

Associations Between Family Functioning and Social Avoidance and Distress in Patients with Strabismus: A Chain Mediation Model

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Purpose: Exploring the mechanisms of fear of negative evaluation (FNE) and self-esteem between family functioning and social avoidance and distress (SAD) to inform the promotion of social functioning in people with strabismus.

Patients and Methods: Convenience sampling was used to select 249 strabismus patients attending a tertiary-level ophthalmology hospital in Wenzhou City from July 2023 to February 2024. The Social Avoidance and Distress Scale, Rosenberg Self-Esteem Scale, Brief Fear of Negative Evaluation Scale, and Family APGAR Index Questionnaire were utilized to assess levels of social avoidance and distress, self-esteem, fear of negative evaluation, and family functioning. Structural equation modeling (SEM) was employed to explore the sequential mediating role of FNE and self-esteem in the relationship between family functioning and SAD.

Results: Family functioning negatively predicted SAD directly ($\beta=-0.14$, $P<0.01$). Additionally, family functioning predicted FNE ($\beta=-0.19$, $P<0.01$) and self-esteem ($\beta=0.41$, $P<0.01$). FNE positively predicted SAD ($\beta=-0.38$, $P<0.01$) and negatively predicted self-esteem ($\beta=-0.22$, $P<0.01$). Moreover, self-esteem negatively predicted SAD ($\beta=-0.33$, $P<0.01$). FNE and self-esteem mediated the relationship between family functioning and SAD, with a combined mediating effect of -0.249 , explaining 63.52% of the total variance.

Conclusion: This study examined how FNE and self-esteem affect the link between family functioning and SAD in patients with strabismus. These findings complement our understanding of SAD mechanisms in strabismus patients, encompassing familial, cognitive, and emotional perspectives, and offer theoretical insights for enhancing social functioning in this population.

Keywords: strabismus, social avoidance and distress, family functioning, fear of negative evaluation, self-esteem, chain mediation

Introduction

Strabismus is an ophthalmic disorder characterized by abnormal eye movement or positioning of the visual axis.¹ Due to contemporary shifts in work, study, and lifestyle, the prevalence of strabismus has markedly risen, establishing it as a prevalent ophthalmic condition. Recent studies indicate a global prevalence of approximately 1.93% for strabismus, suggesting that at least 148.61 million people worldwide are affected based on the current global population.² Strabismus impacts both the patient's appearance and visual function, potentially resulting in irreversible vision loss. Furthermore, individuals with strabismus frequently experience various psychosocial challenges including anxiety, depression, self-esteem issues, and social avoidance.³ Studies indicate that children with strabismus face at least a 10% higher risk of developing psychiatric and other psychological disorders during early adulthood compared to their non-strabismic peers.⁴ Furthermore, a large cohort study indicated that adults with strabismus have a two to threefold higher likelihood of experiencing mental health issues, such as anxiety and depression, compared to those without strabismus.⁵ Eye contact is crucial for conveying effective social cues in social interactions, with humans naturally prioritizing focusing on and observing others' eyes and faces.⁶ In contrast, people with strabismus are prone to limited social activities because of

their inability to make effective eye contact, as well as social problems due to ridicule or discrimination. Social avoidance and distress (SAD) represents a primary type of social anxiety characterized by significant and persistent avoidance behaviors and negative emotional experiences.⁷ This condition is frequently observed in individuals with impaired image.⁸

Strabismus surgery is acknowledged as an efficacious treatment for strabismus. After the age of seven, children's development of stereopsis nears that of adults, highlighting the critical role of timely surgical correction. Early surgical intervention in children can rapidly address ocular misalignment, thereby improving visual function and supporting the maturation of binocular vision.⁹ In adults, beyond the developmental period of visual acuity, the benefits of strabismus surgery are primarily cosmetic, aimed at enhancing ocular alignment and reducing diplopia. Additionally, strabismus surgery has been demonstrated to substantially improve psychosocial issues such as self-consciousness and social anxiety, consequently elevating patients' quality of life.¹⁰ In a prospective intervention study conducted by Archer et al,¹¹ the psychosocial impact of pediatric strabismus surgery was assessed using a modified version of the RAND Health Insurance Study quality of life instrument. By comparing the results of questionnaires completed by parents or guardians two months before and after surgery, they found that surgery significantly improved the children's social and emotional conditions, thereby enhancing the children's quality of life. A literature review¹² focusing on the psychosocial impact of adult strabismus and strabismus surgery also indicates similar views, suggesting that surgery can improve the self-esteem, social functioning, and overall life satisfaction of adult patients. Yet it does not fully resolve all strabismus-related challenges. Ozates et al¹³ observed no statistically significant differences in scores on appearance anxiety and fear of negative evaluation (FNE) among patients with intermittent exotropia, both preoperatively and at 1 year postoperatively. At the same time, strabismus surgery entails uncertainties due to potential under-correction, overcorrection, and recurrence following surgery. Research indicates a 27.14% recurrence rate of intermittent strabismus at 2 years post-surgery,¹⁴ with 52.9% of patients requiring reoperation within five years.¹⁵ Hence, strabismus treatment may also have an impact on patients' psychosocial problems. Given the social dilemmas of patients with strabismus, it is particularly important to further explore the mechanisms that form the basis of their social issues. Given these challenges, exploring underlying mechanisms can offer new avenues for psychological interventions and support, aiding better social adaptation. In studies concerning the social and psychological issues of strabismus patients, the AS-20 questionnaire is frequently utilized as a measurement tool. It has been validated among adult patient populations in China and has demonstrated good reliability and validity.^{16,17} While the AS-20 includes information about social aspects, it primarily focuses on assessing the overall impact of strabismus on patients' quality of life. Therefore, this study aims to employ the Social Avoidance and Distress Scale (SAD) to precisely evaluate the specific problems and feelings patients experience in social situations.

Patients with strabismus face various social challenges. Numerous factors contribute to the emergence and progression of social issues, including factors related to illness, personal characteristics, and external support.¹⁸ Most studies have primarily examined the disease's direct effects, but the influence of familial, psychological, and cognitive factors on social avoidance and distress remains unclear, necessitating further investigation into their underlying mechanisms. Ecosystem theory suggests that the family functioning as a microsystem in individual development, significantly influences personal growth.¹⁹ Family functioning denotes the capacity of members to sustain close relationships, fulfill roles, address issues, adapt to new practices, and communicate effectively.²⁰ He's team¹⁸ assessed social isolation in breast cancer patients using the Social Anxiety Scale, Social Avoidance and Distress Scale, and Loneliness Scale, revealing that family functioning mitigates social isolation in this population. Greater family closeness, belonging, and interdependence correlated with reduced incidence of psychotic features. Patients experiencing better family functioning tended to exhibit greater extroversion and a stronger desire for social acceptance,²¹ potentially motivating increased social activity and reducing SAD. Simultaneously, family environmental factors typically influence through individual internal factors. In some previous research,²² it was found that self-esteem mediated the link between family functioning and adolescent anxiety. Self-esteem, a key risk factor for social anxiety, reflects an individual's self-assessment and sense of worth, effectively mitigating the psychological impact of negative life events. Besides self-esteem, FNE is closely associated with social anxiety, describing an individual's dread of negative evaluations from others. Research indicates this fear is prevalent among adolescents with social anxiety, contributing to significant levels of avoidance, distress, and

impairment.²³ Willemse's team²⁴ identified a direct correlation between negative appraisal fear and self-esteem in burn survivors.

Previous studies have identified a direct relationship between variables, but the interaction mechanisms influencing social issues in individuals with strabismus remain unclear. The Stimulus-Organism-Response (S-O-R) theory²⁵ posits that environmental factors influence an individual's cognition and emotions, thereby impacting their behavior. The pathways through which behavior is produced involve: External Stimulus – Cognitive/Emotional Mediation – Response. Among these, “stimulus” represents environmental factors as the antecedent variable related to family functioning; “organism” denotes psychological/cognitive changes as the mediator variable concerning FNE/self-esteem; and “response” signifies the outcome variable, reflecting behavioral responses such as social avoidance and distress in this study.

In summary, based on the S-O-R theory and previous research, this study proposes four hypotheses: H1 states that family functioning exacerbates SAD in patients; H2 suggests that FNE mediates the link between family functioning and SAD; H3 proposes that self-esteem also serves as a mediator between family functioning and SAD; H4 posits that FNE and self-esteem jointly mediate the relationship between family functioning and SAD. Figure 1 depicts the conceptual model.

Methods

Participants

This study used convenience sampling to select 249 strabismus patients from a tertiary-level ophthalmology hospital in Wenzhou City between July 2023 and February 2024. Inclusion criteria were as follows: aged 14–44 years; meeting the diagnostic criteria of the 2015 Chinese Expert Consensus on Strabismus Classification; illness duration of strabismus of at least 6 months. Exclusion criteria included: presence of other facial or ocular deformities; Other acute and chronic eye diseases, ocular tremor; comorbidities with serious systemic illnesses; history of psychiatric abnormalities or cognitive disorders; communication disorders. For sample size estimation, constructing a structural equation model (SEM) generally requires a minimum of 200 individuals,²⁶ with a suggested minimum of 220 cases to account for a 10% potential sample loss.

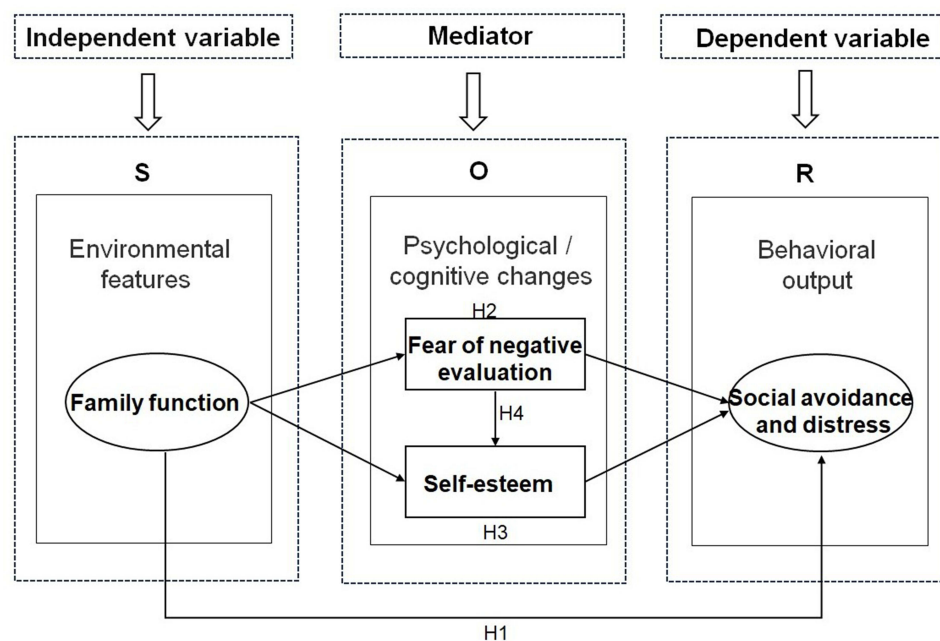


Figure 1 The overall conceptual model.

Measures

General Demographic and Disease Characteristics

General-information questionnaire. General demographic features cover age, sex, residence, marital status, and work status; Disease specifics encompass diplopia, amblyopia, previous history of strabismus surgery, disease duration, strabismus type, and angle of deviation.

SAD

Social Avoidance and Distress Scale was developed by Watson et al.²⁷ and translated into Chinese by Wang et al.²⁸ This scale consists of 2 dimensions, social avoidance (14 entries) and social distress (14 entries), with a total of 28 entries. The scale was assessed using a yes/no scale, with “yes” scoring 0 points and “no” scoring 1 point. After reversing the scores for the 14 reverse entries, the total score ranged from 0–28 points, with higher scores indicating a more severe level of social avoidance and distress in the participant. The range of score levels is as follows: 0–10 as low level, 11–20 as medium level, and >20 as high level. The Cronbach’s alpha coefficient for the scale was 0.872. The Cronbach’s alpha coefficient for the scale in this study was 0.901.

Self-Esteem

Rosenberg Self-Esteem Scale, developed by Rosenberg in 1965,²⁹ was translated into Chinese by Wang and colleagues.²⁸ The scale consists of 10 items measuring single dimensions, with 5 items scored positively and 5 items (2, 4, 6, 8, 10) scored negatively. The scale uses a 4-point Likert scale ranging from 1 (“very poorly”) to 4 (“very well”), yielding scores from 10 to 40, where higher scores indicate greater levels of self-esteem. The Cronbach’s alpha coefficient for the scale was 0.85, and in this study, it was 0.880.

FNE

Brief Fear of Negative Evaluation Scale, developed by Leary³⁰ in 1983, is derived from the Fear of Negative Evaluation Scale. It is designed for easy administration and assesses patients’ fear of negative evaluation. The scale comprises 12 one-dimensional items, with items 2, 4, 7, and 10 being reverse scored and the others positively scored. Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), yielding a total score between 12 and 60. The total score ranges from 12 to 60; higher scores indicate a greater degree of fear of negative evaluation in patients. The Cronbach’s alpha coefficient for this scale was 0.785, and in this study, it was 0.860.

Family Functioning

Family APGAR Index Questionnaire was designed by Smilkstein,³¹ assesses subjective satisfaction with family functioning. It measures five dimensions: family adaptation, cooperation, partnership, affect, and resolve, using a 5-item scale. Ratings were given on a 3-point scale (0–2; almost never = 0, sometimes = 1, often = 2), with a total score ranging from 0 to 10. Scores of 7–10 indicate good family functioning, 4–6 moderate dysfunction, and 0–3 severe dysfunction. Cronbach’s alpha coefficient for this scale was 0.909 in this study.

Data Collection and Quality Control methods

Respondents were screened strictly based on inclusion and exclusion criteria. The survey was conducted in a one-on-one, face-to-face format by the researcher. Before administering the survey, the researcher explained the study’s purpose and significance to patients and their families, and distributed the questionnaires after obtaining consent. This study obtained formal approval from the Institutional Review Board (IRB) and employed written consent to ensure participants’ willingness. For adult participants, a consent form was directly provided to them, which elaborated on the research purposes, methods, potential risks and benefits, as well as their rights. They were required to sign the written consent form after fully understanding and agreeing to participate in the study. For adolescent participants, both the adolescent themselves and their parents or legal guardians needed to understand and sign the consent form jointly before they could be included in the study. During questionnaire collection, emphasis was placed on questionnaire anonymity and confidentiality, with data restricted to scientific research purposes only, aiming to mitigate common method bias. A standardized guide was used to explain questionnaire completion requirements and address patient queries.

Respondents struggling with the questionnaire had entries read aloud and received assistance, taking approximately 10 minutes per questionnaire. Upon completion, the researcher immediately retrieved and examined the questionnaire. Missing entries were promptly completed. Questionnaires were deemed invalid if responses were consistent or all options were identical. Disease-related information was obtained from medical records with respondents' consent, among which the angle of deviation (33 cm) was measured using the prism and alternate cover test method. In this study, 257 questionnaires were distributed and recovered. After double verification, 8 questionnaires (6 showing consistent response patterns or identical answers, and 2 with missing items) were excluded. This resulted in 249 valid questionnaires, yielding an effective recovery rate of 96.89%.

Data Analyses

The data obtained were analyzed using SPSS 26.0 and AMOS 24.0. Firstly, Harman's one-way test was performed for common method bias checking and multiple covariance checking was performed for the main variables. Secondly, measures satisfying normal distribution were expressed as mean \pm standard deviation for descriptive analysis and Pearson's correlation analysis was used for correlation analysis; variables with skewed distribution were expressed as median (quartiles) for descriptive analysis and Spearman correlation analysis was used for correlation analysis. Finally, SEM was used to investigate the mediating role of FNE and self-esteem between family functioning and SAD. Criteria for goodness-of-fit indices included: the ratio of chi-square to degrees of freedom (χ^2/df) should be less than 3, normative fit index (NFI) ≥ 0.90 , comparative fit index (CFI) ≥ 0.90 , goodness-of-fit index (GFI) ≥ 0.90 , tucker-Lewis index (TLI) ≥ 0.90 , adjusted goodness-of-fit index (AGFI) ≥ 0.90 , incremental fit index (IFI) ≥ 0.90 and root mean square error of approximation (RMSEA) ≤ 0.80 .³² We used Bootstrap analysis to test the significance of the mediating effect, with a repeat sample size of 5000 and a confidence interval set at 95%. Differences were considered statistically significant at $P < 0.05$.

Results

General Information About the Respondents

Of the 249 patients with strabismus, 32.1% (N=80) were adolescents (14–18 years old) and 67.9% (N=169) were adults (18–44); 54.2% (N=135) were males and 45.8% (N=114) were females; 61.5% (N=153) of the participants reported their place of residence to be urban and 38.6% (N= 96) had a rural residence; students were more prevalent at 59.0% (N=147); most of the patients were exotropic at 61.9%; 31.3% had combined diplopia, 13.7% had combined amblyopia. 10.8% participants (N=27) had a previous history of strabismus surgery and experienced recurrent strabismus symptoms that persisted for more than 6 months. Detailed demographic and clinical characteristics information of the sample is shown in Table 1.

Table 1 Basic Information of Survey Respondents (N=249)

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	135	54.2
	Female	114	45.8
Age (years)	14–18	80	32.1
	18–44	169	67.9
Residence	Urban	153	61.5
	Rural	96	38.6

(Continued)

Table 1 (Continued).

Variable	Category	Frequency (n)	Percentage (%)
Work status	Students	147	59.0
	Working	71	28.5
	Unemployed	31	12.5
Marital status	Unmarried	215	86.4
	Married	33	13.3
	Divorced	1	0.4
Diplopia	No	171	68.7
	Yes	78	31.3
Amblyopia	No	215	86.4
	Yes	34	13.7
Previous history of strabismus surgery	No	222	89.2
	Yes	27	10.8
Strabismus type	Esotropia	73	29.3
	Exotropia	154	61.9
	Vertical	10	4.0
	Others	12	4.8
Disease duration (years)	>0.5	82	32.9
	>5	50	20.1
	>10	76	30.5
	>20	40	16.1
Angle of deviation (33 cm, PD)	≥10	15	6.0
	≥20	78	31.3
	≥40	156	62.7

Common Methodological Bias and Covariance

As the majority of the data in this study came from self-reports by the study participants, common methodological bias may be present. In addition, a common method bias test was conducted using the Harman one-way test, which showed a total of 13 factors with eigenvalues >1 and a variance contribution of 22.3% (<40% of the recommended standard) for the 1st factor,³³ suggesting that there was no serious common method bias. The covariance test with SAD as dependent variables and family function, self-esteem, and FNE as independent variables showed that the variance inflation factors (VIFs) ranged from 1.105–1.302, which is close to 1, and it can be assumed that there is no serious multiple covariance among the main study variables.

SAD, Family Function, FNE, and Self-Esteem Scores in Patients with Strabismus

From Table 2, we can see that the total SAD score of the strabismus patients in this study was (13.96±7.15), social avoidance score was (6.93±3.51), and social distress score was (7.03±4.12), which was at a moderate level overall, with 36.5% of the

Table 2 The Scores of SAD, APGAR, BFNES and SES of Strabismus Patients. (N=249)

Variables	Items	Score range	Score (Mean±SD)
SAD	28	0–28	13.96±7.15
Social Avoidance	14	0–14	6.93±3.51
Social Distress	14	0–14	7.03±4.12
Family function	5	0–10	6.16±2.84
Adaptation	1	0–2	1.20±0.67
Partnership	1	0–2	1.13±0.69
Growth	1	0–2	1.27±0.66
Affection	1	0–2	1.21±0.67
Resolve	1	0–2	1.35±0.63
FNE	12	12–60	40.30±8.89
Self-esteem	10	10–40	28.16±5.04

Abbreviations: SAD, Social Avoidance and Distress; FNE, Fear of negative evaluation.

patients at a low level, 41.4% at a moderate level, and 22.1% at a high level. The total family function score was 6.16 ± 2.84 , which was at an intermediate level; the FNE score was (40.30 ± 8.89) , and the Self-esteem score was (28.16 ± 5.04) .

Results of Correlation Analysis

The Family function total score was negatively correlated with the SAD total score and its dimensions ($r = -0.332$ to -0.284 , $P < 0.01$), the FNE score ($r = -0.187$, $P < 0.01$), and positively correlated with the self-esteem score ($r = 0.426$, $P < 0.01$); in addition, the self-esteem score was negatively correlated with the SAD total score and its dimensions ($r = -0.478$ to -0.429 , $P < 0.01$); FNE scores were positively correlated with SAD total scores and scores on each dimension ($r = 0.389$ to 0.485 , $P < 0.01$), see [Table 3](#).

Analysis of Intermediation Effects

Structural equation modelling was constructed using AMOS 24.0 software with family caring as the independent variable, social avoidance and distress as the dependent variable, and fear of negative appraisal and self-esteem as the

Table 3 Correlations Among Variables. (N=249)

Variables	SAD	Social Avoidance	Social Distress	Family Function	FNE	Self-Esteem
SAD	1					
Social avoidance	0.925**	1				
Social distress	0.946**	0.753**	1			
Family function	-0.327**	-0.332**	-0.284**	1		
FNE	0.471**	0.389**	0.485**	-0.187**	1	
Self-esteem	-0.478**	-0.469**	-0.429**	0.426**	-0.301**	1

Note: ** $P < 0.01$.

Abbreviations: SAD, Social Avoidance and Distress; FNE, Fear of negative evaluation.

Table 4 Fitting Indicators of the Structural Equation Model

Item	χ^2/df	GFI	NFI	TLI	AGFI	IFI	CFI	RMSEA
Fitting index	2.30	0.96	0.96	0.96	0.92	0.98	0.98	0.07
Fitting standard	<3.00	>0.90	>0.90	>0.90	>0.90	>0.90	>0.90	<0.80

Abbreviations: χ^2/df , the ratio of chi-square to degrees of freedom; GFI, goodness-of-fit index; NFI, normative fit index; TLI, Tucker-Lewis index; AGFI, Adjusted goodness-of-fit index; IFI, Incremental fit index; CFI, comparative fit index; RMSEA, root mean square error of approximation.

mediator variables. According to the results of the model fit test (see Table 4), it can be seen that the model fits well, where $\chi^2/df=2.30$, within the paradigm of 1–3, and RMSEA (root mean square of error)=0.07<0.08. In addition, the test results of the GFI, NFI, TLI, AGFI, IFI, and CFI have reached the excellent level of 0.9 or more.³²

The chain mediated effect model plot of family functioning with SAD (see Figure 2) shows that family functioning can directly and negatively predict SAD ($\beta=-0.14$, $P<0.01$). In addition family functioning also predicted FNE ($\beta=-0.19$, $P<0.01$) and self-esteem ($\beta=0.41$, $P<0.01$), while FNE predicted SAD ($\beta=-0.38$, $P<0.01$) and negatively predicted self-esteem ($\beta=-0.22$, $P<0.01$). Also, self-esteem negatively predicted SAD ($\beta=-0.33$, $P<0.01$). The mediated effects, direct effects, and corresponding effect scales are shown in Table 5, and the results show that the 95% confidence intervals of the three mediated paths did not include 0, indicating that the model of chained mediated effects of FNE and self-esteem between family functioning and SAD was valid. The ratio of the indirect effect to the total effect was $(0.072+0.135+0.042)/0.392=63.52\%$, of which the ratio of the indirect effect value of FNE was $0.072/0.392=18.37\%$; the ratio of the indirect effect of self-esteem was $0.135/0.392=34.44\%$; and the ratio of the chained mediated effect of FNE and self-esteem was $0.042/0.392 = 10.71\%$.

Discussion

SAD Status in Patients with Strabismus

Strabismus symptom burden and ocular misalignment significantly impact self-image, interpersonal relationships, partner-finding ability, and career opportunities across all age groups.³⁴ Psychosocial issues among strabismus patients are increasingly recognized in clinical practice. In this study, 36.5% of patients were categorized as low, 41.4% as medium, and 22.1% as high SAD levels, with a total SAD score of (13.96 ± 7.15) . This score was higher than that of adult vitiligo patients reported (10.30 ± 6.38) ,³⁵ and lower than that of psoriasis patients reported (15.26 ± 4.53) ,³⁶ although all groups showed comparable overall SAD scores. Differences in study population selection may explain these findings. While previous studies primarily focused on adult patients, 32.13% of participants in this study were adolescents. Adolescence is a critical period for psychological development and social relationship building, and strabismus may

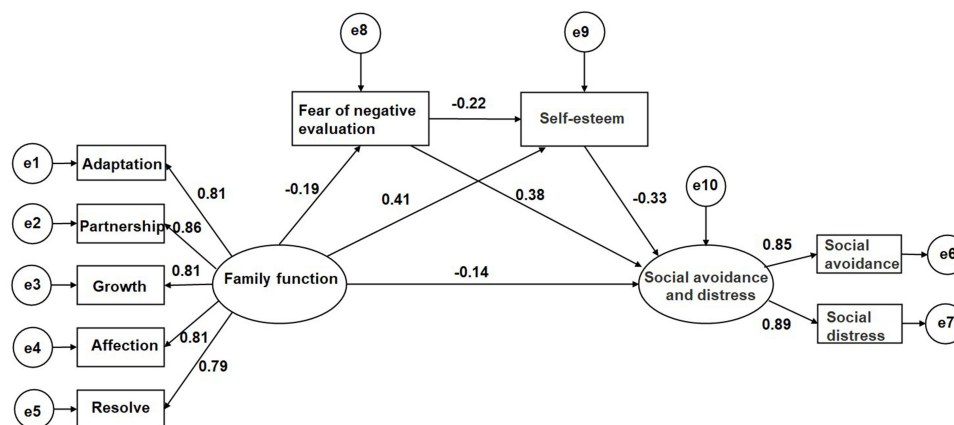


Figure 2 Fear of negative evaluation and Self-esteem as mediators in the relationship between Family function and Social avoidance and distress.

Table 5 The Bootstrap Analysis of Paths and Effects (N=249)

Effect	Path	Effect	SE	95% CI	
				Lower	Upper
Direct effect	Family function → SAD	−0.143	0.065	−0.270	−0.021
Indirect effect	Family function → FNE → SAD	−0.072	0.178	−0.829	−0.122
	Family function → Self-esteem → SAD	−0.135	0.235	−1.350	−0.424
	Family function → FNE → Self-esteem → SAD	−0.042	0.049	−0.231	−0.022
Total effect		−0.392	0.471	−3.149	−1.298

Abbreviations: SAD, Social Avoidance and Distress; FNE, Fear of negative evaluation.

significantly affect their social skills, self-esteem, and self-confidence. Moreover, the majority of adult patients developed strabismus in childhood, leading to long-term impacts on their self-image and psychosocial well-being, potentially increasing tendencies toward social avoidance and distress compared to other conditions that affect appearance. Nonetheless, 10.84% of patients had previous experience seeking surgical treatment, which, despite potential incomplete correction or recurrence, may partially alleviate persistent psychosocial impacts. Nevertheless, many patients delay surgical correction due to common misconceptions about complications, success rates, costs, and inadequate awareness among healthcare providers.³⁷ Therefore, promoting early surgery in patients requires enhanced public education, increased awareness among patients and healthcare providers, and improved health insurance policies.

Family Functioning Status in Patients with Strabismus

The family functioning score among strabismus patients aged 14–44 years in this study was 6.16 ± 2.84 , similar to that of Chinese adults with disabilities (6.86 ± 3.08),³⁸ indicating moderate family dysfunction for all participants. Qualitative interviews with strabismus patients³⁹ revealed that many refer to themselves as “disabled” and recount experiences of being teased, ridiculed, misunderstood, and ignored. Individuals with strabismus tend to be introverted, have difficulty making friends, exhibit poor emotional stability, and are prone to anxiety, depression, and pessimism. They may also be sensitive, stubborn, and headstrong. Individuals’ perceptions of family functioning depend not only on actual caregiving within the family but also on their personality traits. Thus, individuals with strabismus may perceive lower levels of family functioning compared to others.

Independent Mediating Role of FNE and Self-Esteem

The findings of this study indicate that family functioning may affect SAD in strabismus patients through the mediation of FNE. High levels of negative self-evaluation could mediate the relationship between low family functioning and SAD. These results align with Morrison,⁴⁰ who proposed that both FNE and positive appraisal fears can mediate and moderate treatment outcomes for social anxiety disorders. Intergenerational modeling suggests that the environment plays a more significant role in social anxiety compared to genetics. The family represents the patient’s immediate social environment, and the quality of family functioning significantly influences the development of an individual’s psychological traits, thereby impacting the formation of healthy personality traits and overall mental and physical well-being. Research has established a correlation between parental negative influences and the subsequent development of negative evaluative fears and social anxiety in adolescents. In essence, frequent displays of FNE by parents or adolescents may heighten susceptibility to future social anxiety symptoms within the family system.⁴¹ Individuals with strabismus frequently concern themselves with others’ perceptions of their eyes and potential ridicule or social exclusion. Meanwhile, family members encounter comparable psychosocial challenges,⁴² thereby impeding typical family dynamics. Excessive protection from family members can intensify patients’ fear of negative evaluation, leading them to avoid social situations more frequently to minimize external evaluation. In summary, fear of social devaluation in individuals with strabismus contributes to the emergence of social difficulties, exacerbated by insufficient support from family members affected by the condition. Therefore, strategies are needed to combat social prejudice against strabismus patients and enhance

their societal acceptance. Healthcare professionals should involve family members in treatment planning and foster patient-family relationships to enhance family dynamics, boost treatment confidence, and mitigate negative emotional interactions among family members.

The results indicated that self-esteem mediates the relationship between family functioning and SAD, with a mediating effect of 34.44%. Previous studies⁴³ partially support this by suggesting that greater perceived family support and closer family relationships correlate with higher patient self-esteem. Effective family functioning can mitigate perceived discrimination and prejudice, reduce stigma, and enhance self-identity, thereby facilitating positive coping strategies with the disease and life. Other research⁴⁴ suggests that self-esteem mediates the impact of family functioning on depression and anxiety symptoms in patients with inflammatory bowel disease. Additionally, Andreassen et al⁴⁵ demonstrated that enhancing patient self-esteem through eye gaze assistive technology (EGAT) promotes social functioning. However, previous studies indicate that parents of strabismus patients often struggle to establish close relationships, with some mothers experiencing heightened susceptibility to psychiatric disorders. This challenge impedes family cohesion, exacerbated by parental concerns over strabismus, negatively impacting patient quality of life.³ In summary, familial concern and support, particularly from parents, may be uneven, adding stress to strabismus patients over the chronic disease trajectory,⁴⁶ impacting self-perception and exacerbating psychosocial issues. Therefore, assisting patients in fostering a positive, nurturing family environment is crucial. Family members should patiently listen to the patient's feelings and distress, offering understanding and support. They should also educate the patient about strabismus, clarifying that it is a treatable medical condition and not their fault. Interventions may be implemented to boost self-esteem, enhancing the patient's self-awareness and self-acceptance. This helps the patient recognize their own strengths, thereby increasing self-confidence.

Chain Mediation of FNE and Self-Esteem

Our study revealed a significant pathway connecting family functioning to SAD, influenced by FNE and self-esteem. The findings indicate that FNE independently mediates and indirectly exacerbates SAD by affecting self-esteem. Particularly, FNE significantly increases the risk of heightened self-esteem in individuals with strabismus. Families constitute a crucial social structure, with members playing a pivotal role in shaping the emotional support of patients, thereby mitigating negative emotions and fostering a positive psychological outlook. A positive family atmosphere improves patient-family interactions, boosting the patient's self-worth and enhancing psychosocial well-being. Reduced family functioning in patients with strabismus increases susceptibility to its effects, heightens fear of negative feedback, and encourages over-interpretation of others' cues, potentially leading to feelings of imperfection, low self-confidence, and the development of an inferiority complex and other negative emotions. These emotions deplete self-esteem, fostering introversion and shyness,⁴⁷ thereby reducing patient self-esteem and compromising their psychological resilience, heightening sensitivity and vulnerability, and resulting in social avoidance. Thus, comprehensive psycho-cognitive interventions are needed to address FNE and low self-esteem in strabismus patients, aiming to decrease SAD levels.

Clinical Implications

This study examines how family functioning affects SAD in patients with strabismus through the psycho-cognitive lens of SOR theory. It introduces novel perspectives and ideas for clinical treatment. Treatment of strabismus should extend beyond ophthalmology to include essential psychological interventions in patient care and rehabilitation. Firstly, clinical therapists should attentively assess the patient's family environment and understand family members' perceptions and support levels regarding the patient's condition. Patients experiencing poor family functioning may benefit from targeted family support strategies,⁴⁸ such as family therapy and counseling, to educate and empower family members in supporting the patient's recovery. Secondly, in addition to providing surgical, medical institutions should consider offering professional psychological counseling and treatment alongside surgical interventions. Options include cross-diagnostic group therapies like MCT/CBT,⁴⁹ cognitive behavioral therapy,⁵⁰ positive thinking meditation interventions,⁵¹ mixed-mode positive thinking cognitive therapy (M-MBCT),⁵² and role-playing. These interventions help patients simulate social scenarios in a safe environment, gradually overcoming FNE and enhancing self-esteem, thereby promoting social functioning.

Limitations and Prospects

The current study developed a chain-mediated model linking family functioning, SAD from cognitive and psychological perspectives. This enriches theoretical research on social issues. It provides practical insights into the connections among family environment, cognitive and psychological factors, and the social status of strabismus patients. Additionally, it offers psychological guidance to enhance the social integration of these patients. However, this study still has the following limitations: firstly, the study is limited by its cross-sectional design, precluding establishment of causal relationships. Furthermore, the social and psychological issues of patients with strabismus may vary with the treatment of the disease. Longitudinal researches will be conducted to explore the changes in the levels of various variables and the alterations in their relationships at different stages before and after surgery, while also discussing these changes within subgroups based on different treatment outcomes. This study lacked a control group design and only compared the SAD and family function scores of patients with strabismus from the present research with data from historical studies. However, due to variations in study time points, such comparisons may lead to result bias, preventing an accurate and comprehensive revelation of the actual impact of strabismus on patients' lives. Secondly, this study included only strabismus patients aged 14–44 years from a hospital in Wenzhou. The sample size was limited and not representative of strabismus patients across diverse cultural backgrounds and age ranges. As a next step, we plan to conduct a multicenter study with a larger sample size to compare the psychosocial status of strabismus patients across various age groups. Lastly, the study was conducted in a tertiary care facility, potentially introducing selection bias regarding the severity of strabismus.

Conclusion

In the present study 249 patients with strabismus had a SAD score of (13.96 ± 7.15) , 36.5% had a low SAD score, 41.4% had a moderate SAD score, and 22.1% had a high SAD score; family functioning not only directly affects SAD in patients with strabismus, but also indirectly through the mediation of FNE and self-esteem. Mediation was achieved through three pathways: the independent mediating role of FNE; the independent mediating role of self-esteem; and the chain mediating role of FNE and self-esteem. These findings reveal a complex relationship between family environment, cognitive, emotional factors and social problems in people with strabismus, and for better psychosocial outcomes in people with strabismus, we suggest that families, healthcare professionals, and relevant support organizations should collaborate to provide appropriate support for people with strabismus.

Abbreviations

SAD, Social Avoidance and Distress; FNE, Fear of Negative Evaluation; S-O-R, Stimulus-Organism-Response; SEM, Structural equation modeling; χ^2/df , the ratio of chi-square to degrees of freedom; GFI, goodness-of-fit index; NFI, normative fit index; TLI, Tucker-Lewis index; AGFI, adjusted goodness-of-fit index; IFI, incremental fit index; CFI, comparative fit index; RMSEA, root mean square error of approximation.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding authors upon reasonable request.

Ethics Approval and Informed Consent

The study was approved by the Ethics Committee of the Eye Hospital of Wenzhou Medical University (approval number: 2023-115). All subjects gave informed consent to participate in this study. This study complied with the principles of the Declaration of Helsinki. All the study participants and the families of the minor patients gave informed consent to take part in this study.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no competing interests in this work.

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