirming the reliability and validity [61]. In this study, Cronbach's alpha coefficient for the total scale of resilience was 0.901. Resilience is defined as the ability to adapt well and bounce back in the face of adversity, trauma, or significant stressors.

Parenting stress

Parenting stress was assessed using the Parenting Stress Index-Short Form (PSI-SF) [62], which contains three dimensions: parent distress, parent-child dysfunctional interaction, and difficult child. The PSI-SF consists of 36

items, where each item is scored using a 5-point scale, with a total score ranging from 36 to 180. Higher scores indicate a higher level of parenting stress. The Chinese version demonstrated good reliability and validity [63]. In this study, Cronbach's α found to be 0.940. Parenting stress is the psychological and physiological strain experienced by parents in the process of raising their children.

Coping

The Coping Health Inventory for Parents (CHIP) was developed to measure what coping strategies respondents used to maintain a normal family life with a child with chronic disease in the family [64]. The CHIP is a 45-item scale rated on a 5-point scale, with a total score ranging from 45 to 225. Higher scores indicate a higher level of coping, and the scale was widely used among the Chinese population [65]. Cronbach's α was 0.940 in the current study. Coping refers to the conscious efforts and strategies that parents use to manage the demands of a stressful situation.

Optimism

Optimism was assessed using the 10-item Revised Life Orientation Test (LOT-R) [66]. The LOT-R consists of ten items using a 5-point rating system, three of which are for optimism, three of which are for pessimism, and the other four items serve as interference items. A higher score indicates a higher level of optimism. The LOT-R was reliable and valid among various Chinese populations [67]. In the present research, Cronbach's α was 0.600. Optimism is defined as a general tendency to expect positive outcomes. It's a positive attitude that involves believing that good things will happen in the future and that problems are temporary and can be overcome.

Statistical analysis

Data analysis was conducted using SPSS version 20.0 and Amos 23.0. Descriptive statistics were performed to present the characteristics of the participants. Pearson's correlation analysis was carried out to assess the relationships between the 10 dimensions of FES and perceived social support, hope, resilience, coping, and optimism. Path analysis was conducted using Amos 23.0. Maximum Likelihood (ML) Estimates are used for fitting. The model fit was assessed using a normed Chi-square ($\chi^2/df \leq 2$, acceptable fit), the goodness of fit index (GFI: ≥ 0.90 , acceptable fit), Relative Fit Index (RFI: ≥ 0.90 , acceptable fit), Incremental Fit Index (IFI: ≥ 0.90 , acceptable fit), Tucker and Lewis Index (TLI: ≥ 0.90 , acceptable fit), comparative fit index (CFI: ≥ 0.95 , desirable fit), root mean square error of approximation (RMSEA: ≤ 0.08 , acceptable fit) [68]. The standardized regression weight (SRW), critical ratio, and p-value were used to investigate

the estimated significance of regression weights in the hypothesized model.

Ethical consideration

The Ethical Committee of China Medical University granted ethical approval to this study (No.2018–27). The completion of this study was voluntary, and a written informed consent form was obtained from every participant. All the participants were well informed about their right to withdraw from the study, and the participant's anonymity was maintained throughout the study.

Results

Characteristics of participants

A total of 262 questionnaires were distributed in the present study. Of 262, seven participants refused to complete the survey, and seven questionnaires were considered invalid. Table 1 shows the number of valid questionnaires ($n=248$), yielding a response rate of 97.33% and a completion rate of 97.25%. The average age of patients was (7.70 ± 2.76 , 10 months old ~ 18 years old) and there were 136 males (54.8%) and 112 females (45.2%). Furthermore, 38.7% of the patients were the only child in the family. The number of fathers was 162 (66.4%) and mothers were 157 (63.8%), both aged 31–45. Moreover, >50% of the fathers and mothers had an education status of junior high school or below. There were more working fathers than mothers, accounting for 86.9% and 61.3%, respectively. The proportion of fathers and mothers with religious beliefs was 10.2% and 11.4%, respectively. 79.0% of households had a per capita monthly income of <5000 yuan and 62.1% of homes were located in rural areas. The family structures were mainly nuclear and stem (92.4%) families. Only 13 cases (5.2%) had a family history of CL/P, and about half (47.6%) of patients had Cleft lip and palate.

Family function of cleft lip and/or palate patient's families

Compared with the Chinese norm [54], which was the most representative data of FES-CV published in the Chinese Mental Health Journal, family functions among families of CL/P patients were higher in conflict, moral-religious emphasis, and control dimensions ($p < 0.05$) but lower in expressiveness, independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, organization ($p < 0.05$). There was no statistical difference in the score of cohesion between the two groups ($p > 0.05$). Table 2 depicts the results.

Other variables of families of patients with cleft lip and/or palate

Table 3 presents the status of other variables of families of CL/P patients.

Correlation analysis of other variables of families of patients with cleft lip and/or palate and dimensions in the family environment scale

According to correlation analysis, perceived social support, hope, resilience, coping, and optimism among families of CL/P patients are positively related to cohesion, expressiveness, achievement orientation, intellectual-cultural orientation, active-recreational orientation, moral-religious emphasis, organization and control of families, whereas negatively related to conflict and independence of families (see Table 4).

Path analysis for family function of families of patients with cleft lip and/or palate

Preliminary path construction

In this hypothetical paths and initial model illustrated in Fig. 1, the family function was considered as the endogenous latent variable, and 10 dimensions (cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, moral-religious emphasis, organization, and control) of the family environment scale as its measurement indicator variable. In this model, perceived social support, resilience, coping, parenting stress, and optimism were considered explicit variables, in which perceived social support, resilience, coping, and parenting stress are explicit endogenous variables, and optimism is a direct exogenous variable.

Fitting results and evaluation

Fitting results are shown in Fig. 2. The path coefficient displayed on each arrow is a standardized coefficient, which is statistically significant ($p < 0.05$). A total of 26 significant paths affecting the family function of CL/P patients were identified as following.

- Significant path 1: parenting stress → family function;
- Significant path 2: perceived social support → family function;
- Significant path 3: perceived social support → parenting stress → family function;
- Significant path 4: perceived social support → coping → parenting stress → family function;
- Significant path 5: perceived social support → resilience → coping → parenting stress → family function;
- Significant path 6: coping → parenting stress → family function;
- Significant path 7: resilience → coping → parenting stress → family function;
- Significant path 8: hope → parenting stress → family function;

Table 1 General information of families of patients with cleft lip and/or palate ($n = 248$)

Variables		n/X ± S	% / Range
Respondents			
	Fathers	69	27.8
	Mothers	179	72.2
Sex of patients			
	Male	136	54.8
	Female	112	45.2
Age of patients		7.70 ± 2.76	10months-18years old
Is the patient an only child?			
	Yes	96	38.7
	No	152	61.3
Development			
	Normal	202	81.5
	Slower	37	14.9
	Faster	9	3.6
Age of fathers^a			
	≤ 30	37	15.2
	31–45	162	66.4
	> 45	45	18.4
Age of mothers^a			
	≤ 30	59	24.0
	31–45	157	63.8
	> 45	30	12.2
Education of fathers^a			
	Middle school or lower	127	52.0
	High school or secondary school	48	19.7
	College or university or above	69	28.3
Education of mothers^a			
	Middle school or lower	131	53.3
	High school or secondary school	54	21.9
	College or university or above	61	24.8
Job status of fathers^a			
	Regular employee	139	57.0
	Temporary employee	73	29.9
	Resigned for the child	6	2.5
	Unemployed	26	10.6
Job status of mothers^a			
	Regular employee	98	39.8
	Temporary employee	53	21.5
	Resigned for the child	19	7.8
	Unemployed	76	30.9
Religious belief of fathers^a			
	No	219	89.8
	Yes	25	10.2
Religious belief of mothers^a			
	No	218	88.6
	Yes	28	11.4
Income monthly			
	< 3000	95	38.3
	3000–5000	101	40.7

Table 1 (continued)

Variables		n/X ± S	% / Range
Residence	> 5000	52	21
	Urban	94	37.9
	Rural	154	62.1
Family structure	Single-parent family	14	5.6
	Two-parent family	112	45.2
	stem family	117	47.2
	Step-family	5	2.0
Family history with CL/P	Yes	13	5.2
	No	235	94.8
Type of disease	Cleft lip	53	21.4
	Cleft palate	77	31.0
	Cleft lip and palate	118	47.6

^a Due to the existence of a single parent, the total number of fathers/mothers may not be 248

Table 2 Comparison of family function of families of patients with cleft lip and/or palate with Chinese norm ($n = 248$)

Variables	Families of CL/P patients	Chinese norm	T	P
Cohesion	7.70 ± 1.82	7.7 ± 1.9	-0.210	0.983
Expressiveness	5.55 ± 1.58	5.8 ± 1.7	-2.510	0.013*
Conflict	2.51 ± 2.05	2.2 ± 1.9	2.400	0.017*
Independence	5.64 ± 1.24	5.8 ± 1.4	-2.070	0.039*
Achievement orientation	5.11 ± 1.39	6.8 ± 1.7	-19.143	< 0.001***
Intellectual-cultural orientation	4.35 ± 2.10	5.6 ± 2.1	-9.331	< 0.001***
Active-recreational orientation	3.96 ± 2.56	4.9 ± 2.0	-5.810	< 0.001***
Moral-religious emphasis	6.57 ± 1.67	5.3 ± 1.4	12.037	< 0.001***
Organization	5.81 ± 1.73	6.7 ± 1.8	-8.048	< 0.001***
Control	4.00 ± 2.06	3.6 ± 1.8	3.087	0.002**

Chinese norm refer to the data published in Chinese Mental Health Journal on the scores of FES-CV among Chinese general families, which is most representative data of FES-CV in China. The detaol can be seen in Ref 54

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$

Significant path 9: hope → perceived social support → family function;
 Significant path 10: hope → perceived social support → parenting stress → family function;
 Significant path 11: hope → perceived social support → coping → parenting stress → family function;
 Significant path 12: hope → perceived social support → resilience → coping → parenting stress → family function;
 Significant path 13: hope → coping → parenting stress → family function;

Significant path 14: hope → resilience → coping → parenting stress → family function;
 Significant path 15: optimism → parenting stress → family function;
 Significant path 16: optimism → perceived social support → family function;
 Significant path 17: optimism → perceived social support → parenting stress → family function;
 Significant path 18: optimism → perceived social support → coping → parenting stress → family function;

Table 3 The status of other variables of families of patients with cleft lip and/or palate ($n = 248$)

Variables	Items	$\bar{x} \pm s$	Min	Max	Possible scores range	Standardized score
Perceived social support	12	64.04 ± 12.49	22	84	12~84	76.24%
Family supports	4	22.23 ± 4.52	4	28	4~28	79.39%
Friends supports	4	20.62 ± 4.98	6	28	4~28	73.64%
Other supports	4	21.20 ± 4.47	6	28	4~28	75.71%
Hope	12	39.04 ± 4.68	23	48	12~48	81.33%
Temporality and future	4	13.08 ± 1.83	8	16	4~16	81.75%
Positive readiness and expectancy	4	13.07 ± 1.72	6	16	4~16	81.69%
Interconnectedness	4	12.88 ± 1.71	8	16	4~16	80.50%
Resilience	14	75.42 ± 14.34	14	98	14~98	77.0%
Personal ability	10	53.26 ± 10.57	10	70	10~70	76.1%
Positive cognition	4	22.16 ± 4.53	4	28	4~28	79.1%
Parenting Stress	36	84.37 ± 21.67	36	146	60~180	46.87%
Parent distress	12	30.19 ± 8.29	12	54	12~60	50.32%
Parent-child dysfunctional interaction	12	25.40 ± 8.15	12	48	12~60	42.33%
Difficult child	12	28.78 ± 8.38	12	52	12~60	47.97%
Coping	45	168.54 ± 25.10	112	225	45~225	74.9%
Maintaining family unity, cooperation and optimism	19	79.65 ± 9.99	46	95	19~95	83.8%
Understanding the disease through consulting medical personnel and communicating with other parents	18	60.52 ± 12.10	34	90	18~90	67.2%
Seeking social support, maintaining self-esteem and psychological stability	8	28.38 ± 6.64	10	40	8~40	71.0%
optimism	6	16.60 ± 2.72	10	24	0~24	69.17%

Significant path 19: optimism → perceived social support → resilience → coping → parenting stress → family function;

Significant path 20: optimism → hope → parenting stress → family function;

Significant path 21: optimism → hope → resilience → coping → parenting stress → family function;

Significant path 22: optimism → hope → coping → parenting stress → family function;

Significant path 23: optimism → hope → perceived social support → family function;

Significant path 24: optimism → hope → perceived social support → parenting stress → family function;

Significant path 25: optimism → hope → perceived social support → resilience → coping → parenting stress → family function;

Significant path 26: optimism → hope → perceived social support → coping → parenting stress → family function.

Besides, path coefficient between family function and its dimensions were following: cohesion → family function(0.853), expressiveness → family function(0.434), conflict → family function(−0.802),

independence → family function(−0.122), achievement orientation → family function(0.172), intellectual-cultural orientation → family function(0.340), active-recreational orientation → family function(0.240), moral-religious emphasis → family function(0.380), organization → family function(0.618), control → family function(0.262).

Evaluation of model fitting effect: CMIN/DF of the corrected model was < 2, fitting index GFI, RFI, IFI, TLI, and CFI are > 0.9, and RMSEA is < 0.08, indicating the good fitting performance of the corrected model. The values of each fitting index are shown in Table 5.

Direct effect, indirect effect, and overall effect of each related factor in the path

In this study, there are 14 paths with statistical significance in total. Table 6 depicts the standardized path coefficient of each path. Perceived social support and parenting stress have a direct effect on family function. Perceived social support had a positive effect (0.186), and parenting stress had a negative effect (−0.384). Hope, optimism, perceived social support, coping, and resilience indicated an indirect effect on family function. The effects from highest to lowest are hope (0.260), optimism

Table 4 Correlation analysis of dimensions in family environment scale for families of patients with cleft lip and/or palate ($n = 248$)

Variables	Cohesion	Expressiveness	Conflict	Independence	Achievement orientation	Intellectual cultural orientation	Active-recreational orientation	Moral-religious emphasis	Organization	Control
resilience	0.158*	0.058	-0.135*	0.079	0.142*	0.270**	0.197**	0.202**	0.186**	0.112
perceived social support	0.301**	0.271**	-0.242**	-0.106	-0.030	0.180**	0.225**	0.185**	0.146*	0.036
hope	0.297**	0.192**	-0.161*	0.034	0.097	0.217**	0.258**	0.159*	0.192**	0.103
optimism	0.210**	0.146*	-0.031	-0.056	-0.056	0.221**	0.195**	-0.014	0.038	-0.130*
parenting stress	-0.405**	-0.303**	0.312**	0.103	0.012	-0.328**	-0.402**	-0.083	-0.202**	-0.007
coping	0.211**	0.233**	-0.036	0.042	0.084	0.415**	0.432**	0.139*	0.196**	0.219**

Cohesion, Expressiveness, Conflict, Independence, Achievement orientation, Intellectual cultural orientation, Active-recreational orientation, Moral-religious emphasis, Organization and Control are dimensions in family environment scale

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$

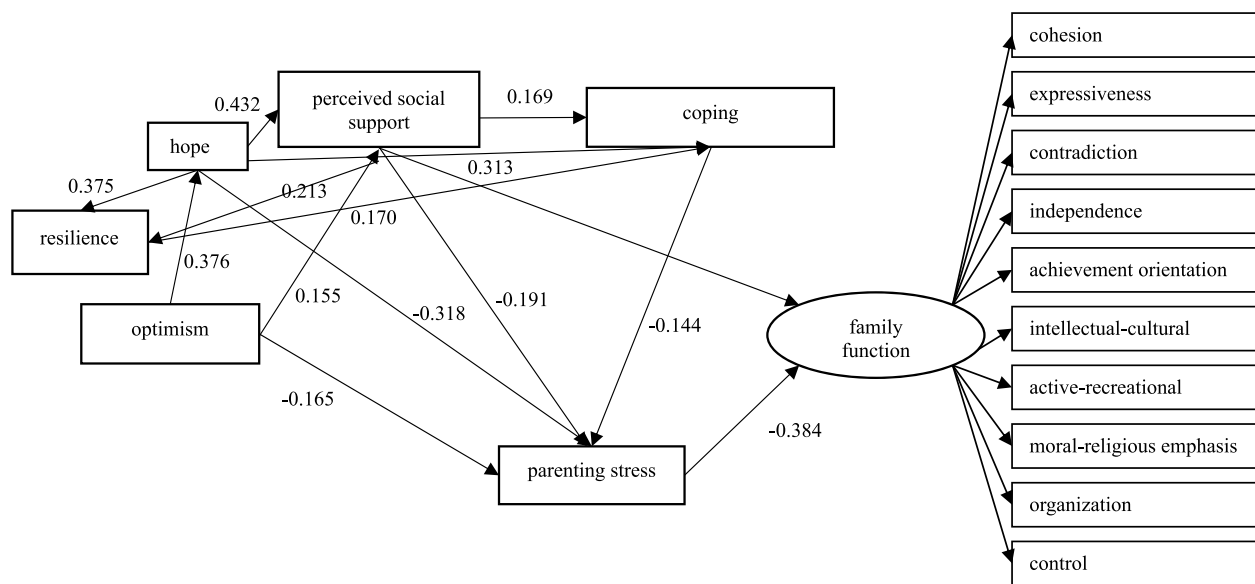


Fig. 2 Path analysis model of factors influencing the family function of families of patients with cleft lip and/or palate

Table 5 Fitting indexes in the corrected model

	CMIN/DF	GFI	RFI	IFI	TLI	CFI	RMSEA
fitting index	1.954	0.914	0.801	0.919	0.909	0.917	0.065
Standardized index	< 2	> 0.90	> 0.90	> 0.90	> 0.90	> 0.90	< 0.08

CMIN/DF Minimum Discrepancy divided by Degree of Freedom, GFI Goodness of Fit Index, RFI Relative Fit Index, IFI Incremental Fit Index, TLI Tucker-Lewis Index, CFI Comparative Fit Index, RMSEA Root Mean Square Error of Approximation

Table 6 Standardized path coefficient

Path	Standardized path coefficient	P
optimism → perceived social support	0.155	0.008
optimism → hope	0.376	< 0.001
optimism → parenting stress	-0.165	0.003
hope → perceived social support	0.432	< 0.001
hope → resilience	0.375	< 0.001
hope → coping	0.313	< 0.001
hope → parenting stress	-0.318	< 0.001
perceived social support → resilience	0.213	< 0.001
perceived social support → coping	0.169	0.008
perceived social support → parenting stress	-0.191	0.001
resilience → coping	0.170	0.007
coping → parenting stress	-0.144	0.014
parenting stress → family function	-0.384	< 0.001
perceived social support → family function	0.186	0.007

(0.203), perceived social support (0.085), coping (0.055), and resilience (0.009). The overall effects of different variables on the family function are as follows: parenting

stress (-0.384), perceived social support (0.271), hope (0.260), optimism (0.203), coping (0.055), and resilience (0.009), wherein the parenting stress had a negative effect (see Table 7).

Parenting stress is the variable with the largest effect size for family function (-0.384). It can directly impact the family function and serve as a mediating variable of family function and other variables. Hope, optimism, perceived social support, and coping can affect family functions through parenting stress.

The perceived social support for the family function has an effect size of 0.271, with direct and indirect effects as 0.186 and 0.085, respectively. Its impact on family function includes the following pathways: (1) perceived social support → family function (direct effect); (2) perceived social support → parenting stress → family function (indirect effect); (3) perceived social support → resilience → coping → parenting stress → family function (indirect effect); (4) perceived social support → coping → parenting stress → family function (indirect effect).

Coping impacts family function by mediating parenting stress, with an effect size of 0.055. The influence of

Table 7 Direct effect, indirect effect, and overall effect (standardized) between variables in path

Dependent variables	Effect size	Independent variables					
		Optimism	Perceived social support	Resilience	Hope	Coping	Parenting stress
perceived social support	Direct effect	0.155					
	Indirect effect	0.162					
	Total effect	0.318					
resilience	Direct effect	-	0.213				
	Indirect effect	0.209	-				
	Total effect	0.209	0.213				
hope	Direct effect	0.376	0.432	0.375			
	Indirect effect	-	-	0.092			
	Total effect	0.376	0.432	0.467			
coping	Direct effect	-	0.169	0.170	-		
	Indirect effect	0.207		-	0.465		
	Total effect	0.207	0.206	0.170	0.465		
parenting stress	Direct effect	-0.165	-0.190	-	-0.318		
	Indirect effect	-0.210	-0.030	-0.025	-0.149		
	Total effect	-0.375	-0.220	-0.025	-0.467	-0.144	
family function	Direct effect	-	0.186	-	-	-	-0.384
	Indirect effect	0.203	0.085	0.009	0.260	0.055	-
	Total effect	0.203	0.271	0.009	0.260	0.055	-0.384

resilience on family function is considered an indirect action, with an effect size of 0.009. The impact of hope on family function is considered an indirect effect, with an effect size of 0.260. The influence of optimism on family function is considered an indirect effect, with an effect size of 0.203.

Discussion

Current status of family functions of families of patients with cleft lip and/or palate

In this study, the family environment scale was used to assess the family functions of families of patients with CL/P, which consists of 10 dimensions, including cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, moral-religious emphasis, organization, and control. Compared with the Chinese norm, conflict, moral-religious emphasis, and control of families of patients with CL/P are higher [54]. Expressiveness, independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, and organization are all lower than the Chinese norm. Furthermore, there is no difference in the cohesion scores between the two. In other words, families of patients with CL/P have more family conflicts, less emotional communication, independence, sense of achievement, participation in recreational activities, and poor arrangement of family activities compared to general families. However,

the degree of recognition and emphasis on moral ethics, religious beliefs and values, and the arrangement of fixed procedures in family life become higher than that of general families.

This can be attributed to two factors. On the one hand, CL/P is a congenital chronic disease. The patient's birth hurts the family. The care burden and pressure on the parents increased. First, the conventional feeding method causes the CL/P patients to buck. Parents need to learn the method of spoon-feeding. Daily feeding is time-consuming and laborious, whereas follow-up treatment, rehabilitation, speech therapy, and other therapies necessitate active parental participation. The care burden is greater than for children without CL/P [18, 69]. The treatment process for this disease is also lengthy and requires multidisciplinary cooperation [70]. To cooperate with the treatment, the family must change the original rhythm of life, which impacts the active-recreational orientation activities and fixed arrangements of families. In terms of therapeutic effect, improving the appearance, voice, and oral state of patients is a long-term process. After families spend a lot of time and energy, they cannot see the effect immediately, affecting their sense of achievement [71]. The pressures (*e.g.*, financial pressure, choice of the treatment plan, time pressure, psychological pressure) during the treatment also aggravate the conflict and affect the emotional communication of family members [72].

Frustration encountered during the treatment and seeking help from others also affect the self-esteem and confidence of family members [73]. Furthermore, it has been demonstrated that patients with CL/P are more likely to have poor academic performance [74, 75], language disorders [76, 77], sports problems [69], cognitive problems [20], other physical health problems [78, 79], oral health problems [80, 81], and psychological problems [26]. Therefore, parents must pay more attention to patients with CL/P learning and growth processes, leading to significant pressure on the division of labor and responsibility of care and increased conflicts [82], whereas relaxation activities, such as cultural and recreational activities, are less. Therefore, the family is more likely to be in a tense atmosphere for a long time. When facing the above challenges, some parents have incorrect subjective understanding, such as a sense of shame [83, 84], less contact with the outside world, and social isolation [85]. Some parents speculate and complain about the bad habits of the other party, leading to diseases and many disputes and disharmony between husband and wife [82]. Some parents with high negative emotions [15, 17] cannot correctly cope with the changes due to the disease or treat it correctly, thus affecting family function.

On the other hand, during the long-term treatment process, families gradually adapt to the disease and treatment, develop their own coping style and approach to dealing with the disease, form their judgment and cognition of the disease and feel some sense of achievement [19]. This results in scores of moral-religious emphasis and control that are higher than those of general families in China.

The results of this study reveal that the family function of CL/P patient's families needs to be intervened. Healthy family function is beneficial for the growth and recovery of patients. Families require external assistance to enhance their resources and adjust coping behaviors to restore family function. Families should be helped to accept the reality and make positive changes. Therefore, it is necessary to formulate an appropriate intervention plan. Studies have shown that the Calgary Family Assessment and Intervention Model [86] and family-focused therapy [87] can significantly help adjust the family function. Furthermore, the suitability of some dimensions in the family environment scale in China has yet to be clarified [88], suggesting that the family environment scale needs to be modified for application in China.

Path analysis of the family function of families of patients with CL/P

Path analyses revealed that parenting stress and perceived social support could directly affect the family function of parents, while hope, optimism, coping, and resilience can only have an indirect impact.

Parenting stress

Path analyses revealed that parenting stress is the variable with the largest effect size for a family function. Furthermore, parenting stress can directly affect the family function and serve as a mediating variable in influencing perceived social support, hope, coping, and optimism in family function, indicating that it plays a key role in maintaining an effective family function of the CL/P patient's families [89, 90].

A certain amount of pressure can induce improved performance of individuals/families, while the negative impact of excessive pressure requires intervention. Based on individual perspectives, parenting distress is the dimension with the highest score of parenting stress. Parenting distress scores the highest, suggesting that parents consider parenting a burden, and some behaviors accordingly negative. For the leader and main member of the family, the negative state will inevitably affect all aspects of family life, thus affecting the patient's treatment. The irregular treatment procedure will affect the parenting feelings of parents, aggravate parenting stress, and form a vicious circle, which in turn impacts the mental health, social health, academic performance, and behavior habits of patients. The negative state of parents is not conducive to the growth and development of patients. However, the unhealthy development of the patient in the above aspects will become a new source of stress for parents, further aggravating the parenting stress. Based on the family perspective, when the family is in a large pressure state, the family function will be affected [91]. Pavarini et al. [92] pointed out that a high level of pressure is a poor predictor of family function. The intervention study also verified the relationship between pressure and family function. A randomized controlled study [93] that measures to reduce the parenting stress of mothers improves family function. The role of pressure management and intervention in maintaining family functions has also been confirmed [94]. From the perspective of the FAAR model, parenting stress represents the crisis faced by the family and perceived social support, hope, coping, and optimism that represent the resources and coping behaviors of the family. The dynamic role change between these two variables impacts the family function. The birth, treatment, feeding, diet, and development of patients with CL/P is a long-term stimulus that requires long-term and continuous efforts from parents. It is a

direct stimulus with a long duration, directly increasing the number of family members and affecting the focus of family life and the arrangement of family activities. Therefore, it will inevitably impact family function. However, the parents have a higher degree of distress and relatively less positive feelings in parenting. When the actual pressure increases, the subjective understanding of the parents becomes less active and positive, exacerbating the impact of parenting stress on family function.

Perceived social support [95], hope [96], coping [97], optimism [98], and resilience [99] have all been shown to play a role in stress reduction. In this study, path analysis verified the effect of perceived social support, hope, coping, and optimism on parenting stress. Their positive role can enhance the resources of the parents and promote a positive view of parenting. However, resilience had no effect on parenting stress in this study, implying that further research is required to verify the role of resilience.

In summary, medical staff should guide families to look at the parenting of patients with CL/P and face the parenting frustration from a positive perspective, inspire them to experience a sense of achievement in parenting, and encourage the parents to accept the situation with a positive attitude and face this fact. Studies have shown that mindfulness intervention [100, 101], acceptance and commitment method [102], and cognitive behavior intervention [103] are instrumental in helping alleviate the parenting stress of parents of children with chronic diseases. These measures deserve further discussion and application in the follow-up study.

Perceived social support

The path analysis reveals that perceived social support can directly affect family function and can also affect family function through parenting stress, thereby protecting family function, consistent with previous studies [104].

Perceived social support is an important part of positive psychology and one of the major psychological capitals of parents. It is not only the response to the quantity of actual support but also the perception and recognition of actual social support and the perception of support quality by supporters [105, 106]. Based on the source analysis of the social support for CL/P patients' families, care support is needed when the child is just born, mainly provided by family members. Medical, financial, and care support are all required during the treatment stage, mainly provided by medical institutions and family members. Family members should understand the situation and needs of the parents and be willing to help and provide substantial assistance, meet the needs of parents, and solve the urgent needs of parents to allow them to better deal with a series of problems in treating patients.

Therefore, family support and other forms of support are the primary needs of parents at this stage. In China, the concept of family is still strong [101]. Family members are closely connected and have more interactions. When encountering difficulties, family members are the first choice for help. Furthermore, social support includes both material and psychological support. Assistance from family members, spouses, and parents can help families of patients with CL/P to stabilize their emotions and obtain psychological comfort [107]. According to a specific situation, medical staff should target the patient and parents in clinical work and pay special attention to patient families with disharmonious family relationships. Based on the results of the present study, future interventions to improve the perceived social support level of patient parents can be implemented.

It has been demonstrated that social support predicts [108] and reduces the burden of care [109]. Families with high levels of social support have the best clinical outcome [110] and can provide more beneficial support for families [111]. Analyzing the reasons, social support can directly reduce the pressure load (*e.g.*, sharing the responsibility of care and financial pressure) and provide psychological support and "spiritual nourishment" for parents. Moreover, similar to the negative impact of parenting stress on the entire family, an increase in social support level will provide direct help for whole family resources, thereby promoting the recovery of family function.

In summary, intervention for social support is of great significance. Furthermore, medical staff should focus on parents to improve social support and assist parents in correctly feeling and understanding the help they have received, facing and accepting support from all angles with a positive attitude, forming a good family atmosphere, and promoting the healthy development of a family function.

Others

Hope is a crucial component of positive psychology and one of the positive coping resources for people when facing difficulties. It is almost related to all good health outcomes [112]. According to the theory of hope by Herth, the essence of hope is a belief that convinces people that the current predicament can be changed. Consequently, people will reduce their dissatisfaction with the current situation and take action [113]. Previous research has indicated that the level of hope is an important protective factor for anxiety and depression [114, 115], helps alleviate negative emotions, and is positively correlated with life satisfaction [116]. It is also a predictive factor for parenting stress and parenting behavior of parents of children with chronic diseases [117]. In this study, hope acts

on family function through parenting stress, perceived social support, resilience, and coping styles. Existing studies have shown that the health education model of knowledge, attitude, and practice and the enhancement of internal positivity (such as having hobbies and goals) [117]. Therefore, in clinical work and continuing care, we can start from the above aspects, correct the positive attitude of caregivers, encourage their positive actions and close relationships, thus raising the level of hope of patient caregivers.

Optimism is a positive expectation or belief about upcoming events in the future [118]. Individuals with a high level of optimism can view and face facts positively and adopt positive coping behaviors and strategies [119]. These positive attitudes, values, and behaviors can effectively reduce the adverse effects brought by stress and challenges and promote good adaptation of individuals. Existing studies have shown that optimism is a key variable for improving the mental health of caregivers [120, 121]. Individuals with a high level of optimism have a low degree of pain experience [122] and a high level of life satisfaction. Parents with a high level of optimism also have more positive parenting behaviors [123] and have more positive cognitions and evaluations of parenting [124]. In this study, optimism acts on family function through parenting stress, perceived social support, and hope. Caregivers with a high level of optimism can correctly view diseases, treatments, and their impacts and have positive and forward-looking expectations. Therefore, improving the optimism level of caregivers is helpful for cultivating the positive psychological qualities and behaviors of caregivers, which is conducive to a favorable outcome for patients and should be emphasized in future work and research.

Coping have no direct effect on family function, but they can affect family function by reducing parenting stress. Analyzing the possible reasons, previous studies have shown that positive and appropriate coping styles can relieve stress [97]. Positive coping styles can not only promote the mental health of caregivers but also be beneficial to the improvement of parent–child behavior [125]. In this study, positive coping behaviors can not only promote the positive behaviors of caregivers, including behaviors when facing disease treatment, as well as interaction and communication with patients, which is conducive to reducing parenting stress and thus promoting the recovery of family function. It is worth noting that the least used by caregivers in this study is “understanding the disease situation by consulting medical staff and communicating with other parents.” This may be related to the large number of patients and the fast pace of medical treatment in China’s national conditions. At present, with the

development of information technology, the network is becoming more and more developed and communication is becoming more and more convenient. And some studies have also shown that online intervention and peer support are effective methods to deal with disease dilemmas [126–128]. Therefore, in future clinical work, patient caregivers can be encouraged to express their needs and respond positively to the needs they put forward. At the same time, online intervention can be adopted to establish communication groups for patient caregivers to facilitate contact and promote their good development.

Resilience is one of the important contents of positive psychology. It can help individuals recover from difficulties, setbacks, and challenges and even reach a higher level. Resilience helps caregivers perceive the positive aspects of parenting and reduce the burden of parenting [129]. Studies in other groups have shown that resilience is conducive to positive coping, effective communication, emotion management, and self-affirmation of families [130–132] and can reduce the burden of caregiving [133]. In this study, the indirect effect on family function of resilience is achieved through coping, and its effect size is also very small. However, its role still cannot be ignored by clinical workers.

This study has several limitations. One limitation was the cross-sectional design, which only showed a glimpse of the participants at a specific time. Besides, potential biases were still inevitable due to convenience sampling, although we have chosen two larger cleft lip and palate treatment centers in northeastern and southwestern China to collect data, and the age range of patients with CL/P was 10 months to 18 years old. Another limitation was the need for a larger sample to improve representativeness. This study also has some strengths, which included both fathers and mothers, compared to many previous studies that included only mothers. Findings from this study may contribute to a better understanding of the family function of families with CL/P in China and consequently provide some practical inspiration for future researchers and healthcare providers.

Conclusions

In this study, we showed that parenting stress and social support could directly affect the family function of families of patients with CL/P. Coping style, hope, resilience, and optimism could indirectly affect family function through parenting stress and perceived social support. Therefore, parenting stress and social support are the key variables of further interventions to maintain and improve family function among families of patients with

CL/P. However, due to the limitations of cross-sectional studies, these results may not be directly generalizable to other populations. Future longitudinal designs are needed to further depict this relationship, and further research should be conducted on how key variables (parenting stress and social support) that affect family function can be intervened.

Relevance to clinical practices

This study contributes to a better understanding of the family function among families of patients with CL/P by exploring what could affect family function directly. Findings from this study have implications for care providers in clinical and community. In clinical and community settings, it is recommended that parenting stress and perceived social support be valued. Our findings also have implications for researchers. In the future, we should focus on conducting in-depth evidence-based research in these two specific areas. By rigorously collecting and analyzing relevant evidence, we can formulate highly targeted intervention programs. These programs are designed to seamlessly translate the research findings into tangible clinical applications. Through this process, not only can the quality of medical care be significantly enhanced, but also better patient outcomes can be achieved, ultimately promoting the overall development of the medical field.

Abbreviations

CL/P	Cleft lip and/or palate
FES	Family Environment Scale
FES-CV	The Family Environment Scale-Chinese Version
MSPSS	The Multidimensional Scale of Perceived Social Support
HHI	Herth Hope Index
PSS-10	Perceived Stress Scale
RS-14	Resilience Scale-14
PSI-SF	Parenting Stress Index-Short Form
CHIP	The Coping Health Inventory for Parents
LOT-R	Revised Life Orientation Test
ML	Maximum Likelihood
CMIN/DF	Minimum Discrepancy divided by Degree of Freedom
GFI	Goodness of Fit Index
RFI	Relative Fit Index
IFI	Incremental Fit Index
TLI	Tucker-Lewis Index
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

LLY, YD and HJL contributed to the study conception and design. JYW, YJW, JRY and XJW contributed to data collection. Data analyses were performed by LLY, WRW and HJL. The first draft and revision of the manuscript were by LLY, YD and HJL. All authors commented on subsequent versions of the manuscript. All authors critically revised and approved the final manuscript.

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Data availability

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation. The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The Ethical Committee of China Medical University granted ethical approval to this study (No.2018–27). The completion of this study was voluntary and implied consent was communicated to all participants. They were also well informed about their right to withdraw from the study. Participants' anonymity was maintained throughout the study. Participants provided their informed consent prior to responding to the survey questions. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Zhang Z. Oral and Maxillofacial Surgery (Seventh Edition) People's Medical Publishing House. 2012.
2. Dixon MJ, Marazita ML, Beaty TH, Murray JC. Cleft lip and palate: understanding genetic and environmental influences. *Nat Rev Genet*. 2011;12(3):167–78.
3. China. MoHotPsRo: Report on prevention and treatment of birth defects in China. 2012. <http://www.gov.cn/gzdt/att/att/site1/20120912/1c6f6506c7f811bacf9301.pdf>.
4. Huang H. Advances Etiology of Cleft Lip and/or Palate. *J Oral Maxillofac Surg*. 2007;03:201–4.
5. Zhao R. Epidemiological analysis of congenital cleft lip and palate. *China Practical Medical*. 2011;6(16):223–4.
6. Zhang J, Song F, Zhou S, Zheng H, Peng L, Zhang Q, Zhao W, Zhang T, Li W, Zhou Z, et al. Analysis of single-nucleotide polymorphism of Sonic hedgehog signaling pathway in non-syndromic cleft lip and/or palate in the Chinese population. *J Peking University*. 2019;51(03):556–63.
7. Shi B, Zheng Q. It is necessary to do psychological intervention for patients with cleft lip and palate. *West China J Stomatol*. 2010;28(4):345–7, 351.

8. Che G, Ding Y, Xu M. The study of the integration of school, family and society on the youth moral education: the enlightenment of U.Bronfenbrenner's theory of developing ecology. *J Northeast Normal University (Philosophy and Social Sciences)*. 2007;04:155–60.
9. Ha P, Zheng Q. History, present status, and future of psychological research on cleft lip and palate. *Int J Stomatol*. 2014;41(03):355–7.
10. Sank JR, Berk NW, Cooper ME, Marazita ML. Perceived social support of mothers of children with clefts. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association*. 2003;40(2):165–71.
11. Field T, Healy B, Goldstein S, Perry S, Bendell D, Schanberg S, Zimmerman EA, Kuhn C. Infants of depressed mothers show "depressed" behavior even with nondepressed adults. *Child Dev*. 1988;59(6):1569–79.
12. Weng G, Xu L, Liao C. Status quo of research on psychological state of parents of children with cheilopalatognathus. *Chin Nurs Res*. 2009;23(32):2920–1.
13. Zheng L. Analysis of psychological status of parents with cleft lip and palate. MD: Sichuan University; 2004.
14. Hu H. Study on temperament and behavioral characteristics of infants with cleft lip and palate. MD: Central South University; 2012.
15. Ueki S, Fujita Y, Kitao M, Kumagai Y, Ike M, Niinomi K, Matsunaka E, Fujiwara C. Resilience and difficulties of parents of children with a cleft lip and palate. *Japan journal of nursing science : JJNS*. 2019;16(2):232–7.
16. Ault S, Breitenstein SM, Tucker S, Haverkamp SM, Ford JL. Caregivers of children with autism spectrum disorder in rural areas: A literature review of mental health and social support. *J Pediatr Nurs*. 2021;61:229–39.
17. Nur Yilmaz RB, Germeç Çakan D, Türkyilmaz Uyar E. Maternal and paternal well-being during nasolabial molding and primary surgery periods. *J Craniofac Surg*. 2019;30(7):2227–32.
18. Marchand WR. Neural mechanisms of mindfulness and meditation: Evidence from neuroimaging studies. *World journal of radiology*. 2014;6(7):471–9.
19. Britton KF, McDonald SH, Welbury RR. An investigation into infant feeding in children born with a cleft lip and/or palate in the West of Scotland. *European archives of paediatric dentistry : official journal of the European Academy of Paediatric Dentistry*. 2011;12(5):250–5.
20. Roberts RM, Mathias JL, Wheaton P. Cognitive functioning in children and adults with nonsyndromal cleft lip and/or palate: a meta-analysis. *J Pediatr Psychol*. 2012;37(7):786–97.
21. Cavalheiro MG, Lamônica DAC, de Vasconcellos Hage SR, Maximino LP. Child development skills and language in toddlers with cleft lip and palate. *Int J Pediatr Otorhinolaryngol*. 2019;116:18–21.
22. Bruneel L, Bettens K, Van Lierde K. The relationship between health-related quality of life and speech in children with cleft palate. *Int J Pediatr Otorhinolaryngol*. 2019;120:112–7.
23. Subramanian B, Nagarajan R, Vaidyanathan R, Rajashekhar B, Sathiyasekaran BWC. Caregivers' perception of speech and language status and related needs in children with cleft lip and palate. *Int J Pediatr Otorhinolaryngol*. 2018;108:22–5.
24. Richman LC, McCoy TE, Conrad AL, Nopoulos PC. Neuropsychological, behavioral, and academic sequelae of cleft: early developmental, school age, and adolescent/young adult outcomes. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association*. 2012;49(4):387–96.
25. Persson M, Becker M, Svensson H. Academic achievement in individuals with cleft: a population-based register study. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association*. 2012;49(2):153–9.
26. Crerand CE, Rosenberg J, Magee L, Stein MB, Wilson-Genderson M, Broder HL. Parent-reported family functioning among children with cleft lip/palate. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association*. 2015;52(6):651–9.
27. Bluestone CD. Studies in otitis media: Children's Hospital of Pittsburgh-University of Pittsburgh progress report–2004. *Laryngoscope*. 2004;114(11 Pt 3 Suppl 105):1–26.
28. Dp K. KT M: The state of the art: speech and language issues in the cleft palate population. *Cleft Palate Cran J*. 2000;37:348.
29. Bennett KG, Ranganathan K, Patterson AK, Baker MK, Vercler CJ, Kasten SJ, Buchman SR, Waljee JF. Caregiver-reported outcomes and barriers to care among patients with cleft lip and palate. *Plast Reconstr Surg*. 2018;142(6):884e–91e.
30. Gong C, Xiong M, Wu M. Psychological characteristics and nursing of cleft lip and palate children and their parents. *International Journal of Stomatology*. 2010;37(04):413–6.
31. Li Q. Study on psychosomatic health status and psychological intervention of parents of children with cleft lip and palate in Pingdingshan area. Zhengzhou University 2018.
32. Gyimah SO. Cultural background and infant survival in Ghana. *Ethn Health*. 2006;11(2):101–20.
33. Loh J. M A: Cross-cultural attitudes and perceptions towards cleft lip and palate deformities. *World Cultural Psychiatr Res Rev*. 2011;6(2):127–34.
34. Bonsu AB, Dzomeku VM, Apiribu F, et al. Having a child with orofacial cleft: Initial reaction and psychosocial experiences of Ghanaian mothers. *Int J Africa Nurs Sci*. 2018;8:132–40.
35. Awoyale T, Onajole AT, Ogunnowo BE, Adeyemo WL, Wanyonyi KL, Butali A. Quality of life of family caregivers of children with orofacial clefts in Nigeria: a mixed-method study. *Oral Dis*. 2016;22(2):116–22.
36. Aslan BI, Gülşen A, Tirank ŞB, Findikçioğlu K, Uzuner FD, Tutar H, Üçüncü N. Family Functions and Life Quality of Parents of Children With Cleft Lip and Palate. *J Craniofac Surg*. 2018;29(6):1614–8.
37. Patterson JM. Families experiencing stress. *Family Systems Medicine*. 1988;6(2):202–37.
38. Anderson V, Hearps SJC, Catroppa C, Beauchamp MH, Ryan NP. What predicts persisting social impairment following pediatric traumatic brain injury: contribution of a biopsychosocial approach. *Psychol Med*. 2022;53(8):3568–79.
39. Li F. Correlation analysis of hope level, resilience and family function in children with strabismus. *J Clin Nurs*. 2020;19(06):28–31.
40. Ahlberg M, Persson C, Berterö C, Ågren S. Family health conversations versus support group conversations when a family member has been critically ill: A mixed methods study. *Fam Syst Health*. 2021;39(2):293–305.
41. Li Y. Study on family function and influencing factors of children with cerebral palsy. MD: Zhengzhou University; 2017.
42. Lamb AE, Biesecker BB, Umstead KL, Muratori M, Biesecker LG, Erby LH. Family functioning mediates adaptation in caregivers of individuals with Rett syndrome. *Patient Educ Couns*. 2016;99(11):1873–9.
43. Lv T, Yang C, Du Y, Liu W. Characteristics and effect factors of family function about autism spectrum disorder children. *Journal of Bio-Education*. 2019;7(03):134–7.
44. Al-Jadiri A, Tybor DJ, Mulé C, Sakai C. Factors associated with resilience in families of children with autism spectrum disorder. *J Dev Behav Pediatr:JDBP*. 2021;42(1):16–22.
45. Lloyd TJ, Hastings R. Hope as a psychological resilience factor in mothers and fathers of children with intellectual disabilities. *Journal of intellectual disability research : JIDR*. 2009;53(12):957–68.
46. Ruiz-Robledo N, De Andrés-García S, Pérez-Blasco J, González-Bono E, Moya-Albiol L. Highly resilient coping entails better perceived health, high social support and low morning cortisol levels in parents of children with autism spectrum disorder. *Res Dev Disabil*. 2014;35(3):686–95.
47. Shen S. Study on the correlation and mediating effect of mental resilience, coping style, social support and quality of life in young breast cancer patients. MD: Zhejiang Chinese Medical University; 2020.
48. Xie N. Study on parents' hope of children with autism spectrum disorder and construction of hope intervention program. MD: Fujian Medical University; 2021.
49. Sun W, Bai H, Cui H, Wang Y. Hope and Resilience of Underprivileged Children: The Mediating Role of Perceived Social Support and the Moderating Role of Parent-Child Attachment. In: In the 23rd National Psychological Academic Conference: 2021; Hohhot, Inner Mongolia, China; 2021: 11–12.
50. Jackson DL. Revisiting sample size and number of parameter estimates: some support for the N:q Hypothesis. *Structural Equation Modeling*. 2003;10(1):128–41.
51. Bentler PM, Chou CP. Practical issues in structural modeling. *Sociol Methods Res*. 1987;16(1):78–117.
52. R M, B M: Family Environment Scale Manual. Palo Alto CA: Consulting Psychologists Press 1981.

53. Fei L, Shen Q, Zheng Y, Zhao J, Jiang S, Wang L, Wang X. Preliminary evaluation of the "Family Adaptability and Cohesion Scale" and the "Family Environment Scale" — A comparative study of members from normal families and families with schizophrenia patients. *Chin Mental Health J*. 1991;5:198–202.
54. Wang X, Wang X, Ma H. Rating Scales for Mental Health. Beijing: Chinese Mental Health Journal; 1999.
55. Xue L, Zhu X, Bai M, Zhang Y, Zhang L. Reliability and validity of the short Chinese version of the family environment scale in application among adolescent students. *Chin Ment Health J*. 2014;22(06):881–3.
56. Dahlem NW, Zimet GD, Walker RR. The Multidimensional Scale of Perceived Social Support: a confirmation study. *J Clin Psychol*. 1991;47(6):756–61.
57. Wang D, Zhu F, Xi S, Niu L, Tebes JK, Xiao S, Yu Y. Psychometric Properties of the Multidimensional Scale of Perceived Social Support (MSPSS) Among Family Caregivers of People with Schizophrenia in China. *Psychol Res Behav Manag*. 2021;14:1201–9.
58. Herth K. Development and refinement of an instrument to measure hope. *Sch Inq Nurs Pract*. 1991;5(1):39–51.
59. Wang YH. Study on feasibility of Chinese version of Herth Hope Index for cancer patients. *J Chinese Nurs Res*. 2010;24(01):20–1.
60. Wagnild GM, Young HM. Development and psychometric evaluation of the Resilience Scale. *J Nurs Meas*. 1993;1(2):165–78.
61. Zhao W, Shu T, Ma Y, Wei X, Zhu C, Peng L, Zhao L, Zhang Q. Examining the dimensionality, reliability, and invariance of the Chinese version of the Resilience Scale-14: A multicenter cross-sectional survey in Chinese junior nurses. *Front Psychiatry*. 2022;13:964151.
62. Abidin RR. Parenting stress index-professional manual, 3rd Ed. Psychological Assessment Resource: Lutz FL; 1995.
63. Yeh CH, Chen ML, Li W, Chuang HL. The Chinese version of the Parenting Stress Index: a psychometric study. *Acta paediatrica (Oslo, Norway : 1992)*. 2001;90(12):1470–7.
64. Mccubbin HI, Mccubbin MA, Patterson JM, Elizabeth Cauble A, Wilson LR, Warwick WCHIP. Coping Health inventory for parents: an assessment of parental coping patterns in the care of the chronically ill child. *J Marriage Family*. 1983;45(2):359–70.
65. Li Y, Wei M. Study of application of the chinese version of CHIP for parents of children with chronic disease. *Chin J Nurs*. 2007;42(11):972–5.
66. Scheier MF, Carver CS, Bridges MW. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the Life Orientation Test. *J Pers Soc Psychol*. 1994;67(6):1063–78.
67. Wen J. Reliability and validity of the Life Orientation Test in college students. *Chin Ment Health J*. 2012;26(04):305–9.
68. Sharif SP, Mostafiz I, Gupta V. A systematic review of structural equation modelling in nursing research. *Nurse Res*. 2019;26(2):28–31.
69. Penn DL, Waldheter EJ, Perkins DO, Mueser KT, Lieberman JA. Psychosocial treatment for first-episode psychosis: a research update. *Am J Psychiatry*. 2005;162(12):2220–32.
70. Yang G. Clinical observation of nasal alveolar shaping in children with cleft lip and palate undergoing sequential therapy. *China Health Care & Nutrition*. 2019;29(19):68.
71. Choi J, Fiszdon JM, Medalia A. Expectancy-value theory in persistence of learning effects in schizophrenia: role of task value and perceived competency. *Schizophr Bull*. 2010;36(5):957–65.
72. Fromkin HL. Reinforcement and effort expenditure: predictions of "reinforcement theory" versus predictions of dissonance theory. *J Pers Soc Psychol*. 1968;9(4):347–52.
73. Lev EL. Bandura's theory of self-efficacy: applications to oncology. *Sch Inq Nurs Pract*. 1997;11(1):21–37.
74. Wehby GL, Collett BR, Barron S, Romitti P, Ansley T. Children with oral clefts are at greater risk for persistent low achievement in school than classmates. *Arch Dis Child*. 2015;100(12):1148–54.
75. Gallagher ER, Collett BR, Barron S, Romitti P, Ansley T, Wehby GL. Laterality of oral clefts and academic achievement. *Pediatrics*. 2017;139(2):e20162662.
76. Collett BR, Leroux B, Speltz ML. Language and early reading among children with orofacial clefts. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association*. 2010;47(3):284–92.
77. Brunnegård K, Lohmander A. A cross-sectional study of speech in 10-year-old children with cleft palate: results and issues of rater reliability. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association*. 2007;44(1):33–44.
78. Goh BS, Tang CL, Hashim ND, Annamalai T, Abd Rahman FN. Hearing status and behavioural patterns among school aged children with cleft lip and/or palate. *Int J Pediatr Otorhinolaryngol*. 2019;118:1–5.
79. Rosenberg J, Albert M, Aspinall C, Bautista S, Crilly Bellucci C, Edwards TC, Heike CL, Mecham SH, Patrick DL, Stueckle L, et al. Parent Observations of the Health Status of Infants With Clefts of the Lip: Results From Qualitative Interviews. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association*. 2019;56(5):646–57.
80. Hazza'a AM, Rawashdeh MA, Al-Nimri K, Al Habashneh R. Dental and oral hygiene status in Jordanian children with cleft lip and palate: a comparison between unilateral and bilateral clefts. *Int J Dental Hygiene*. 2011;9(1):30–6.
81. Sundell AL, Ullbro C, Marcusson A, Twetman S. Comparing caries risk profiles between 5- and 10- year-old children with cleft lip and/or palate and non-cleft controls. *BMC Oral Health*. 2015;15:85.
82. Sischo L, Clouston SA, Phillips C, Broder HL. Caregiver responses to early cleft palate care: A mixed method approach. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*. 2016;35(5):474–82.
83. Nelson P, Glenn AM, Kirk S, Caress AL. Parents' experiences of caring for a child with a cleft lip and/or palate: a review of the literature. *Child Care Health Dev*. 2012;38(1):6–20.
84. Bonsu AB, Dzomeku VM, Apiribu F, Obiri-Yeboah S, Asamoah B, Mensah KB, Agyenim-Boateng A, Appiah AK, Donkor P. Having a child with Orofacial cleft: Initial reaction and psychosocial experiences of Ghanaian mothers. *International Journal of Africa Nursing Sciences*. 2018;8:132–40.
85. Loh J, Ascoli M. Cross-cultural attitudes and perceptions towards cleft lip and palate deformities. *World Cult Psychiatry Res Rev*. 2011;6(2):127–34.
86. Leahey M, Wright LM. Application of the Calgary Family Assessment and Intervention Models: Reflections on the Reciprocity Between the Personal and the Professional. *J Fam Nurs*. 2016;22(4):450–9.
87. Nicholes MP. Family Therapy : Concepts and Methods: Pearson; 2005.
88. Zhao X, Ai Z, Chen Y, Wang J, Zou S, Zheng S. The effectiveness of parenting interventions on psychosocial adjustment in parents of children and adolescents with type 1 diabetes: a meta-analysis. *Worldviews on evidence-based nursing*. 2019;16(6):462–9.
89. Can DD, Ginsburg-Block M. Parenting stress and home-based literacy interactions in low-income preschool families. *J Appl Dev Psychol*. 2016;46:51–62.
90. Townshend K, Jordan Z, Stephenson M, Tsey K. The effectiveness of mindful parenting programs in promoting parents' and children's well-being: a systematic review. *JB I Database System Rev Implement Rep*. 2016;14(3):139–80.
91. Bowden MR, Stormon M, Hardikar W, Ee LC, Krishnan U, Carmody D, Jermy V, Lee M-M, O'Loughlin EV, Sawyer J, et al. Family adjustment and parenting stress when an infant has serious liver disease: the Australian experience. *J Pediatr Gastroenterol Nutr*. 2015;60(6):717–22.
92. Pavarini SCI, Bregola AG, Luchesi BM, Oliveira D, Orlandi FS, de Moura FG, Silva HRO, de Oliveira NA, Zazzetta MS, Dos Santos-Orlandi AA, et al. Social and health-related predictors of family function in older spousal caregivers: a cross-sectional study. *Dement Neuropsychol*. 2020;14(4):372–8.
93. Churchill SS, Leo MC, Brennan EM, Sellmaier C, Kendall J, Houck GM. Longitudinal impact of a randomized clinical trial to improve family function, reduce maternal stress and improve child outcomes in families of children with ADHD. *Matern Child Health J*. 2018;22(8):1172–82.
94. Keypour M, Arman S, Maracy MR. The effectiveness of cognitive behavioral stress management training on mental health, social interaction and family function in adolescents of families with one Human Immunodeficiency Virus (HIV) positive member. *J Res Med Sci*. 2011;16(6):741–9.
95. Wang Y, Chung MC, Wang N, Yu X, Kenardy J. Social support and post-traumatic stress disorder: A meta-analysis of longitudinal studies. *Clin Psychol Rev*. 2021;85:101998.
96. Zhang Y, Cui C, Wang L, Yu X, Wang Y, Wang X. The mediating role of hope in the relationship between perceived stress and post-traumatic

- stress disorder among chinese patients with oral cancer: a cross-sectional study. *Cancer management and research*. 2021;13:393–401.
97. Li L, Ai H, Gao L, Zhou H, Liu X, Zhang Z, Sun T, Fan L. Moderating effects of coping on work stress and job performance for nurses in tertiary hospitals: a cross-sectional survey in China. *BMC Health Serv Res*. 2017;17(1):401.
 98. Kimhi S, Eshel Y, Shahar E. Optimism as a predictor of the effects of laboratory-induced stress on fears and hope. *International journal of psychology : Journal international de psychologie*. 2013;48(4):641–8.
 99. Cordova-Marks FM, Cunningham J, Harris RB, Gerald L, Norton B, Mastergeorge A, Teufel-Shone NI. Resilience and Stress among Hopi Female Caregivers. *American Indian and Alaska native mental health research* (Online). 2020;27(2):76–89.
 100. Boele FW, Rooney AG, Bulbeck H, Sherwood P. Interventions to help support caregivers of people with a brain or spinal cord tumour. *Cochrane Database Syst Rev*. 2019;7:CD012582.
 101. Osborn R, Dorstyn D, Roberts L, Kneebone I. Mindfulness therapies for improving mental health in parents of children with a developmental disability: a systematic review. *J Dev Phys Disabil*. 2021;33(3):373–89.
 102. Byrne G, Ghrada AN, O'Mahony T, Brennan E. A systematic review of the use of acceptance and commitment therapy in supporting parents. *Psychology and Psychotherapy-Theory Research and Practice*. 2021;94:378–407.
 103. Sohmaran C, Shorey S. Psychological interventions in reducing stress, depression and anxiety among parents of children and adolescents with developmental disabilities: A systematic review and meta-analysis. *J Adv Nurs*. 2019;75(12):3316–30.
 104. Branjerdporn N, Benfer K, Crawford E, Ziviani J, Boyd RN, Sakzewski L. Efficacy of early interventions with active parent implementation in low-and-Middle income countries for young children with cerebral palsy to improve child development and parent mental health outcomes: a systematic review. *Disabil Rehabil*. 2021;144(23):6969–83.
 105. Bourke-Taylor HM, Lee DCA, Tirlea L, Joyce K, Morgan P, Haines TP. Interventions to improve the mental health of mothers of children with a disability: systematic review, meta-analysis and description of interventions. *J Autism Dev Disord*. 2021;51(10):3690–706.
 106. Zhang X, Wang M, Liu L, Chen M. Correlations among mutuality, perceived social support and resilience among main caregivers of pancreatic cancer patients after surgery. *Chinese Journal of Modern Nursing*. 2020;26(14):1865–70.
 107. Shi B, Peng Z, Ma Y, Dong X. Gender analysis of caregivers for children with cleft lip and palate. *J Social Work*. 2014;2:84–91.
 108. Chiou CJ, Chang HY, Chen IP, Wang HH. Social support and caregiving circumstances as predictors of caregiver burden in Taiwan. *Arch Gerontol Geriatr*. 2009;48(3):419–24.
 109. Yu H, Wang X, He R, Liang R, Zhou L. Measuring the caregiver burden of caring for community-residing people with alzheimer's disease. *PLoS ONE*. 2015;10(7):e0132168.
 110. Nissen KG, Trevino K, Lange T, Prigerson HG. Family relationships and psychosocial dysfunction among family caregivers of patients with advanced cancer. *J Pain Symptom Manage*. 2016;52(6):841–849.e841.
 111. Tong H, Qiu F, Fan L. Characterising common challenges faced by parental caregivers of children with type 1 diabetes mellitus in mainland China: a qualitative study. *BMJ Open*. 2022;12(1):e048763.
 112. Wang WL, Zhou YQ, Chai NN, Li GH, Liu DW. Mediation and moderation analyses: exploring the complex pathways between hope and quality of life among patients with schizophrenia. *BMC Psychiatry*. 2020;20(1):22.
 113. Dufault K, Martocchio BC. Symposium on compassionate care and the dying experience. Hope: its spheres and dimensions. *Nurs Clin North Am*. 1985;20(2):379–91.
 114. Yuan LL, Lu L, Wang XH, Guo XX, Ren H, Gao YQ, Pan BC. Prevalence and predictors of anxiety and depressive symptoms among international medical students in China during COVID-19 pandemic. *Front Psychiatry*. 2021;12:761964.
 115. Fischer IC, Cripe LD, Rand KL. Predicting symptoms of anxiety and depression in patients living with advanced cancer: the differential roles of hope and optimism. *Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer*. 2018;26(10):3471–7.
 116. Peh CX, Kua EH, Mahendran R. Hope, emotion regulation, and psychosocial well-being in patients newly diagnosed with cancer. *Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer*. 2016;24(5):1955–62.
 117. Xie N. Hope of and construction of hope intervention program for parents of children with autism spectrum disorder master. Fuzhou: Fujian Medical University; 2021.
 118. Ek E, Remes J, Sovio U. Social and developmental predictors of optimism from infancy to early adulthood. *Soc Indic Res*. 2004;69(2):219–42.
 119. Wrosch C, Scheier MF. Personality and quality of life: the importance of optimism and goal adjustment. *Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation*. 2003;12(Suppl 1):59–72.
 120. Díaz A, Ponsoda JM, Beleña A. Optimism as a key to improving mental health in family caregivers of people living with Alzheimer's disease. *Aging Ment Health*. 2020;24(10):1662–70.
 121. Hirsch JK, Walker KL, Wilkinson RB, Lyness JM. Family criticism and depressive symptoms in older adult primary care patients: optimism and pessimism as moderators. *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry*. 2014;22(6):632–5.
 122. Thompson KA, Bulls HW, Sibille KT, Bartley EJ, Glover TL, Terry EL, Vaughn IA, Cardoso JS, Sotolongo A, Staud R, et al. Optimism and Psychological Resilience are Beneficially Associated With Measures of Clinical and Experimental Pain in Adults With or at Risk for Knee Osteoarthritis. *Clin J Pain*. 2018;34(12):1164–72.
 123. Kurtz-Nelson E, McIntyre LL. Optimism and positive and negative feelings in parents of young children with developmental delay. *Journal of intellectual disability research : JIDR*. 2017;61(7):719–25.
 124. Slattery É, McMahon J, Gallagher S. Optimism and benefit finding in parents of children with developmental disabilities: The role of positive reappraisal and social support. *Res Dev Disabil*. 2017;65:12–22.
 125. Hasanzadeh N, Khoda MO, Jahanbin A, Vatankhah M. Coping strategies and psychological distress among mothers of patients with nonsyndromic cleft lip and palate and the family impact of this disorder. *J Craniofac Surg*. 2014;25(2):441–5.
 126. Spencer CM, Topham GL, King EL. Do online parenting programs create change?: A meta-analysis. *J Fam Psychol*. 2020;34(3):364–74.
 127. Thomson G, Feeley C. Types, evidence, and resources of interventions focused on improving the psychosocial well-being of parents of premature/sick infants: a scoping review. *Adv Neonatal Care*. 2022;22(5):E138–e151.
 128. Schoemaker NK, Wentholt WGM, Goemans A, Vermeer HJ, Juffer F, Alink LRA. A meta-analytic review of parenting interventions in foster care and adoption. *Dev Psychopathol*. 2020;32(3):1149–72.
 129. Ma Q, Yan Z, Chang L, Zhang Q, Li Y. Family resilience and subjective responses to caregiving for children with epilepsy. *Epilepsy & behavior : E&B*. 2021;125:108417.
 130. Li Y, Qiao Y, Luan X, Li S, Wang K. Family resilience and psychological well-being among Chinese breast cancer survivors and their caregivers. 2019;28(2):e12984.
 131. Henry CS, Morris AS, Harrist AW. Family Resilience: Moving into the Third Wave. *Fam Relat*. 2015;64(1):22–43.
 132. Hawley DR, DeHaan L. Toward a definition of family resilience: integrating life-span and family perspectives. *Fam Process*. 1996;35(3):283–98.
 133. Liu Y, Li Y, Chen L, Li Y, Qi W, Yu L. Relationships between family resilience and posttraumatic growth in breast cancer survivors and caregiver burden. *Psychooncology*. 2018;27(4):1284–90.

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