

A Latent Profile Analysis of Psychological Adaptation Among Caregivers of Children with Strabismus: A Cross-Sectional Study

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Purpose: The psychological well-being of caregivers profoundly influences the treatment efficacy, long-term visual rehabilitation, and overall family well-being of children with strabismus. However, the heterogeneity within this caregiver population has not been explored.

Patients and Methods: A cross-sectional survey was conducted among 409 caregivers. Latent profile analysis was performed based on levels of depression symptoms, resilience, and social support to classify caregivers. Multiple logistic regression analysis was used to identify the factors of profile membership.

Results: Three distinct profiles were identified: vulnerable and distressed group (36.19%), paradoxically distressed group (7.34%), and resilient and adapted group (56.47%). Regression analyses revealed that low education was a risk factor for vulnerable and distressed group. Younger age (<30 years) was a strong risk factor for paradoxically distressed group, whereas having two children was a protective factor. The clinical features of the children showed no significant association with caregivers' psychological adaptation profiles.

Conclusion: Caregivers of children with strabismus exhibited significant heterogeneity in psychological adaptation, which was primarily driven by their own demographic factors rather than the child's clinical features. These findings provide a critical basis for developing targeted psychological interventions.

Keywords: strabismus, caregiver, psychological well-being, depression, resilience, latent profile analysis

Introduction

Strabismus, a common pediatric ophthalmic condition, is defined as any deviation of the binocular alignment that can be the cause or the effect of poor binocularity.¹ In China, the prevalence of strabismus among children ranges from 2% to 5.6%.²⁻⁴ Strabismus not only affects binocular visual function and visual development, but also significantly impairs the child's self-esteem, social interaction and quality of life due to abnormal appearance.⁵⁻⁷ Children with strabismus are prone to have adverse reactions in terms of peer acceptance, appearance satisfaction, and emotional experience. The core dimensions of reduced quality of life change with age: younger children primarily experience declines in functional vision, whereas adolescents report more prominent social and emotional distress.⁸ Furthermore, these childhood

challenges may have long-term consequences, potentially adversely affecting educational attainment, employment opportunities, and marriage in adulthood.^{8–10} As most children with strabismus are in the early stage of development, they are highly dependent on their families for diagnosis and treatment decisions as well as daily management, especially the primary caregivers. Therefore, caregivers play an irreplaceable role in the treatment compliance, functional rehabilitation and psychosocial adaptation of children with strabismus.

Causes of considerable psychological pressure for caregivers of children with strabismus include: (1) long-term exposure to the child's abnormal appearance, (2) uncertainty regarding surgical timing and efficacy, (3) repeated follow-ups and visual rehabilitation training, (4) economic burden, and (5) evaluations from relatives, friends, or society.^{11–13} Previous studies have indicated that caregivers of children with strabismus experience considerable emotional distress and are confronted with a multitude of caregiving challenges.^{14,15} And a systematic review and meta-analysis focusing on caregivers of children with eye diseases revealed that a significant proportion experience clinically relevant levels of depression and anxiety.¹⁶ These adverse psychological states not only reduce the quality of life of caregivers themselves, but may also further affect the treatment cooperation and psychological development of children.

Current psychological research in the field of strabismus has mostly focused on the quality of life and psychosocial well-being of the affected children themselves, with relatively few systematic studies dedicated to the caregiver population. Existing relevant studies tend to treat caregivers as a relatively homogeneous group and describe their psychological status using single indicators such as depression, anxiety, or negative emotions.^{14,17,18} Although such research has identified certain risk factors, it has largely overlooked the internal heterogeneity among caregivers and the complex adaptive patterns formed by the combination of different psychological dimensions, thereby limiting the refinement and targeting of intervention strategies.

To address these gaps, this study adopts the framework of “psychological adaptation”, which is derived from the mainstream paradigm of health psychology. This framework emphasizes that an individual's psychological state under illness-related stress is not static but a dynamic balancing process. This process is shaped by the continuous interplay between internal resources (eg, resilience, cognitive appraisal, and coping styles) and external resources (eg, social support, socioeconomic and cultural contexts).^{19–21} Based on this framework, we selected three core constructs for operational definition and measurement to jointly assess caregivers' psychological adaptation: depressive symptoms represent the negative outcome of emotional adaptation and serve as a key indicator of caregivers' psychological risks;²² resilience, as an important internal resource, refers to positive adaptation or the ability to maintain or regain mental health despite experiencing adversity, and acts as the internal motivational system for coping with stress;²³ social support, as a critical external resource, refers to the interpersonal resources accessed and mobilized when individuals attempt to deal with everyday stresses and strains of life, and functions as an external protective factor that buffers the impact of stress.²⁴ In terms of statistical methods, this study adopts Latent Profile Analysis (LPA), an individual-centered statistical approach. Based on the score patterns of caregivers in depression symptoms, resilience, and social support, underlying subgroups of psychological adaptation among caregivers are identified. This study aims to: (1) characterize the psychological adaptation profile of caregivers of children with strabismus; (2) explore the associations between different types of psychological adaptation and socio-demographic and disease-related factors. The findings will help medical staff understand the diverse psychosocial adaptation profiles among caregivers and inform the development of tailored support strategies to effectively reduce their psychological burden.

Materials and Methods

Study Design and Patients

A cross-sectional descriptive study was conducted between September 2025 and December 2025 at an ophthalmic center in Guangzhou, China. As one of the leading ophthalmic centers in mainland China, it provides care for approximately 70,000 patients with strabismus annually. The caregivers of children with strabismus were recruited for this study. And a convenience sampling approach was used. The inclusion criteria were: (1) child aged ≤ 14 years with a diagnosis of manifest strabismus and listed for strabismus surgery, (2) a parent or legal guardian of the child, (3) aged 18 years or older, (4) able to complete Chinese questionnaires, and (5) capable of providing written informed consent. Caregivers

were excluded if they had a history of major psychiatric disorders, severe sensory impairments, or had experienced a major negative life event within the past month. Children with severe congenital eye diseases (such as congenital cataracts, glaucoma) or systemic diseases were also excluded.

According to the sample size calculation method for regression analysis,^{25,26} the required sample size is typically 5 to 10 times the number of independent variables. In this study, with 17 independent variables included and considering a 20% non-response rate, the calculated minimum sample size was 204. Furthermore, to identify distinct subtypes of psychological adaptation, latent profile analysis (LPA) was conducted. Nylund-Gibson et al²⁷ indicated that a sample size of at least 300 is required to ensure the reliability and stability of model parameters in LPA. Ultimately, 409 participants were enrolled in the survey.

Measurement

Questionnaires for Demographics and Characteristics

The survey included questions on child (gender, age, education, type of strabismus, number of operations, duration of strabismus, prism diopter near, amblyopia, diplopia) and caregiver (relationship with the child, age, education, employment, average family monthly income, residence, number of children raised, payment for medication).

Self-Rating Depression Scale

The Chinese version of the Self-Rating Depression Scale (SDS) was used to measure depression symptoms, which has demonstrated good reliability with Cronbach's α coefficient of 0.83.²⁸ The scale consists of 20 items. Items 2, 5, 6, 11, 12, 14, 16, 17, 18 and 20 are reverse-scored. Higher scores are associated with higher levels of depression. According to the Chinese norm results, the cutoff value of the SDS standard score is 53 points, which can be identified as elevated depression symptoms. Scores between 53–62 points indicate mild depression symptoms, those between 63–72 points indicate moderate depression symptoms, and scores of 73 or more indicate severe depression symptoms.²⁹ The Cronbach's α coefficient in this study was 0.86.

Connor-Davidson Resilience Scale

The Chinese version of the Connor-Davidson Resilience Scale (CD-RISC) was adopted to measure resilience.³⁰ The scale comprises 25 items across three dimensions: tenacity, strength, and optimism. Each item was evaluated using a 5-point Likert-type scale (0-4), with total scores ranging from 0 to 100. Higher scores indicate a higher level of resilience. The Cronbach's α coefficient in this study was 0.95.

Social Support Rating Scale

The Social Support Rating Scale (SSRS) was adopted by Xiao in 1986, widely used to assess the level of social support in China.³¹ This scale includes three dimensions: subjective social support, objective social support, and utilization of social support. Participants were classified into four categories: low (<33), moderate (33–45), and good (>45) social support.³² The Cronbach's α coefficient in this study was 0.78.

Ethical Consideration and Data Collection Procedure

This study was approved by the Ethics Committee of the Zhongshan Ophthalmic Center (NO. 2025KYPJ123) and conducted in accordance with the Declaration of Helsinki. Three clinical nurses from the Strabismus Department were selected as research assistants (RA). The RAs received standardized training emphasizing neutral communication, avoidance of emotionally suggestive language, and clarification that participation was entirely voluntary and unrelated to clinical decision-making. Caregivers were approached in a quiet area of the ward before the child's scheduled surgery. The study was introduced as a general investigation of caregiver experiences rather than as an evaluation of emotional instability, in order to minimize potential response priming. For those caregivers willing to participate, written informed consent was obtained prior to any data collection. Subsequently, caregivers completed the questionnaires independently and anonymously. The RAs remained available throughout the process to clarify any items that were difficult to understand. To ensure data completeness, all questionnaires were checked upon return, and caregivers were asked to fill in any missing responses immediately.

Statistical Analysis

The data were analyzed using SPSS 25.0 and Mplus 8.3. The normality of the distributions of the study variables was checked. Categorical variables were described using frequency and percentage. Normally distributed continuous variables were presented as mean \pm standard deviation. For between-group comparisons, a two-sample *t*-test or one-way analysis of variance (ANOVA) was used for continuous variables. Categorical variables were compared using the chi-square test or Fisher's exact test.

Latent profile analysis was performed using Mplus 8.3. As the measurement scales differed across the dimensions of the Self-Rating Depression Scale, Connor-Davidson Resilience Scale, and Social Support Rating Scale, the data were standardized to a mean of 0 and a standard deviation of 1. Latent profile models were estimated using the maximum likelihood method. Model fit was evaluated using the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), and the sample size-adjusted BIC (aBIC), with lower values indicating a better fit. The precision of classification was assessed by entropy, where values closer to 1 indicate higher classification accuracy. The Bootstrap Likelihood Ratio test (BLRT) and Lo-Mendell-Rubin likelihood ratio test (LMR) were used to examine fitting effects, with $P < 0.05$ indicating a superior fit for the *k*-category model compared to the *k*-1 category model. We recognized that one of the identified profiles had a relatively small sample size ($n=30$). To ensure the stability of the model results, the following measures were taken: (1) a robust estimator suitable for smaller samples (eg, MLR) was employed; (2) the optimal model was determined by a comprehensive evaluation of multiple fit indices, such as the BIC and BLRT.

Finally, a multiple logistic regression model was employed to analyze the factors influencing latent categories. Variables were selected for inclusion in the multiple logistic regression based on their significant association ($P < 0.05$) in the univariate analysis. And the significance level was set at 0.05.

Results

Demographics and Characteristics

A total of 421 questionnaires were distributed in this study, and 409 questionnaires with complete and valid information were collected, with an effective recovery rate of 97.15%. Twelve caregivers were excluded due to incorrect hospitalization IDs, which prevented verification of their children's clinical data.

The disease duration of children with strabismus ranged from 3 months to 13 years, with an average of (4.14 ± 2.70) years. The mean ages of the children and caregivers were 7.25 ± 2.91 and 36.78 ± 5.24 years, respectively. The majority of children with strabismus in this study were older than 5 years (68.22%), had exotropia (56.97%), and had no history of strabismus surgery (74.33%). Among the participating caregivers, mothers accounted for the largest proportion (69.68%), over half had attained a post-secondary education or higher (51.59%), and most were raising two children (57.70%). The participants' characteristics are listed and shown in Table 1.

Table 1 General Characteristics and Univariate Analysis of Potential Profiles of Psychological Adaptation Among Caregivers of Children with Strabismus

Variables	n	Vulnerable and Distressed Group (n=148)	Paradoxically Distressed Group (n=30)	Resilient and Adapted Group (n=231)	Statistics	P
Child gender					0.941	0.625
Male	212	78 (52.7)	13 (43.3)	121 (52.4)		
Female	197	70 (47.3)	17 (56.7)	197 (47.6)		
Age of the children (years)					1.634	0.803
<3	8	2 (1.4)	1 (3.3)	5 (2.2)		
3-5	122	40 (27.0)	9 (30.0)	73 (31.6)		
>5	279	106 (71.6)	20 (66.7)	153 (66.2)		

(Continued)

Table 1 (Continued).

Variables	n	Vulnerable and Distressed Group (n=148)	Paradoxically Distressed Group (n=30)	Resilient and Adapted Group (n=231)	Statistics	P
Education of the children						
Preschool	162	53 (35.8)	13 (43.3)	96 (41.6)	2.881	0.578
Elementary	213	85 (57.4)	14 (46.7)	114 (49.4)		
Middle school	34	10 (6.8)	3 (10.0)	21 (9.0)		
Strabismus type of the children					7.222	0.125
Esotropia	144	63 (42.6)	8 (26.7)	73 (31.6)		
Exotropia	233	77 (52.0)	18 (60.0)	138 (59.7)		
Vertical deviation	32	8 (5.4)	4 (13.3)	20 (8.7)		
Number of operations for children					7.983	0.092
0	304	117 (79.1)	22 (73.3)	165 (71.4)		
1	92	28 (18.9)	5 (16.7)	59 (25.6)		
2	13	3 (2.0)	3 (10.0)	7 (3.0)		
Duration of strabismus in child (years)					1.603	0.449
<3	191	63 (42.6)	15 (50.0)	113 (48.9)		
≥3	218	85 (57.4)	15 (50.0)	118 (51.1)		
Prism diopter near in child (Δ)					4.670	0.323
≤30	184	58 (39.2)	12 (40.0)	114 (49.4)		
31-60	201	80 (54.1)	17 (56.7)	104 (45.0)		
>60	24	10 (6.7)	1 (3.3)	13 (5.6)		
Child had amblyopia					2.955	0.228
Yes	35	13 (8.8)	5 (16.7)	17 (7.4)		
No	374	135 (91.2)	25 (83.3)	214 (92.6)		
Child had diplopia					0.371	0.831
Yes	54	19 (12.8)	3 (10.0)	32 (13.9)		
No	355	129 (87.2)	27 (90.0)	199 (86.1)		
Relationship with the child					0.684	0.710
Father	124	43 (29.1)	11 (36.7)	70 (30.3)		
Mother	285	105 (70.9)	19 (63.3)	161 (69.7)		
Age of the caregivers					17.014	0.002
<30	22	5 (3.4)	6 (20.0)	11 (4.8)		
30-40	306	119 (80.4)	20 (66.7)	167 (72.3)		
>40	81	24 (16.2)	4 (13.3)	53 (22.9)		
Education of the caregivers					27.841	<0.001
Less than middle school	105	55 (37.2)	13 (43.3)	37 (16.0)		
Middle school	93	33 (22.3)	5 (16.7)	55 (23.8)		
College and beyond	211	60 (40.5)	12 (40.0)	139 (60.2)		
Employment of the caregivers					8.523	0.014
Employed	305	100 (67.6)	20 (66.7)	185 (80.1)		
Underemployed	104	48 (32.4)	10 (33.3)	46 (19.9)		
Average family monthly income (yuan)					26.248	<0.001
<2500	210	97 (65.5)	20 (66.7)	93 (40.3)		
2500-5000	133	33 (22.3)	7 (23.3)	93 (40.3)		
>5000	66	18 (12.2)	3 (10.0)	45 (19.5)		
Residence					8.371	0.015
City	217	66 (44.6)	14 (46.7)	137 (59.3)		
Rural	192	82 (55.4)	16 (53.3)	94 (40.7)		

(Continued)

Table 1 (Continued).

Variables	n	Vulnerable and Distressed Group (n=148)	Paradoxically Distressed Group (n=30)	Resilient and Adapted Group (n=231)	Statistics	P
Number of children raised					13.107	0.011
1	98	30 (20.3)	7 (23.3)	61 (26.4)		
2	236	85 (57.4)	12 (40.0)	139 (60.2)		
3 and above	75	33 (22.3)	11 (36.7)	31 (13.4)		
Payment for medication					0.731	0.694
Public medical care	329	117 (79.1)	23 (76.7)	189 (81.8)		
Self-paying	80	31 (20.9)	7 (23.3)	42 (18.2)		

Note: ΔPrism diopter.

Depression Symptoms, Resilience, and Social Support in Caregivers of Children with Strabismus

The results of this study showed that the mean score of SDS was 46.89 ± 11.84 . The proportion of caregivers with depression symptoms in this study was 37.41%; among them, 20.54% had mild depression, 16.87% had moderate depression. The mean score of resilience was 63.80 ± 14.16 . The average scores for the three dimensions of resilience were as follows: tenacity (35.35 ± 9.59), strength (19.64 ± 5.72), and optimism (10.55 ± 3.32). The mean score of social support was 42.10 ± 8.17 , with the mean score of dimensions as follows: objective support (8.79 ± 3.04), subjective support (25.83 ± 4.56), and utilization of social support (7.47 ± 2.38).

Potential Profile Analysis of Psychological Adaptation in Caregivers of Children with Strabismus

Using the mean scores of depression symptoms, resilience, and social support as observed indicators, 1 to 5 latent profile models were specified and estimated (Table 2). When Model 3 was retained, AIC, BIC and aBIC decreased, the entropy was the largest, and LMR and BLRT were statistically significant (all $P < 0.001$). Therefore, Model 3 was selected as the best fitting model.

Figure 1 presents the distribution of scores across the dimensions of the scales for each latent profile. Profile 1 comprised 148 cases (36.19%), characterized by higher depression symptoms (58.31 ± 5.34) and lower levels of resilience (51.68 ± 14.95) and social support (36.41 ± 8.13). It was therefore labeled as the “Vulnerable and distressed” group. Profile 2 included 30 cases (7.34%), with depression symptoms (60.04 ± 3.84), resilience (89.80 ± 9.70), and social support (46.70 ± 5.24) all at relatively high levels. This profile was named the “Paradoxically distressed” group. Profile 3 consisted of 231 cases (56.47%), featuring lower levels of depressive symptoms (37.86 ± 6.34), with moderate levels of both resilience (71.27 ± 13.10) and social support (45.14 ± 6.32). It was designated as the “Resilient and adapted” group.

Table 2 Model Fitting Information for the Latent Profile (n=409)

Model	AIC	BIC	aBIC	Entropy	Class Proportions (%)	LMR p value	BLRT p value
1	3491.071	3515.154	3496.115	–	–	–	–
2	3289.851	3329.988	3298.256	0.832	44.25/55.75	<0.001	<0.001
3	3232.763	3288.956	3244.531	0.847	36.19/7.34/56.47	<0.001	<0.001
4	3192.821	3265.068	3207.951	0.774	29.58/7.82/33.01/29.59	0.0449	<0.001
5	3161.273	3249.574	3179.764	0.799	36.92/2.76/29.58/22.56/8.18	0.3454	<0.001

Abbreviations: AIC, Akaike's information criteria; BIC, Bayesian information criteria; aBIC, sample-size adjusted BIC; LMR, Lo–Mendel–Rubin; BLRT, Bootstrapped likelihood ratio test.

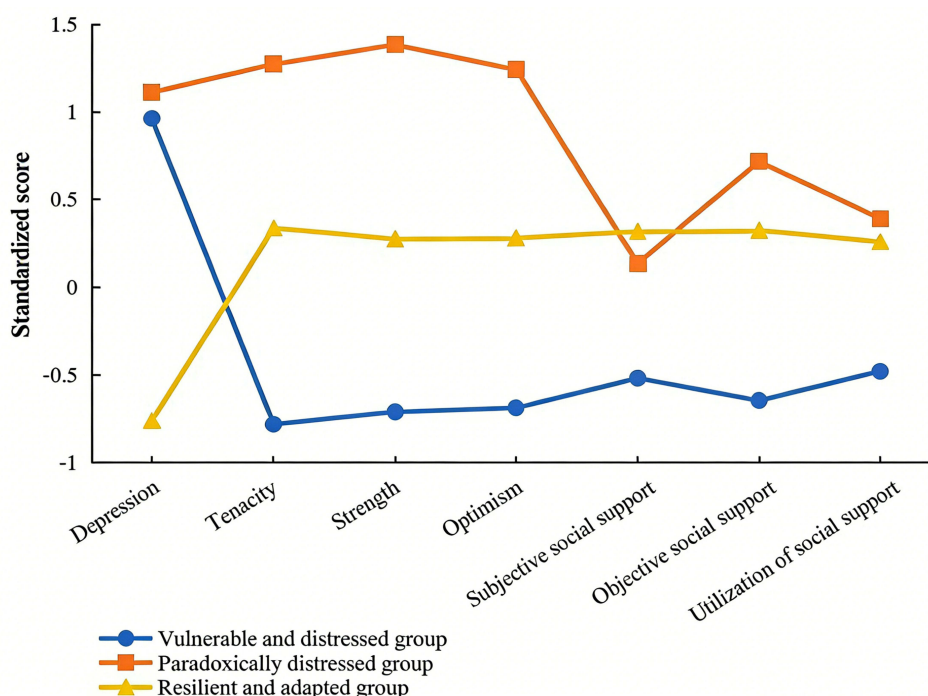


Figure 1 The characteristic distribution of 3 latent profiles of psychological adaptation among caregivers of children with strabismus.

Influencing Factors of Different Latent Profiles

The results of the univariate analysis indicated statistically significant differences among the three caregiver profiles in caregiver's age, education, employment, average family monthly income, residence, and number of children raised ($P < 0.05$), as shown in Table 1.

Taking the three latent profiles as the dependent variable, with the "Resilient and adapted" profile set as the reference group, and incorporating variables that showed statistical significance in the univariate analysis as independent variables, a multiple logistic regression analysis was performed. The results showed that caregivers' age, education, and number of children raised were the influencing factors of latent profiles of psychological adaptation in caregivers of children with strabismus, as illustrated in Table 3.

Table 3 Multiple Logistic Regression Analysis of Potential Profiles

Variables	β	SE	Wald χ^2	P	OR	95% CI
"Vulnerable and distressed" profile vs "Resilient and adapted" profile						
Education of the caregivers						
Less than high school	0.767	0.311	6.063	0.014*	2.153	1.169–3.964
High school	-0.124	0.306	0.166	0.684	0.883	0.485–1.608
College and beyond ^a	–	–	–	–	–	–
"Paradoxically distressed" profile vs "Resilient and adapted" profile						
Number of children raised						
1	-0.823	0.603	1.860	0.173	0.439	0.135–1.433
2	-1.078	0.526	4.193	0.041*	0.340	0.121–0.955
3 and above ^a	–	–	–	–	–	–

(Continued)

Table 3 (Continued).

Variables	β	SE	Wald χ^2	P	OR	95% CI
Age of the caregivers (years)						
<30	1.701	0.774	4.830	0.028*	5.479	1.202–24.970
30-40	0.524	0.583	0.810	0.368	1.690	0.539–5.295
>40 ^a	-	-	-	-	-	-

Notes: ^aReference category; *P < 0.05.

Discussion

To our knowledge, this is the first study to utilize LPA to delineate the profiles of psychological adaptation among caregivers of children with strabismus, defined jointly by depressive symptoms, resilience, and social support. This study identified three distinct latent classes and explored the impact of influencing factors on the psychological adaptation subgroups. This finding validates the core premise of the psychological adaptation framework, indicating that caregivers' mental health outcomes are not uniform but rather emerge from the dynamic interplay of internal and external resources.

Profiles of Psychological Adaptation

This study identified three distinct latent classes of psychological adaptation among caregivers of children with strabismus: vulnerable and distressed group (36.19%), paradoxically distressed group (7.34%), and resilient and adapted group (56.47%).

The vulnerable and distressed group represented a caregiver population characterized by limited resources and heightened emotional vulnerability. These caregivers typically had lower income and educational attainment, and cared for children with longer disease duration (>3 years) and greater degree of strabismus. Their psychological state was consistent with findings from existing literature.^{14,15} Collectively, these factors may contribute to a high-risk context marked by a severe “stress-resource imbalance”: the chronic burden of long-term caregiving, financial strain, persistent concerns about complex medical conditions, and potential difficulties in accessing sufficient social and healthcare support led to progressive exhaustion of both internal and external resources, thereby substantially increasing the risk of depression.

The paradoxically distressed group, although small in size, exhibited a contradictory pattern of “high resources-high depressive symptoms”. Caregivers in this group tended to report high levels of resilience and social support. However, under the sustained burden of caregiving and long-term emotional exhaustion, they still exhibited significant depressive symptoms. Although social support was objectively available, the mode, content, or timing of such support may not have effectively addressed the caregivers' core needs at the time.

The resilient and adapted group, which constituted the largest proportion of caregivers, demonstrated the low levels of depression symptoms and moderate levels of resilience and social support. This suggested that more than half of caregivers were able to effectively mobilize internal coping mechanisms and external assistance to adapt to their caregiving roles in this study. They may have established effective communication with medical staff or experienced favorable treatment outcomes in their children, enabling them to maintain favorable psychological adaptation to effectively cope with challenges. Research has consistently shown improved quality of life and mental health following strabismus surgery among children and their parents.^{33,34}

The identification of these distinct profiles provides empirical support for the psychological adaptation framework in the context of pediatric strabismus caregiving. This framework posits that psychological outcomes are not determined solely by stressors, but by the dynamic interplay between internal resources (eg, resilience) and external resources (eg, social support). Our findings extend this theoretical perspective by demonstrating that these resources combine in qualitatively different ways to produce distinct adaptation patterns, rather than simply varying along a continuum. The paradoxically distressed group, in particular, challenges linear models of psychological adjustment by showing that high

resources do not guarantee low distress. This suggests the need for more nuanced theoretical models that account for resource mobilization, appraisal processes, and the potential mismatch between available support and actual needs.

Predictors of Profiles

Our study showed that caregivers with less than high school education more likely to belong to the vulnerable and distressed group compared with the resilient and adapted group. This result was consistent with previous research showing that lower education level was associated with greater parenting burden and poorer psychological outcomes among caregivers of children with chronic illness.^{35–37} Inadequate education is associated with limited material and informational resources, low health literacy, restricted access to supportive networks, and a lack of adaptive coping strategies. As noted in relevant research, it is thought that low education level of parents causes them to experience inadequacy in understanding the illness of their children, in managing the treatment process and accessing the necessary information.³⁵ All of these factors may exacerbate the burden of disease management, elevate susceptibility to depression, and increase psychological vulnerability in chronic care settings.

In this study, the paradoxically distressed group was significantly associated with younger caregiver age and the number of children raised. A study on the psychosocial and support needs of primary caregivers for adolescents and young adult cancer patients has similarly shown that younger parents report higher levels of psychological distress.³⁸ Young parents are typically in the early stages of their careers or facing economic instability, which often results in more pronounced conflicts between economic pressures, career demands, and caregiving responsibilities when managing their children's illnesses. Although they may possess resilience and social support, they generally lack practical experience in caring for children, implementing complex treatment regimens, and effectively navigating healthcare systems. This experiential deficit may limit their ability to translate existing psychological and social resources into concrete, context-specific coping strategies. Interestingly, raising two children (versus three or more) was associated with lower risk of being in the paradoxically distressed group compared with the resilient and adapted group, suggesting a non-linear relationship between family size and psychological adaptation. We hypothesized that caregivers with two children may benefit from prior caregiving experience and a more balanced distribution of family demands, whereas those with larger families may face competing demands that strain psychological resources.

Notably, the clinical characteristics of the children investigated in this study did not show statistically significant associations with the psychological adaptation profiles of the caregivers. This result challenges a common assumption that the objective severity or complexity of a child's condition directly dictates caregiver's psychological distress. Similar dissociations between objective disease indices and caregiver outcomes have been reported in other pediatric chronic disease populations. A survey of parents of children with cancer found that the type of cancer and clinical stage had no significant impact on parental hopelessness, resilience, and intolerance of uncertainty.³⁹ And a systematic review of parenting stress of caregivers of children with chronic diseases indicated that greater general parenting stress was associated with greater parental responsibility for treatment management and was unrelated to illness duration and severity across illness populations. Greater parenting stress was associated with poorer psychological adjustment in caregivers and children with chronic illness.⁴⁰ These studies further suggest that the mental health of caregivers is not a simple reflection of objective disease indicators but depends more on their subjective interpretation of the illness, internal coping processes, and psychologically adaptive trajectories over time. Comparison with early-onset myopia further contextualizes these findings. Strabismus is visibly apparent and may trigger concerns about social stigma, while myopia is less conspicuous but requires long-term management. Parental distress in pediatric myopia has been associated more closely with concerns about disease progression (refractive error magnitude) and management burden than with appearance-related factors.⁴¹ This distinction suggests that caregiver psychological adaptation in strabismus may be driven more by social visibility, whereas in early-onset myopia it may be shaped more by chronic uncertainty and decision-related stress.⁴²

Implications for Practice

The management of strabismus in pediatric patients should not only focus on the child's quality of life but also include caregivers' mental health. It is recommended that caregivers' psychological well-being be integrated into routine clinical

assessment. Brief and validated psychosocial scales should be administered to screen caregivers at the time of diagnosis and at key clinical milestones, enabling timely identification and intervention for psychological distress. This study highlights the particular need to support caregivers with low education and younger age. Moreover, caregivers of children with strabismus exhibited significant heterogeneity in psychological adaptation. It is recommended to develop personalized intervention strategies tailored to distinct caregiver subtypes. Caregivers in the vulnerable and distressed group should be prioritized for immediate psychosocial interventions, including referral to professional psychological support, such as cognitive-behavioral interventions for depression,⁴³ provision of practical social work assistance to address structural barriers, and enhanced access to peer support and community resources. For caregivers in the paradoxically distressed group, the focus of intervention should not be on increasing resource availability but on facilitating cognitive restructuring and aligning expectations. The goal is to transform their patterns of resource utilization and stress appraisal, thereby converting existing resources into effective coping capacities. Lastly, caregivers in the resilient and adapted group were not necessarily problem-free, but rather represented a low-risk group. These families may benefit most from low-intensity, strength-based supports such as watchful waiting, psychological education, and facilitated access to resources, rather than intensive interventions. Collectively, these findings support a paradigm shift toward family-centered care in pediatric ophthalmology, where routine psychosocial screening and profile-informed support pathways are integrated into standard practice.

Limitations

There are some limitations in this study. Firstly, this cross-sectional study was conducted at a single ophthalmology clinic, making the sample less representative, so a multi-center longitudinal study can be carried out to investigate the trajectories of adaptation over time. Secondly, future studies could benefit from incorporating more mediating or moderating variables, such as caregivers' cognitive appraisals and coping styles, to further elucidate the underlying mechanisms. Thirdly, data on caregivers' personal or vicarious experiences with strabismus or strabismus surgery were not collected. Such prior experiences may shape caregivers' expectations, anxiety levels, and psychological responses, and should be considered in future studies. Moreover, our study identified the paradoxically distressed group, revealing a previously overlooked and highly clinically significant subgroup of caregivers. However, this sample size was relatively small (7.34%), which may affect the statistical power and stability of the results of multiple logistic regression. Replication with larger samples is needed to confirm the existence and characteristics of this profile. Last but not least, it is also important to acknowledge that the act of surveying parents about their emotional concerns may itself have influenced their responses. By drawing attention to psychological distress, the survey process might have temporarily heightened caregivers' awareness of their own emotional state, potentially leading to higher reported levels of distress. Future studies could consider incorporating repeated measurements or qualitative interviews to distinguish between stable trait-like distress and transient state-like responses triggered by the survey context.

Conclusion

In summary, three distinct latent classes of psychological adaptation among caregivers of children with strabismus were identified by using LPA of depressive symptoms, resilience, and social support: vulnerable and distressed group, paradoxically distressed group, and resilient and adapted group. Caregivers' education, age and the number of children raised were the significant predictors of latent classes of psychological adaptation. These findings move beyond a one-size-fits-all understanding of caregiver distress and provide an evidence-based framework for tailoring support to individual needs. By demonstrating that caregivers require fundamentally different types of support depending on their psychological profile, this study lays the groundwork for a paradigm shift in clinical practice—from generic psychosocial advice to precise, profile-driven intervention strategies that address the specific mechanisms underlying each caregiver's distress.

Data Sharing Statement

The data are available from the corresponding author (Yinghuan Wang) on reasonable request.

Acknowledgments

We would like to thank all participants who took part in the study.

Funding

This study was supported by the Medical Scientific Research Foundation of Guangdong Province, China (grant No. A2024758).

Disclosure

The authors report no conflicts of interest in this work.

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