Mediating effects of coping styles on the relationship between family resilience and self-care status of adolescents with epilepsy transitioning to adult healthcare: A cross-sectional study in China

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ABSTRACT

Purpose: This study aimed to explore the relationship between family resilience, coping styles, and self-care among Chinese adolescents with epilepsy.

Design and methods: A total of 1238 adolescents with epilepsy in nine tertiary hospitals in China participated in a cross-sectional survey conducted from May 2018 to March 2020. Structural equation modeling was used to analyze the mediating effect.

Results: The total scores for family resilience and coping styles were positively correlated with the total self-care status score of adolescents with epilepsy during their transition ($r = 0.209, 0.202, P < 0.01$). Family resilience was positively correlated with coping style ($r = 0.450, P < 0.01$). The modified model's fit index included $\chi^2/$ df = 1.970, P = 0.001, RMSEA = 0.054, TLI = 0.973, CFI = 0.978, GFI = 0.941, AGFI = 0.917, NFI = 0.956, and IFI = 0.978. The confidence interval (CI) was 0.004–0.140 for the indirect effect and 0.033–0.306 for the direct effect.

Conclusions: The self-care status of adolescents with epilepsy during the transitional period is closely related to coping style and family resilience. Coping style mediates family resilience and self-care status.

Practice implications: Healthcare teams should pay attention to the coping ability of adolescents with epilepsy to help them transition smoothly and to improve family functioning. This study provides a theoretical basis for establishing transitional care programs for adolescents with chronic illnesses. The significant mediating effect of coping style should be emphasized in modalities of healthcare that include patient participation.

Introduction

Epilepsy is one of the most common chronic neurological diseases in adolescents. About 50% of patients will have seizures and treatment until adulthood (Geerlings et al., 2015). The complexity of the disease, prominent comorbidities, stage specificity, family dependence, and the impact of its persistence have been found to have a significant effect on the growth of individual adolescents (Cui et al., 2019). The transition period for adolescents with chronic diseases from childhood to adulthood involves a process of planning for the transfer from a child-centered healthcare system to an adult-centered healthcare system (Garvey et al., 2012), including transition preparation (from 12 years old) and formal transfer (age 16–18 years) (Conway, 2013; Owen & Beskine, 2008). The transition time depends on the child's preparation for it; supportive intervention strategies, the initiation of the preparatory phase of the transition process by age 12 or earlier (Conway, 2013; Owen & Beskine, 2008), and receiving care at adult facilities by 18 years of age are recommended (Owen & Beskine, 2008; White et al., 2012).

Self-care during the phase of transition refers to the planned transition from pediatric care, in which adolescents are dependent upon parental involvement in clinical decision-making, to a model of independent active-coping self-management led by young adult patients themselves (Collet et al., 2018). The health problems of adolescents with epilepsy during the transition from childhood to adulthood are obvious, as adolescents are in a critical period between reliance on parental care and a desire to engage in self-care (Betz et al., 2004). Guidelines for the transition period indicate that improving the self-care status of adolescents and their families during the transition period can improve treatment outcomes and family functioning (Betz et al., 2016; White & Cooley, 2018). High-risk behaviors and family dysfunction among these adolescents are more likely to negatively affect their disease control and quality of life. Some studies have examined biologic and psychosocial predictors of adolescents' self-care capacity during the

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transition period, including seizure frequency, medication effects, severity of comorbidities, disease duration, psychological functioning, self-efficacy, and attitude towards epilepsy (Smith et al., 2018).

Although previously examined variables have been found to predict some variability in self-care outcomes in persons with epilepsy, several important modifiable family-related variables in adolescents with chronic disease have yet to be examined, including family functioning. The core concepts of family functioning include adjustment, adaptation, and family resilience (Walsh, 2003). Resilience refers to the family's ability to withstand stressful experiences and rebound from them by creating new, healthy ways of functioning (Walsh, 2003). Studies have shown that family resilience supports the development of the healthy functioning of families of adolescents with chronic diseases (Li et al., 2016). Effective family support and higher family functioning are conducive to promoting the quality of life of adolescents with chronic diseases and their caregivers (Lee et al., 2004). The resilience-oriented approach builds on developments in the field of family therapy, including refocused attention from the family's deficits to the family's strengths (Luo et al., 2019). It has been suggested that the higher family resilience is, the higher the patient's self-management capacity is (Xu, 2020), thereby improving the patient's ability to cope temporarily with adversity. Family resilience, as a family advantage or strength, has a positive significance for promoting adult healthcare for young adults and families (Fair et al., 2016; Rechenberg et al., 2017). Accordingly, intervening variables are needed to navigate the relationship between the self-care status of adolescents with epilepsy and their family's resilience during the period of transition to adult care.

Coping style refers to the cognitive and behavioral efforts made by individuals to meet internal and external needs, including positive and negative coping (Ellis et al., 2016). Research by scholars (Rechenberg et al., 2017) has shown that long-term, recurrent attacks of chronic diseases can easily lead to negative coping styles of affected patients and affect their self-care capacity. During transition from childhood to adulthood, lack of a targeted intervention, poor compliance with treatment, and other high-risk behaviors impair the ability of adolescents with a chronic disease to control it, which creates a series of negative life events for their families (Cousino & Hazen, 2013; Crowley et al., 2018). The concept of coping style extends theory and research on family stress, adaptation, and self-management of chronic disease (Jaser et al., 2012). A study (Anderson et al., 2017) showed that the stronger the coping ability of patients was, the higher their quality of life was, which has demonstrated to predict patients' self-care ability. Therefore, the relationship between positive change at the family and individual levels is worth further examination during the transition period. Considering that coping style represents overall family functioning and adaptation to a significant challenge, such as a child's chronic medical condition (Rechenberg et al., 2017), it may function as a significant mediating variable in the relationship between family resilience and level of self-care. Thus, the relationships between the three variables are also worth further clarification, in order to develop targeted and effective interventions to help adolescents with epilepsy transition smoothly from child healthcare to adult healthcare.

Enhancing our understanding of the unique ways coping styles contribute to self-care status may facilitate the development of family function-based interventions to improve the transition of adolescents with epilepsy. Given this premise, the present study examined the mediating role of personal coping styles on the relationship between family resilience and the self-care status of children with epilepsy during the transitional period. We conducted a mediation analysis to determine whether coping style acted as a mediating variable in the relationship between self-care status (dependent variable) and family resilience (independent variable) during the child's transition from child to adult healthcare.

The following hypotheses were tested:

Hypothesis 1. Family resilience has a direct effect on the status of self-care of adolescents with epilepsy.

Hypothesis 2. Coping style has a mediating effect on the relationship between family resilience and self-care status.

Methods

Study design and population

A cross-sectional design was used to investigate the status of related variables and analyze the mediating effect of coping style on the paths of family resilience and self-care status; 1238 adolescents with epilepsy and their families were recruited from nine tertiary A-level children's or maternal and children's specialist hospitals in China, from May 2018 to March 2020. The researchers communicated with potential patients who fit the sampling criteria and obtained written informed consent before inviting them to participate in the study. The criteria for inclusion in the study were: (1) diagnosis and classification of seizures according to the International League Against Epilepsy with regular check-ups for 1 year or longer, (2) between 12 and 18 years old upon entry into the study, (3) stable medical condition i.e., no changes in antiepileptic drug prescriptions, monotherapy, or combination therapy for 1 year or longer) (Cramer et al., 2014), (4) the guardian gave informed consent to participate in the study and for participation by the child, and (5) both child and guardian were able to read and understand the study materials. The exclusion criteria were: (1) the patient or the guardian did not agree to participate in the study, (2) the patient had a learning disability, impaired adaptive function, or severely impaired brain function with a Wechsler Intelligence Quotient <70 points (Wechsler, 2014), and (3) the family had a history of a major traumatic event.

A study's sample size should be 5 to 15 times the number of observed variables or measured indicators, and not less than 200 participants (Kline, 1993). A total of 14 variables, including 104 items (indicators) were included in this study, with an estimated sample size of 520–1560 participants. The sample size required for the structural equation modeling (SEM) was calculated to be 1050 (Kline, 1993). Considering a 15% dropout rate, 1238 adolescents with epilepsy and their families were recruited. However, the model included 14 items and the model parameters were analyzed using SEM and the maximum likelihood method, with 1000 bootstrap samples.

Data collection methods

Data for the sample were collected through the hospital medical record management system, and the records were selected in accordance with the inclusion and exclusion criteria. Data were collected after uniform training of the investigators; a total of ten registered nurses were recruited from nine tertiary A-level children's or maternal and children's specialist hospitals in China. Before the investigation, the nurses were informed of the purpose and significance of the study and the precautions needed to protect the personal information of the adolescents and their families. The research leader regularly visited the study's setting to provide guidance and feedback to the investigators on the distribution of the questionnaires. The investigators provided the QR code of the questionnaire during face-to-face introductions to the adolescents and their families in the outpatient and inpatient neurology services and the outpatient epilepsy services in the hospitals. The adolescents and their guardians were able to scan the QR code: the general information questionnaire was completed by the principal guardian; the FRAS-C, CODI, and Self-care status questionnaires on adolescent epilepsy during the transition period were self-report measures completed on the spot by the adolescents, following the principles of confidentiality and anonymity. A survey unit (adolescents with epilepsy and guardians) was required to use a telephone IP address and an IP number as the

questionnaire code. A total of 1560 questionnaires were distributed and 1380 were collected, for a return rate of 88.5%. The criteria for eliminating invalid questionnaires were: 1) "strongly disagree" more than two times on lie-detection items; 2) missing data on more than two items; 3) the questionnaire contained undulating or monogrammed answers (Qian & Yuan, 2011). There were 1238 valid questionnaires, for an effective response rate of 89.7%.

Measures

General questionnaire

A general questionnaire was used to collect the following baseline data on the adolescents with epilepsy: age (years), course of disease (months), gender, place of residence, type of epilepsy, main guardian (the family member with primary responsibility for the care of the adolescent with epilepsy), educational background, and family income.

Family resilience assessment scale (FRAS-C)

The level of family resilience was measured using the FRAS-C, which was previously translated to Chinese. (Li et al., 2016). This self-administered scale has three dimensions, namely, family communication and problem solving, utilizing social resources, and maintaining a positive outlook. Each of its 32 items is rated on a 4-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree), yielding a total possible score ranging from 32 to 128, with a higher score indicating a higher level of family resilience. The Chinese version of the FRAS-C has good reliability and validity. The internal consistency is an important indicator of a questionnaire's reliability and stability. When Cronbach's α is >0.7, the reliability of the data is considered acceptable; when Cronbach's α is <0.6, the chance of error is too large and the reliability is unacceptable (Adamson & Prion, 2013). The internal consistency reliability coefficient for this study was 0.96, and the internal consistency coefficients of the three dimensions were 0.94, 0.69, and 0.84. The Cronbach's α coefficients for all three dimensions was >0.7, achieving the highest level of reliability. Exploratory factor analysis revealed that the items all belonged to their own dimensions with factor loadings >0.6, and the cumulative contribution of the three common factors was 63.35%.

Coping with a disease for adolescents with chronic diseases (CODI)

Prepared by the German scholars (Petersen et al., 2004) in 2003, the Children with Chronic Diseases (CODI) Coping Questionnaire is a self-assessment questionnaire for coping styles, which is suitable for chronically ill children aged 8–18. The Chinese version of CODI was translated to Chinese (Yang & Min, 2008). This version of the scale has a total of 28 items divided into five subscales, namely avoidance and distance (8 items), wishful thinking (3 items), cognitive-palliative (5 items), acceptance (6 items), and emotional reaction (6 items). Respondents use a Likert 5-point scale, that is, never (1 point), rarely (2 points), sometimes (3 points), often (4 points), and always (5 points) to say how often they use each of these coping methods. The last item of the scale is "generally speaking, I think the condition of coping with the disease is," where there are five choices: very bad, not good, general, good, and very good. The adolescents themselves are expected to fill in the questionnaire according to their own situation. The content validity index of the Chinese version of CODI was 0.96; Cronbach's α coefficients of the five subscales ranged from 0.64 to 0.88, and the overall Cronbach's α coefficient of the scale was 0.83. The Cronbach's α coefficients of the above five subscales were > 0.7, indicating the highest level of reliability. Exploratory factor analysis revealed that all of the items belonged to their own dimensions with factor loadings >0.6, and the cumulative contribution of the five common factors was 71.19%.

Self-care status questionnaire of adolescent epilepsy in transition period

We developed the questionnaire on self-care status of adolescents with epilepsy in the transition period by reference to relevant literature

(Cui et al., 2017; Ferris et al., 2012; Wagner et al., 2017), combined with the national conditions in China and the characteristics of epilepsy as a chronic disease (Cheng et al., 2021; Cui et al., 2020), and revised it on the basis of expert review and two preliminary investigations. In this study, seven experts were chosen on the basis of being familiar with the management of chronic diseases in children and adolescents, familiar with the clinical treatment and care of epilepsy, and familiar with the scale compilation method. They consisted of four nursing management experts, two clinical experts, and one statistical expert; two were physicians, three had master's degrees, and two had undergraduate degrees. They used a Likert 4-point scale to evaluate the questionnaires, and to evaluate the correlations between each item and the self-care of adolescents with epilepsy. Experts rated the content validity of the questionnaire as 0.88. The research team conducted a pre-survey of 35 adolescents and families with epilepsy between December 2017 and March 2018, and the retest reliability of the questionnaire was 0.832. The Cronbach's α coefficients for the dimensions of the questionnaire ranged from 0.781 to 0.928. The Cronbach's α coefficient of the questionnaire used in the preliminary survey was 0.84. The Cronbach's α coefficient for each dimension of the questionnaire >0.7, reaching the highest reliability level. Exploratory factor analysis showed that all of the items belonged to their own dimensions, with factor loadings >0.6, and the cumulative contribution of the six common factors was 69.92%.

The questionnaire obtained 36 items and six dimensions, namely, epilepsy drug management (6 items), seizure symptom monitoring (5 items), participation in diagnosis and treatment (6 items), compliance behavior (8 items), emotion regulation, and management (5 items), information utilization, and management (6 items). Each item is scored on a Likert 5-point scale from 1, which variously means very unwilling, disagree strongly, never, or do not understand at all, to 5, which correspondingly means very willing, agree strongly, always, or understand very well. The dimension score is the sum of the scores of the included items. If the child is not currently taking oral antiepileptic drugs, the relevant items are given a score of 5; certain reverse-scored items are scored by subtracting the raw score from 6. The sum of the scores of each item is the level of self-care score during the transitional period of adolescents with epilepsy; the higher the score, the higher the level of self-care. Because different dimensions contain different numbers of items, standardized scores are used to analyze the level of self-care in the transitional period. The standard score = (actual score/total score) × 100; a standardized score ≤ 60 is considered low; 61–80 is medium; and > 80 is high (Li et al., 2016; Yan & Xu, 2019).

Ethical considerations

This study was approved by the appropriate hospital ethics committee. Adolescents and guardians signed informed consent forms. They were advised that they had the right to withdraw from the study at any time without prejudice, and the staff promised to adhere to the principle of confidentiality, by de-identifying participants by coding the data using numbers rather than their names.

Statistical analysis

All data were entered into the EpiData 3.1 database. SPSS 21.0 software package was used for descriptive statistics, ANOVA, t-test, Spearman correlation analysis, and Amos 24.0 was used for latent variable path analysis. The scholars (Baron & Kenny, 1986) have proposed that the conditions to determine a mediating variable are: 1) that the independent variable is significantly correlated with the dependent variable; 2) that the independent variable is significantly correlated with the mediating variable; and 3) that the mediating variable is significantly related to the dependent variable. According to this method, this paper takes family resilience as independent variable, self-care

Table 1

Means and standard deviations of the items included in the subscales of the family resilience, coping style, and self-care status questionnaires for adolescents with epilepsy during the transitional period.

Dimension	Item	$\bar{x}\pm s$
FRAS-C	1.Family communication and problem solving	70.10 ± 8.594
	2.Utilizing social resource	9.072 ± 2.490
	3.Maintaining a positive outlook	18.24 ± 1.484
CODI	4.Avoidance and distance	6.66 ± 1.450
	5.Wishful thinking	7.69 ± 2.080
	6.Cognitive-palliative	15.95 ± 2.075
	7.Acceptance	18.08 ± 2.048
	8.Emotional reacting	11.75 ± 1.083
Self-care status in transitional period	9.Epilepsy drug management	22.08 ± 2.309
	10.Seizure symptom monitoring	15.36 ± 2.955
	11.Participation in treatment	18.63 ± 1.924
	12.Compliance behavior	15.32 ± 1.947
	13.Emotion regulation and management	7.72 ± 0.911
	14.Information utilization and management	16.08 ± 1.919

Note: FRAS-C, The Family Resilience Assessment Scale; CODI, Coping with a Disease. Questionnaire.

level as dependent variable and coping style as mediating variable to construct a relationship model among them.

Results

General information

The average age of the adolescents was 15.23 ± 2.26 years (12–18 years), and the average duration of the disease was 46.41 ± 28.75 months, with a mean of 48.68 months; data on 688 males (55.6%) and 550 females (44.4%) were analyzed; there were 287 patients (23.2%) with generalized seizures, 521 patients (42.1%) with focal seizures, and 430 patients (34.7%) with generalized combined seizures; 221 patients (17.9%) had a monthly income <5000 yuan, 689 patients (55.7%) had 5000–8000 yuan, 328 (26.5%) had >8000 yuan; 421 people (34.0%) came from cities, 432 people (34.9%) came from districts and counties, and 385 people (31.1%) came from rural areas; the average age of the main guardian was 41.21 ± 6.78 years old (36–52 years old); the main guardian was a parent of 634 patients (51.3%), a grandparent of 398 patients (32.1%), and another relative of 206 patients (16.6%).

The scores on family resilience, coping style, and self-care status

The adolescents' total score on family resilience was 97.42 ± 8.42, and the total scores for each variable, from high to low were family communication and problem solving (70.10 ± 8.59), maintaining a positive outlook (18.24 ± 1.48), and utilizing social resources (9.07 ± 2.49). The total score for the coping style items was 56.61 ± 13.03. The mean score of each variable, from high to low were acceptance (18.08 ± 2.05), cognitive-palliative (15.95 ± 2.08), emotional reaction (11.75 ± 1.08), wishful thinking (7.69 ± 2.08), and avoidance (6.66 ± 1.45). The total self-care status score was 68.36 ± 3.98, and the variables were epilepsy drug management (22.08 ± 2.31), participation in treatment (18.63 ± 1.92), information utilization and management (16.08 ± 1.92), compliance (15.32 ± 1.95), seizure symptom monitoring (15.36 ± 2.96), and emotion regulation and management (7.72 ± 0.91), as shown in Table 1-3.

The results of the factor analysis showed that the FRAS-C, CODI, and Self-care status questionnaire for adolescents with epilepsy average variance extracted during the transition period had a loading coefficient of 0.7 or more for each dimension, a value of 0.7 or more for composite reliability (CR), and 0.5 or more for the average variance extracted (AVE). The absolute fit index (χ^2/df) of the FRAS-C was between 2 and 5; the RMSEA was 0.042 (below 0.06); and the TLI, CFI, and GF were > 0.9; the absolute fit index of the FRAS-C was acceptable. The absolute fit index (χ^2/df) of the CODI questionnaire was between 2 and 5; the RMSEA was 0.042 (below 0.06); the TLI, CFI, and GF were > 0.9; and the absolute fit index of the CODI questionnaire was acceptable. The absolute fit index (χ^2/df) of the questionnaire on self-care status of adolescent epilepsy in the transition period was between 2 and 5, the RMSEA value was 0.042 (less than 0.06); the TLI, CFI, and GF were > 0.9; and the absolute fit index of the Transitional Adolescent Epilepsy Self-Care Status Questionnaire was acceptable. In summary, the measurement tools were validated by the results of the factor analysis, and the correlations between the variables, and the square root of the AVE. To achieve good discriminant power, the square root of the AVE should be higher than its correlation coefficient with the other constructs (Gefen et al., 2000). An evaluation of the study's convergent validity showed that the diagonal coefficients were greater than the correlation coefficients between the variables, indicating that the FRAS-C, CODI questionnaire, and Self-care status scale met the requirements for convergent validity (see Supplementary File 1).

Correlation analysis of family resilience, coping style, and self-care status

Correlation analysis tests the significance of the correlation coefficients between the variables, and if the H0 hypothesis is accepted at the 1% significance level, there are no significant correlations between the variables. Conversely, if the H0 hypothesis is rejected at the 1% significance level, there is a significant correlation between the variables. Our correlation analysis showed that there was a positive correlation

Table 2

Correlation analysis of the items in the family resilience, coping style, and self-care status subscales during the transitional period of adolescents with epilepsy (r).

Item	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Family communication and problem solving	1												
2.Utilizing social resource	0.729***	1											
3.Maintaining a positive outlook	0.734***	0.847***	1										
4.Avoidance and distance	0.353***	0.267***	0.260***	1									
5.Wishful thinking	0.377***	0.344***	0.360***	0.726***	1								
6.Cognitive-palliative	0.438***	0.376***	0.380***	0.715***	0.714***	1							
7.Acceptance	0.421***	0.379***	0.364***	0.725***	0.764***	0.717***	1						
8.Emotional reacting	0.376***	0.413***	0.394***	0.700***	0.696***	0.650***	0.673***	1					
9.Epilepsy drug management	0.133**	0.150***	0.156***	0.124**	0.118**	0.117**	0.108*	0.084	1				
10.Seizure symptom monitoring	0.154***	0.099*	0.139**	0.173***	0.183***	0.229***	0.172***	0.086	0.594***	1			
11.Participation in treatment	0.235***	0.176***	0.219***	0.186***	0.179***	0.168***	0.176***	0.104*	0.620***	0.689***	1		
12.Compliance behavior	0.159***	0.145***	0.159***	0.153***	0.146***	0.156***	0.118**	0.058	0.698***	0.615***	0.599***	1	
13.Emotion regulation and management	0.202***	0.152***	0.180***	0.222***	0.191***	0.166***	0.13**	0.115**	0.649***	0.584***	0.613***	0.621***	1
14.Information utilization and management	0.152***	0.132**	0.158***	0.179***	0.171***	0.190***	0.137**	0.116**	0.659***	0.697***	0.615***	0.670***	0.587***

Note: *$P < 0.1$; **$P < 0.05$; ***$P < 0.01$. FRAS-C(1,2,3) CODI(4,5,6,7,8) Self-care status in transitional period(9,10,11,12,13,14).

Table 3
Correlation analysis of the dimensions of family resilience, coping style, and self-care status during the transitional period of adolescents with epilepsy (r).

Dimension	M ± SD	1	2	3
Family resilience	97.416 ± 8.42	1		
Coping style	56.612 ± 13.03	0.450***	1	
Transitional self-care	68.36 ± 3.98	0.209***	0.202***	1

Note: *P < 0.1; **P < 0.05; ***P < 0.01; M, mean; SD, standard deviation.

between the total score of family resilience and the total score of self-care in the transitional period ($r = 0.209$, $P < 0.01$); the total score of family resilience was positively correlated with the total score of coping style ($r = 0.450$, $P < 0.01$); the total score of coping style was positively correlated with the total score of self-care in the transitional period ($r = 0.202$, $P < 0.01$), as shown in Table 2. Based on the linear regression results of the three variables, it can be seen that the variance inflation factor between family resilience and coping style was below 5, indicating there was no multicollinearity in the model (see Supplementary File 1).

Latent variable path analysis of family resilience, coping style, and self-care status

The initial model was set by referring to the relevant literature and the statistical analysis results above, and SEM was performed using SPSS Amos 24 to verify the mediating effect of coping style. In the model structure, the self-care status of adolescents with epilepsy in the transitional period was taken as the dependent variable, family resilience was analyzed as the independent variable, and coping style was analyzed as the mediating variable (Fig. 1). The adjusted model removed the information utilization and management dimension from the original model, as the standard residuals for this dimension were > 1. The residuals e4 and e5, and e13 and e14 are linked with double arrows, respectively, according to the model's indices.

The variables and the scores of each dimension were taken as the observation indices to enter the model after standardization. The general criteria of fitting value indices in model evaluation are as follows: absolute fit index $2 < \chi^2/df < 5$, RMSEA <0.08, TLI, CFI, and GFI > 0.90, and the model was acceptable. The results were $\chi^2/df = 2.170$, $P = 0.001$,

RMSEA = 0.084, TLI = 0.942, CFI = 0.928, and GFI = 0.881. After the model was modified, the model fit indices ($\chi^2 = 145.798$, df = 74, $\chi^2/df = 1.970$, P = 0.001, RMSEA = 0.054, TLI = 0.973, CFI = 0.978, GFI = 0.941, AGFI = 0.917, NFI = 0.956, and IFI = 0.978) indicated that the model fit was reasonable, the model was acceptable, and each path coefficient reached a significant level, as shown in Table 4. According to the fitting results, the mediation effect was tested by a bias-corrected bootstrap program. Using a repeated random sampling method, 2000 bootstrap samples were selected from the original data ($n = 330$), and an approximate sampling distribution was generated. The 95% confidence interval (CI) of mediation effect was estimated by using the 2.5% and 97.5% percentile. If the 95% CI of indirect effect does not include 0, it indicates that the mediating effect should be statistically significant; if the 95% CI of direct effect includes 0, it indicates complete mediation. The results showed that in the structural equation the family resilience was the independent variable. The variance inflation factor of both the independent and dependent variables were below 5, indicating there were no covariants in the model. The coefficient of the influence of family resilience on the standardization of the dependent variable was 0.148, which was statistically significant at the 1% significance level ($P < 0.01$), indicating a significant positive effect of family resilience on the dependent variable. The coefficient of influence of the mediating variable on the standardization of the independent variable was 0.025, which was statistically significant at the 1% significance level (P < 0.01), indicating a significant positive effect of coping style of adolescent patients with epilepsy on the dependent variable. The test of the validity of the mediating variable showed the Sobel test for the indirect effect was 6.379, which was statistically significant at the 1% level of significance, indicating an effect of the mediating variable; the CI of the direct effect was 0.147 and was statistically significant at the 1% significance level, indicating the coping style of the adolescents with epilepsy had a partial mediating role.

Discussion

The status quo of family resilience, coping style, and self-care status among Chinese adolescents with epilepsy

Family resilience of the adolescents with epilepsy was low. The family resilience score of the adolescents was similar to the average FRAS-C
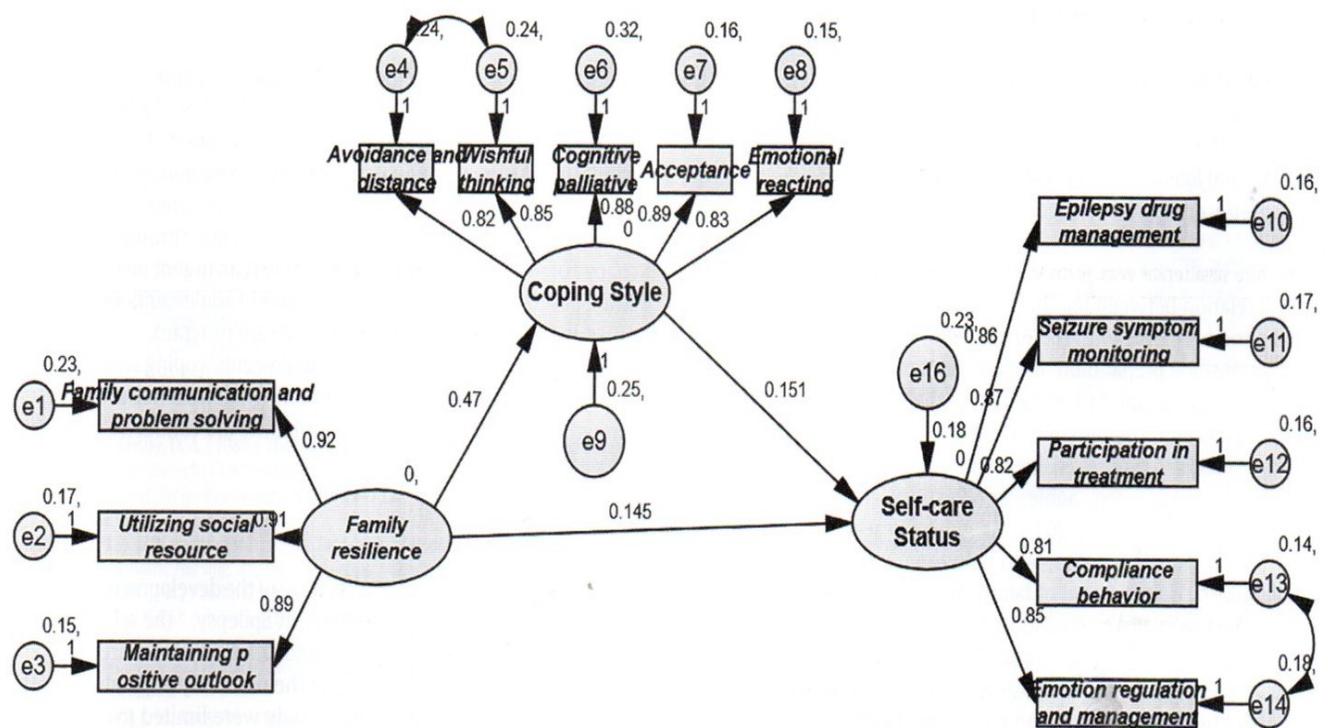

Fig. 1. Latent variable path analysis of family resilience, coping style, and transitional self-care of adolescents with epilepsy.

Table 4

Overall model fitting index.

χ^2/df	GFI	AGFI	NFI	IFI	TLI	CFI	RMSEA
1.970	0.941	0.917	0.956	0.978	0.973	0.978	0.054

score (101.18 ± 5.23) of Chinese adolescents who experienced traumatic events (Li et al., 2016). Due to the unpredictability and comorbidity characteristics of adolescents with seizures, and the interaction and construction of health problems in the physical, mental, social, and spiritual fields, families face disease pressure and more frustrations (Smith et al., 2018). At the same time, there is a lack of healthcare institutions addressing the transition period from children to adults with chronic diseases in China, resulting a shortage of intervention measures.

The overall average score of coping style of adolescents with epilepsy was moderate. The coping style score in this study was similar to that of Li Yang et al. (Shegog et al., 2013), but slightly lower than that of adolescents from families in Europe and the United States that had experienced trauma (Petersen et al., 2004; Yang, 2018). The results were accompanied by prominent comorbidities and long-term use of antiepileptic drugs, which had an obvious effect on the mental and cognitive status, and affected the coping style. A study (Tedeschi & Calhoun, 1996) showed that both positive and negative coping styles are related to traumatized individuals' growth in new possibilities and personal abilities. Therefore, it is suggested that healthcare staff should promptly guide their families to explore these favorable personality characteristics, self-care status, and adverse experiences to promote the coping abilities of adolescents with epilepsy.

The status of self-care during the transition period of adolescents with epilepsy was moderate according to the questionnaire's standard score. The higher scores were for "epileptic drug management," "participation in diagnosis and treatment," and "information utilization and management." Oral antiepileptic drugs are the main treatment plan for adolescents with epilepsy (Crowley et al., 2018). In this study, the score on "participation in diagnosis and treatment" was high, which reflected that the group had a strong desire to participate in healthcare. "Information utilization and management" is related to the gradual development of self-management intervention based on the development of network information technology in recent years. "Emotional regulation and management" has the lowest score, which is related to the rapid development of puberty, and the fluctuation of psychological and endocrine conditions caused by diseases and medications. It is suggested that early detection, timely referral and standardized intervention should be carried out to minimize the adverse effects on the physical and mental health of adolescents with epilepsy.

The impact of family resilience and coping style on self-care of adolescents with epilepsy during the transition period

Family resilience was positively correlated with self-care. The positive correlation between family resilience and self-care in the transitional period is in line with the American Pediatric Association's "high quality transition preparation" as the basic standard of clinical services: family is an important variable affecting the transition (Mastro et al., 2014). This position statement is designed as framework for pediatric nurses to provide comprehensive healthcare transition services based upon a family-centered, adolescent-focused, and interdisciplinary framework of care (Betz, 2017). It guides researchers to develop targeted intervention measures to help them smoothly transition to adulthood. The development of family resilience can help families find and tap their own advantages, functions, and resources, to cope better with various challenges in the future. The smoother the family function is, the stronger the family resilience is, and the more smoothly the adolescents with chronic disease can participate in self-care activities (Li et al., 2016; Rolland & Walsh, 2006). Improving family resilience and providing timely support for adolescents with epilepsy by approaching

the family as a unit is conducive to good self-care during this phase of development.

The total coping style score of the adolescents with epilepsy was positively correlated with their total self-care score. Coping styles are the methods, means, or strategies people use to cope with internal and external environmental requirements and related emotional distress. Different coping styles have different effects on post-traumatic growth and the self-management level of chronic disease adolescents, and positive coping indicates better management and progression of the disease (Li et al., 2016). In addition to coping with adolescent changes, they also have to try to maintain self-health, self-monitoring, and self-care. The disease coping skills of adolescents will affect their degree of participation in healthcare. Some researchers found that the effective coping of children was positively correlated with maintaining good interpersonal relationships, which enabled them to obtain more social support and resources for self-care (Kager & Holden, 1992). Therefore, paying attention to the coping styles of children is important for helping them better cope with the struggle of living with a chronic disease and adapt to their current level of growth, which can be a basis for developing strategies to enhance self-care activities.

Family resilience indirectly affects the level of self-care in transition period through the mediating factor of coping style. A study (Masten & Monn, 2015) et al. pointed out the importance of family resilience for family members to adapt and develop in adversity. Family resilience plays a key role in family crisis response. Positive family coping styles can help families resist crises, and promote healthy recovery of family resilience. Not only can resilient families of adolescents with epilepsy manage stressful events, but family members can also use adversity to shape themselves and promote their ability to respond to crises. Coping style is an important intermediate variable affecting the self-care outcomes of adolescents with epilepsy, and it plays a role in regulating the individual's physical and mental health. Different coping styles can reduce or aggravate the family resilience of adolescents with a chronic disease. Adolescents prone to anxiety and depressive disorders, especially those with complex epilepsy, require more guidance and strategies for developing coping styles that should provide a basis for clinical interventions. As controllable factors that affect the quality of self-care in the transitional period, individuals and families can facilitate a smooth transition of adolescents with a chronic disease from a child-centered medical system to an adult-centered medical system.

Practice implications

Clinical nurses and doctors should address the personality characteristics, psychological status, and family functioning of adolescents with epilepsy. It is important to screen the coping style of adolescents dynamically by the transitional service team to formulate targeted interventions in the transfer plan, to maximize the coping capacity of the adolescents, and promote their independence through the gradual change of responsibilities. However, there is an urgent need for effective strategies to improve the family resilience of adolescents, especially in a nurse-led multidisciplinary transitional care program.

Exploring strategies to improve adolescents' coping styles, maximizing their coping capacity, and promoting adolescents' independence through a gradual change in responsibilities are conducive to a smooth transition to adult healthcare.

Limitations

During the expert consultation stage of the development of the "Self-care Status Questionnaire of Adolescent Epilepsy, " the selected experts represented only three provinces and cities. Hence, there may be regional and selection biases. During the reliability and validity testing stage, the participants in the pilot study were limited to one hospital, and the sample size was small. Therefore, it is necessary to further expand the sample size and improve the sample's representativeness in

the next study, to verify the study's results. Moreover, future studies can try to explore the timing and stability of the dynamic interaction among self-care, family resilience, and personal coping skills in the transitional period, so as to explore the potential and strength of adolescents and families as much as possible in future clinical intervention studies, and verify and expand their possible advantages. Additional factors to be considered in further research on the transition period of adolescents with epilepsy include the types of epilepsy, disease severity, course of disease, types of oral drugs, temperament type, adversity experience, family economic level, and medical insurance status.

Conclusion

In conclusion, the family resilience of Chinese adolescents with epilepsy in transitional period is low, and their coping style and self-care level are in the moderate range. The status of self-care in the transitional period is closely related to coping style and family resilience. Coping style plays a mediating role in promoting family resilience recovery and self-care maintenance. It is suggested that under the family-centered pediatric nursing concept and "patient participation" mode of healthcare, giving priority to the role of family and the positive role of adolescents with chronic disease in their own healthcare will promote more responsive services and better care results. Supplementary data for this article can be found online.

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Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pedn.2021.11.021.

References

Adamson, K. A., & Prion, S. (2013). Reliability: Measuring internal consistency using Cronbach's α. Clinical Simulation in Nursing, 9(5), e179–e180.

Anderson, B. J., Laffel, L. M., Domenger, C., Danne, T., Phillip, M., Mazza, C., ... Mathieu, C. (2017). Factors associated with diabetes-specific health-related quality of life in youth with type 1 diabetes: The global teens study. Diabetes Care, 40, 1002–1009. https://doi.org/10.2337/dc16-1990.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51, 1173–1182. https://doi.org/10.1037//0022-3514.51.6.1173.

Betz, C. L. (2017). SPN position statement: Transition of pediatric patients into adult care. Journal of Pediatric Nursing, 35, 160–164. https://doi.org/10.1016/j.pedn.2017.05.003.

Betz, C. L., Cowell, J. M., Faulkner, M. S., Feeg, V. D., Greenberg, C. S., Krajicek, M. J., ... Vessey, J. A. (2016). Advancing the development of the guidelines for the nursing of children, adolescents, and families: 2014 revision: Process, development, and dissemination. Journal of Pediatric Health Care, 30, 284–288. https://doi.org/10.1016/j.pedhc.2015.11.003.

Betz, C. L., Cowell, J. M., Lobo, M. L., & Craft-Rosenberg, M. (2004). American academy of nursing child and family expert panel: Health care quality and outcomes guidelines for nursing of children and families: Phase ii. Nursing Outlook, 52, 311–316. https://doi.org/10.1016/j.outlook.2004.10.003.

Cheng, W. J., Cui, C., Zheng, X. L., & Li, S. Z. (2021). Status and influencing factors of willingness of patient participation in health care among transitioning adolescence with epilepsy. Journal of Nursing Science, 36, 24–29.

Collet, N., Batista, A., Nóbrega, V. M. D., Souza, M., & Fernandes, L. T. B. (2018). Self-care support for the management of type 1 diabetes during the transition from childhood to adolescence. Revista da Escola de Enfermagem da U.S.P., 52, Article e03376. https://doi.org/10.1590/s1980-220x2017038503376.

Conway, B. (2013). National Review of Transitional Care[DB/OL]. 2007-05-01. http://www.diabetesaustralia.com.au/PageFiles/5928/NationalReviewofTransitionalCareReport.pdf.

Cousino, M. K., & Hazen, R. A. (2013). Parenting stress among caregivers of children with chronic illness: A systematic review. Journal of Pediatric Psychology, 38, 809–828. https://doi.org/10.1093/jpepsy/jst049.

Cramer, J. A, Wang, Z. X. J, Chang, E., Powers, A., Copher, R., Cherepanov, D., et al. (2019). Healthcare utilization and costs in children with stable and uncontrolled epilepsy. Epilepsy & Behavior, 32, 135–141. https://doi.org/10.1016/j.yebeh.2014.01.016.

Crowley, S. L., Byrne, S., McNulty, S., Keating, K., Nestor, T., Owen, Y., ... King, M. D. (2018). The temple star transitional model of care for epilepsy; the outcome of a quality improvement project. Epilepsy & Behavior, 79, 4–8. https://doi.org/10.1016/j.yebeh.2017.10.043.

Cui, C., Li, S. Z., Zheng, X. L., Cheng, W. J., & Ting, W. (2020). Participation in healthcare behavior by adolescents with epilepsy and factors that influence it during the transition period: A cross-sectional study in China. Epilepsy & Behavior, 113, Article 107576. https://doi.org/10.1016/j.yebeh.2020.107576.

Cui, C., Li, S. Z., Zheng, X. L., Cheng, W. J., & Xia, Q. (2019). Health assessment of chinese adolescents with epilepsy in the preparatory phase of transition process from pediatric to adulthood:A single-center study using the omaha system. Journal of Pediatric Nursing, 49, e2–e7. https://doi.org/10.1016/j.pedn.2019.06.005.

Cui, C., Zheng, X. L., & Ll, S. Z., Cheng, W, J., & Wang, L. (2017). Construction and application of extended care of children with epilepsy. Chinese Journal of Nursing, 52, 336–341.

Ellis, L., Gergen, J., Wohlgemuth, L., Nolan, M. T., & Aslakson, R. (2016). Empowering the "cheerers": Role of surgical intensive care unit nurses in enhancing family resilience. American Journal of Critical Care, 25, 39–45. https://doi.org/10.4037/ajcc2016926.

Fair, C., Cuttance, J., Sharma, N., Maslow, G., Wiener, L., Betz, C., ... Ferris, M. (2016). International and interdisciplinary identification of health care transition outcomes. JAMA Pediatrics, 170, 205–211. https://doi.org/10.1001/jamapediatrics.2015.3168.

Ferris, M. E., Harward, D. H., Bickford, K., Layton, J. B., Ferris, M. T., Hogan, S. L., ... Hooper, S. R. (2012). A clinical tool to measure the components of health-care transition from pediatric care to adult care: The UNC TR(x)ANSITION scale. Renal Failure, 34, 744–753. https://doi.org/10.3109/0886022x.2012.678171.

Garvey, K. C., Wolpert, H. A., Rhodes, E. T., Laffel, L. M., Kleinman, K., Beste, M. G., ... Finkelstein, J. A. (2012). Health care transition in patients with type 1 diabetes: Young adult experiences and relationship to glycemic control. Diabetes Care, 35, 1716–1722. https://doi.org/10.2337/dc11-2434.

Geerlings, R. P., Aldenkamp, A. P., de With, P. H., Zinger, S., Gottmer-Welschen, L. M., & de Louw, A. J. (2015). Transition to adult medical care for adolescents with epilepsy. Epilepsy & Behavior, 44, 127–135. https://doi.org/10.1016/j.yebeh.2014.12.041.

Gefen, D., Straub, D., & Boudreau, M. C. (2000). Structural equation modeling and regression: Guidelines for research practice. Communications of the Association for Information Systems, 41, 7.

Jaser, S. S., Faulkner, M. S., Whittemore, R., Jeon, S., Murphy, K., Delamater, A., & Grey, M. (2012). Coping, self-management, and adaptation in adolescents with type 1 diabetes. Annals of Behavioral Medicine, 43, 311–319. https://doi.org/10.1007/s12160-012-9343-z.

Kager, V. A., & Holden, E. W. (1992). Preliminary investigation of the direct and moderating effects of family and individual variables on the adjustment of children and adolescents with diabetes. Journal of Pediatric Psychology, 17, 491–502. https://doi.org/10.1093/jpepsy/17.4.491.

Kline, P. (1993). The handbook of psychological testing. London, NY: Routledge.

Lee, I., Lee, E. O., Kim, H. S., Park, Y. S., Song, M., & Park, Y. H. (2004). Concept development of family resilience: A study of Korean families with a chronically ill child. Journal of Clinical Nursing, 13, 636–645. https://doi.org/10.1111/j.1365-2702.2004.00845.x.

Li, Y., Lu, P. W., & Sun, J. (2016). Research on post-traumatic growth status and influencing factors of adolescent patients with chronic diseases. Journal of Chinese Nursing Management, 7, 914–919.

Luo, D., Xu, J. J., Cai, X., Zhu, M., Wang, H., Yan, D., & Li, M. Z. (2019). The effects of family functioning and resilience on self-management and glycaemic control among youth with type 1 diabetes. Journal of Clinical Nursing, 28, 4478–4487. https://doi.org/10.1111/jocn.15033.

Masten, A. S., & Monn, A. R. (2015). Child and family resilience: A call for integrated science, practice, and professional training. Family Relations, 64(1), 5–21.

Mastro, K. A., Flynn, L., & Preuster, C. (2014). Patient- and family-centered care: A call to action for new knowledge and innovation. The Journal of Nursing Administration, 44, 446–451. https://doi.org/10.1097/nna.0000000000000099.

Owen, P., & Beskine, D. (2008). Factors affecting transition of young people with diabetes. Paediatric Nursing, 20, 33–38. https://doi.org/10.7748/paed2008.09.20.7.33.c6706.

Petersen, C., Schmidt, S., & Bullinger, M. (2004). Brief report: Development and pilot testing of a coping questionnaire for children and adolescents with chronic health conditions. Journal of Pediatric Psychology, 29, 635–640. https://doi.org/10.1093/jpepsy/jsh066.

Qian, H., & Yuan, C. (2011). Reliability and validity evaluation of Chinese version of cancer self-management efficacy scale. Chinese Journal of Nursing, 1, 87–89.