

RESEARCH ARTICLE

Influence of family function on social anxiety among Chinese nursing students: The mediating role of alexithymia

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Abstract

Aims: This study aims to explore the relationship between family function, alexithymia and social anxiety among Chinese nursing students, especially to determine whether alexithymia acts as a mediator between family function and social anxiety among this social group.

Design: A cross-sectional study.

Methods: From January to March 2021, a cross-sectional study was conducted among 204 Chinese nursing students at a nursing school of a medical university in the Northeastern Region of China. The interaction anxiousness scale, APGAR family function scale and Tronto alexithymia scale were used for measurement of social anxiety, perceived family function and alexithymia respectively. The data were subjected to correlation analysis, multiple linear regression and structural equation modelling (SEM).

Results: Results indicated that social anxiety score was negatively correlated with perceived family function ($r = -.232$), but positively with alexithymia ($r = .307$). After controlling for demographic variables, family function and alexithymia could explain 14.5% of the total variance in social anxiety. The SEM results suggested that the effect of family function on social anxiety was partially mediated by alexithymia with a 36.9% mediating effect.

Conclusions: This study reveals that alexithymia might partially mediate the impact of family function and social anxiety in Chinese nursing students. In this sense, improvement of alexithymia is expected to be an effective strategy to ameliorate the severity social anxiety in Chinese nursing students, especially for those with a dysfunctional family context.

KEYWORDS

alexithymia, family function, nursing students, social anxiety

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1 | INTRODUCTION

Social anxiety, defined as “anxiety resulting from the prospect or presence of personal evaluation in real or imagined social situations” (Schlenker & Leary, 1982), is an important predictor of poor-quality personal relationships, and would potentially produce a significant impact on individual health level, both physically and mentally (Gao et al., 2016). This negative psychological status seriously impairs interpersonal communication and social function of suffered individuals, affecting their performance in daily life, at work or at school (Cheok & Proeve, 2019). Nowadays clinical setting is becoming increasingly complicated, unpredictable and changeable, which requires higher problem-solving ability, better communication skills and better interpersonal relationships (Lau, 2014). Individuals with social anxiety are more likely to experience interpersonal impairment and suffer from poor role functioning (Yin et al., 2020). Mental health concerns such as depression, anxiety and distress are highly reported among nursing students worldwide. However, few studies have investigated the social anxiety status among nursing students as yet. Therefore, identifying particular sociopsychological factors that trigger social anxiety would not only help understand the mechanism underlie this disorder, but also inform effective intervention strategies to alleviate anxiety level among sufferers. This would in turn potentially lead to the interpersonal improvement of nursing students, rendering them more qualified to cope with the highly unpredictable clinical setting after they become practicing nurses.

Recent years have seen a major research paradigm shift from analysis of individual internalizing problems to the influence of social context when exploring the psychological conditions of its members. In line with this, analysis of family function has received great interest in the field of mental abnormality of adolescent students (González et al., 2019). Family function refers to the degree to which a family as a unit addresses conditions, activities, external stimuli or events causing stress (Huang et al., 2021). It also refers to the perceived care and support of a member from his own family (Smilkstein, 1978). Many studies have shown that perceived family function has a remarkable bearing on the individual's behavioural and psychological abnormalities, such as depression, loneliness, suicide and poor quality of life (Cao et al., 2019; Jia et al., 2021; Li et al., 2021a; Pereira-Morales et al., 2017; Sun et al., 2009). Accumulating evidence shows that family functionality is closely related to mental health symptoms. For example, a recent study undertaken in Spain demonstrated that family dysfunctionality correlated with depression, anxiety and stress among college students (Caravaca-Sánchez et al., 2021). In another study, stronger family support is also conducive to mental health level of the Chinese pregnant women (Ngai & Ngu, 2013). These findings indicate that family functionality plays a potentially important and protective role against mental health vulnerabilities. In compatible with this, having a functional family predicts better health-related quality of life (HRQoL) mental component score in older adults and type 2 diabetic patients (Andrade et al., 2020; Jia et al., 2021). In addition, according to family systems theory, the stability, harmony and health of the

whole family system have a critical bearing on the psychological and emotional development of offsprings via the interactions of family function (Peng et al., 2021). In this regard, it is unquestionably of importance to explore psychological distress in students from the analysis of their family environment. However, presently limited studies have focused on the relationship between family function and social anxiety, especially among the group of Chinese nursing students.

In addition to social anxiety, poor family function also may provoke alexithymia in the affected individuals. Alexithymia is an unfavourable and stable personality trait characterized by difficulties in identifying and describing conscious feelings of oneself and others, distinguishing the bodily sensations arising out of emotional arousal from feeling, imagination deficit and externally oriented thinking (Hemming et al., 2021). The attachment theory is a commonly used theoretical framework for explaining the role of parental attachment in the development of emotion regulation capacities, as well as mental health status. According to attachment theory, early relationships with key figures are critical for shaping of certain attachment style, as expressed as certain modes of internal operational model for interpersonal communication, as well as emotional and behavioural regulation in specific social context (Lyvers et al., 2019; Mikulincer & Shaver, 2019). This early established attachment style is constant and stable and sustained in adulthood, affecting self-emotion and -behaviour regulation process (Zdankiewicz-Ścigata & Ścigata, 2018). An insecure attachment tend to increase the risk of the dysregulation of emotion processing, or alexithymia, and correspondingly of diverse deficits in mental health and social behaviours (Lyvers et al., 2019; Sechi et al., 2020).

Many reports have confirmed the close correlation between family function and alexithymia. For example, existing literatures support the possible association between family atmosphere and alexithymic tendencies. Studies have shown that the childhood family environment has an impact on the development of alexithymia, with family variables found predictive of either global alexithymic scores or individual component of alexithymia (Kench & Irwin, 2000). In addition, mounting evidence shows that insecure attachment is closely related to alexithymia (Romeo et al., 2020). Numerous studies show that alexithymia also has a significant positive correlation with multiple psychiatric disorders. Individuals with alexithymia tend to experience negative psychiatric or behaviour processes, such as learning/job burnout, increased psychological inflexibility, violence, post-traumatic stress disorder, etc (Edwards & Lowe, 2021; Hemming et al., 2021; Ledermann et al., 2020; Zhang, Bai, et al., 2021; Zhang, Li, et al., 2021). The close relationship between alexithymia and negative psychiatric processes might be interpreted by “alexithymia-stress hypothesis” proposed as early as 1985, which suggests that alexithymic individuals tend to evaluate the ambient environment in a negative and exaggerated manner due to their disability in properly describing emotion, which would disturb their assessment regarding challenges and threats and eventually become a vulnerability factor for various stressful conditions (de Timary et al., 2008; Huang et al., 2022; Martin & Pihl, 1985).

Based on the analyses above and mediation effect theory, where the independent variable must have a significant effect on dependent

variable and mediating variables, and mediating variable significantly affects the dependent variable, we hypothesized that among Chinese nursing students, family function was negatively related to interaction anxiousness and their correlation was mediated by alexithymia. This hypothesized interaction model is presented in Figure 1. This study herein thus was designed for confirmation this hypothesis using the structural equation modelling method. This study may hopefully further reveal the aetiopathogenetic mechanisms of interaction anxiousness among Chinese nursing students, and correspondingly inform effective and well-directed intervention on this psychological vulnerability.

2 | METHODS

2.1 | Participants and design

A cross-sectional study was conducted among undergraduate nursing students at a nursing school of a medical university in the Northeastern Region of China from January to March 2021. This survey was approved by the ethical review board of Jinzhou Medical University. The sample size was predetermined according to Kendall's principle, where the sample size should reach to 5- to 10-fold the number of variables (Hou et al., 2022). The present study contained a total of 12 variables and thus the estimated minimum sample size was 60. Given the potential sample loss and the minimum sample size requirement of 200 in structural equation modelling analysis, 204 nursing students aged 18–25 years were included in this survey via convenience sampling. Before data collection, all participants were told to complete the questionnaires voluntarily and anonymously and gave their informed consent. They were also informed to have the right to withdraw from this survey at any time for any reason.

2.2 | Measures

2.2.1 | General information

This questionnaire was designed by the investigator. Participants' age (in years), sex (male and female) and grade (first, second, third and fourth academic year) were collected by self-report.

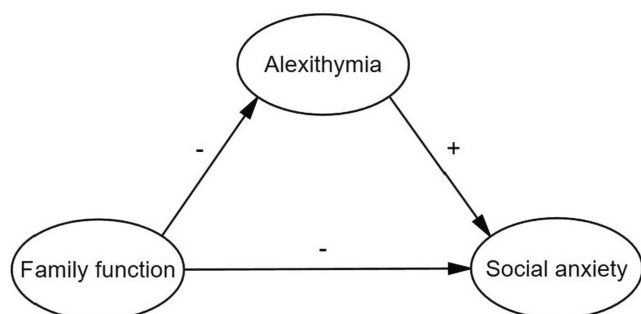


FIGURE 1 The hypothesized theoretical model.

2.2.2 | Social anxiety

Social anxiety level of nursing students was evaluated by the interaction anxiousness scale (IAS) from previous studies (Cao et al., 2016). The IAS exhibits good test-retest and internal reliability, and construct and criterion-related validity and is more suitable than other measures to measure subjective social anxiousness tendency (Leary & Kowalski, 1993). It consists of 15 items, each of which is rated from 1 to 5. The total score ranges from 15 to 75, with higher scale total score indicating more severe dispositional social anxiety. The participants with IAS ≥ 50 can be considered socially anxious as demonstrated previously in Chinese undergraduates (Cao et al., 2016). The Cronbach's α coefficient of internal consistency of the scale was 0.835 in this study.

2.2.3 | Family function

The family APGAR scale was used to assess an individual's satisfaction with their perceived family function. This scale was initially designed by Smilkstein in 1978 and contained five dimensions: adaptability, partnership, growth, affection and resolve (Smilkstein, 1978). A three-point scoring ranging from 0 (hardly ever) to 2 (almost always) was used for all the items, with the total score ranging from 0 to 10. Higher APGAR score represents better the family function. The family would be considered highly functional if the APGAR total score is between 7–10, moderately dysfunctional between 4–6 and severely dysfunctional between 0–3 (Smilkstein, 1978). The APGAR scale has been widely used in China, with satisfactory reliability and validity (Zhao et al., 2021). In this study, the Cronbach's α coefficient of the scale was 0.915.

2.2.4 | Alexithymia

The Tronto alexithymia scale (TAS-20) was used in this study to assess the severity of alexithymia. Cross-cultural psychometric validation showed that the TAS-20 had adequate reliability and validity in Chinese sample of adolescents, undergraduate students and clinical patients (Ling et al., 2016; Zhu et al., 2007). The scale consists of 20 items of three dimensions: difficulty identifying emotions and distinguishing them from the bodily sensations of emotions (DIF, 7 items); difficulty describing feeling to others (DDF, 5 items); an externally oriented cognitive style of thinking (EOT, 8 items). Each item is rated on a Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with five items negatively keyed (Zhu et al., 2007). The scale total scores ranged from 20 to 100, with higher scores indicating more severe alexithymia symptoms. As per the cutoff scores as determined previously (Liu et al., 2021), the respondents would be considered to have high alexithymia if they got a total score ≥ 61 points, or possible alexithymia when the total scores range from 52 to 60, or no alexithymia when the total scores ≤ 51 points. In the present study, the

Cronbach's α coefficient of internal consistency of the scale was 0.846.

2.3 | Statistical analysis

Data analysis was performed with SPSS version 20.0 (IBM Corporation, Armonk, NY, USA) and AMOS version 22.0 (IBM Corporation, Armonk, NY, USA). Descriptive statistics with normal distribution were expressed by mean \pm standard deviation (Mean \pm SD). Pearson correlation analysis was used to examine the correlation among social anxiety, family function and alexithymia. Multiple linear regression was conducted with the total score of social anxiety as the dependent variable, family function and alexithymia as the independent variables, and demographic characteristics as the control variable. Thus, Model 1 was established by social anxiety as the dependent variable, and demographic characteristics as the independent variable. Model 2 was established by social anxiety as the dependent variable, and demographic characteristics and family function as the independent variable. Model 3 was established by social anxiety as the dependent variable, and demographic characteristics, alexithymia and family function as the independent variables. A structural equation modelling approach with the bootstrap method (2000 replicates) was conducted to test the mediation role of alexithymia between family function and social anxiety using AMOS version 22.0. The model fit index should meet the following criteria: chi-square fit statistics/degree of freedom (CMIN/DF) $<$ 5.0, the goodness of fit index (GFI) $>$ 0.90, adjusted goodness of fit index (AGFI) $>$ 0.90, root mean square error of approximation (RMSEA) $<$ 0.08, confirmatory fit index (CFI) $>$ 0.90 and parsimony goodness-of-fit index (PGFI) $>$ 0.50. It was considered statistically significant when a two-tailed probability value was less than 0.05.

2.4 | Ethical statement

This study was performed in accordance with the ethical standards of Declaration of Helsinki and its later amendments, and reviewed and approved by the ethical review board of Jinzhou Medical University, China. All participants volunteered to participate in the study and gave their informed consent before data collection. This survey was conducted anonymously to ensure full protection of individual privacy of the respondents.

3 | RESULTS

3.1 | Sociodemographic characteristics

A total of 204 participants were included in this study, with their sociodemographic details displayed in Table 1. The vast majority (94.6%) of the participants were female. The age of the participants

TABLE 1 Demographic characteristics of the study sample ($n = 204$)

Age, years (M \pm SD)	21.09 \pm 1.99
Grade (N, %)	
First year	(95, 46.6)
Second year	(45, 22.0)
Third year	(35, 17.2)
Fourth year	(29, 14.2)
Sex (N, %)	
Male	(11, 5.4)
Female	(193, 94.6)

Abbreviations: M, mean; SD, standard deviation.

ranged from 18 to 25 years, with their mean age being 21.09 years (standard deviation 1.99). 46.6%, 22.0%, 17.2% and 14.2% of the nursing students were in their first, second, third and fourth academic year respectively.

3.2 | Category and distribution of social anxiety, family function and alexithymia

Based on the well-established cut-off scores of APGAR scale, TAS-20 and IAS, the score of each scale was categorized into different categories. As shown in Table 2, of the 204 participants, 30 (14.7%) were from severely dysfunctional families; 65 (31.9%) were highly alexithymia; 74 (36.3%) had social anxiety disorders.

3.3 | Correlation analyses

Table 3 shows the participants' total and subscale scores of social anxiety, family function and alexithymia and the correlations between these variables. The results revealed that the scores of social anxiety were significantly negatively related to family function ($r = -.232, p < .01$), and positively related to alexithymia scores ($r = .307, p < .01$). All the dimensions of family function were significantly correlated with social anxiety scores, with the highest correlation at partnership ($r = -.231, p < .01$), and the least at adaptability ($r = -.169, p < .05$). As for alexithymia, social anxiety score showed a significant positive correlation with DDF ($r = .344, p < .01$) and DIF ($r = .330, p < .01$). No significant correlation was found between social anxiety and EOT dimension of alexithymia. In addition, a significantly negative correlation between family function and alexithymia ($r = -.262, p < .01$) was also seen in this study.

3.3.1 | Multiple regression analysis

A thrice repeated multiple linear regression analysis was used to explore the potential predictor effect of family function and

TABLE 2 Category and distribution of social anxiety, family function and alexithymia

Variables	Category	N	%
Family function	Highly functional (7–10)	80	39.2
	Moderately dysfunctional (4–6)	94	46.1
	Severely dysfunctional (0–3)	30	14.7
Alexithymia	Highly alexithymic (≥ 61)	65	31.9
	Moderately alexithymic (52–60)	63	30.9
	Lowly alexithymic (≤ 51)	76	37.2
Social anxiety	Absence of social anxiety (< 50)	130	63.7
	Presence of social anxiety (≥ 50)	74	36.3

alexithymia on social anxiety among Chinese nursing students and the results are shown in Table 4. In the end, data in the final model 3 showed that both alexithymia, mainly its two subscales DDF and EOT, and family function were significantly related to social anxiety. These independent variables explained 14.5% of the total variance of social anxiety ($F = 5.934, p < .001$).

3.4 | Structural equation modelling

In order to determine the synthetic relationship between family function, alexithymia and social anxiety, a SEM was constructed. As shown in Table 5, the modified goodness of fit indexes, including CMIN/DF, RMSEA, GFI, AGFI, PGFI and CFI showed that the model fit the data well. By taking social anxiety as a dependent variable, family function as an independent variable and alexithymia as a mediating variable, the three-factor loading parameters (0.42–0.91) in alexithymia matrix and five-factor loading parameters (0.75–0.88) in family function matrix were all statistically significant (all $p < .001$). The SEM explained 7% of the variance in alexithymia and 16% of that in social anxiety as reflected by the estimated squared multiple correlations of these two endogenous latent variables (Figure 2). As shown in Table 6, the standardized point estimates of the total, direct and indirect effects of family function on social anxiety with alexithymia as a mediator were -0.241 , -0.152 and -0.089 respectively. The bootstrapped 95% confidence interval (CI) for total effect, direct effect and indirect effects do not include 0, suggesting a partial mediating effect of alexithymia between family function and social anxiety. In this study, the mediating effect accounted for 36.9% of the total effect ($-0.089/-0.241$).

4 | DISCUSSION

Social anxiety is a common and persistent mental aberration, which produces deep anguish and restlessness in the affected individuals and severely undermines their social and scholastic functioning (Cejudo et al., 2018; Scaini et al., 2016). It is estimated that the prevalence of this disorder ranges from 5%–10% among children and adolescents (Jones et al., 2014). Social anxiety has been shown

critically associated with varied psychopathological conditions including loneliness, dysphoria and poor interpersonal relationships with peers (Cejudo et al., 2018). Adolescent students with social anxiety tend to present avoidance behaviours in confronted with school work and socio-school inadaptation (Ranta et al., 2009). Thus, understanding the psychosocial mechanisms of this mental torture is of utmost importance for development of interventions accordingly. In spite of that, so far few studies have examined the social anxiety level in nursing student sample, although existing literatures have shown a high prevalence of mental disorder in this population globally. In the present study, we found that up to 36.3% Chinese nursing students had social anxiety, indicating that this mood abnormality might have achieved to a worrying level in Chinese nursing students. Notably, the present study was conducted during the COVID-19 pandemic, which might be one of the underlying causes for this high occurrence of social anxiety (Ali et al., 2022). Furthermore, existing studies reveal that nursing students seem more likely to experience stressors during pandemics and correspondingly present an increased incidence of anxiety when compared to general adults or students (Bai et al., 2021). In line with this, an Israeli study conducted among 244 nursing students showed that the prevalence of moderate and severe anxiety was 42.8% and 13.1% during the COVID-19 respectively (Savitsky et al., 2020). In addition, compared with other age groups, younger individuals experience more exposure to kinds of social media, which triggers the increase in anxiety prevalence due to the complexity to interpret and process the social media information (Lin et al., 2020). A recent study conducted among 8,079 general Chinese students with the age ranging from 12 to 18 years showed a 37.4% prevalence of anxiety during the pandemic (Zhou et al., 2020). In contrast, a Spanish study revealed that most individuals over 60 years of age reported no anxiety, even if at the time of COVID-19 outbreak (Picaza Gorrochategi et al., 2020). Thus, the necessity for early recognition and intervention of social anxiety should be highlighted among the group of adolescence, especially Chinese nursing students. Further our data revealed social anxiety was directly or indirectly influenced by family function and alexithymia. However, we failed to find a significant correlation between sociodemographic factors (sex, age and grade) and social anxiety level.

Family, like a harbour, provides continuous power, comfort and support to its members. A sound family function is also conducive to development and maintenance of the mental health status of the family members. For example, a recent study showed that dissatisfied family function triggered increased occurrence of loneliness among Chinese secondary vocational school students (Yun et al., 2021). In addition, it also revealed that nursing students in the probation period with well-functioning families exhibited a more positive occupational attitude towards nursing work (Li et al., 2021b). Consistently, a Chinese study among baccalaureate nursing students in Hong Kong showed that a relationship crisis with family led to a 3.1-fold increase in depression among this population (Cheung et al., 2016). Nowadays, individuals are constrained by ongoing COVID-19 to spend more time at home, which, together with increased social isolation due to pandemic restrictions makes it

TABLE 3 Correlation analysis for the relationship between social anxiety, family function and alexithymia

Variables	1	2	3	4	5	6	7	8	9	10	11
1 Social anxiety	-										
2 Family function	-0.232**	-									
3 Adaptability	-0.169*	0.818***	-								
4 Partnership	-0.231**	0.877***	0.698**	-							
5 Growth	-0.201**	0.856***	0.597**	0.671**	-						
6 Affection	-0.226**	0.873***	0.600**	0.707**	0.699***	-					
7 Resolve	-0.175*	0.897***	0.656**	0.722**	0.735**	0.753**	-				
8 Alexithymia	0.307**	-0.262**	-0.222**	-0.312**	-0.206**	-0.208**	-0.188**	-			
9 DIF	0.330**	-0.238**	-0.194**	-0.273**	-0.188**	-0.188**	-0.190**	0.938**	-		
10 DDF	0.344**	-0.221**	-0.190**	-0.270**	-0.192**	-0.166**	-0.142**	0.880**	0.797**	-	
11 EOT	0.032	-0.191**	-0.176**	-0.241**	-0.131**	-0.164**	-0.117**	0.633**	0.391**	0.370**	-
Mean	46.67	6.08	1.22	1.19	1.27	1.17	1.23	55.15	19.34	14.02	21.79
Standard deviation	8.38	2.86	0.64	0.65	0.65	0.68	0.69	10.25	5.86	3.24	3.00

Abbreviations: DDF, difficulty describing feeling to others; DIF, difficulty identifying emotions and distinguishing them from the bodily sensations of emotions; EOT, an externally oriented cognitive style of thinking.

* $p < .05$; ** $p < .01$.

Variables	Model 1		Model 2		Model 3	
	t	p	t	p	t	p
Sociodemographic variables						
Sex	0.859	.391	0.786	.433	1.235	.218
Age	0.184	.854	-0.097	.923	0.003	.998
Grade	0.212	.832	0.059	.953	0.299	.765
Family function			-3.325	.001	-2.357	.019
Alexithymia						
DIF					1.555	.122
DCF					2.125	.035
EOT					-2.027	.044
F value	0.310		3.009		5.934	
p value	.818		.019		.000	
Adjusted R ²	-0.010		0.038		0.145	

TABLE 4 Multiple linear regression analysis for the relationship between Social anxiety, family function and alexithymia

Abbreviations: DDF, difficulty describing feeling to others; DIF, difficulty identifying emotions and distinguishing them from the bodily sensations of emotions; EOT, an externally oriented cognitive style of thinking.

TABLE 5 Goodness-of-fit indices of the measurement model

CMIN/DF	RMSEA	GFI	AGFI	PGFI	CFI
1.402	0.045	0.963	0.933	0.535	0.990

particularly important to explore the influence of family function on family members' mental disorders.

In terms of the correlation between family function and social anxiety among Chinese nursing students, all dimensions of family function exhibited significant negative correlation with social anxiety. In agreement with this, results of multiple regression analysis model 2 showed that family function had a significant and independent bearing on social anxiety after control of demographical variables. This finding is partially supported by previous reports that decreased family function increased the severity of social anxiety through impairing the self-esteem level of adolescents (Yen et al., 2013), and that negative parenting practices would render offspring become more sensitive to stressors, thereby triggering social anxiety symptoms (Belsky & Pluess, 2009; Lipscomb et al., 2018). A recent study also suggested that compared with external form of family (family structure), the internal quality of role (family function) might be more crucial to Chinese residents' mental health (Cheng et al., 2017). Our work here showed that up to 14.7% of participants perceived their families as severely dysfunctional. Given the close association between family function and social anxiety, it is suggested that improvement of family function should be considered as a priority strategy to decrease social anxiety level of Chinese nursing students.

After alexithymia variables were added in model 3, it was found that DDF and EOT were independently associated with social anxiety. Furthermore, SEM analysis revealed that the relationship between family function and social anxiety was partially mediated by

alexithymia. Thus, family dysfunction could increase alexithymia, thereby leading to an increased probability of social anxiety disorder among nursing students, which was consistent with our theoretical model. This finding would help deepen the understanding of the mechanisms of social anxiety among Chinese nursing students and accordingly, would provide more scientific and effective intervention strategy to ameliorate the severity of mental problems, such as social anxiety, among Chinese nursing students. The negative effect of family function on alexithymia has been documented in some previous studies (Kench & Irwin, 2000; Lumley et al., 1996; Romeo et al., 2020). Parental attachment plays a pivotal role in shaping emotion regulation capacities and affects the development of youth's internal working models, which involve the representation of the dyadic relationship and ways of interaction between the self and the others. A secure attachment is conducive for the development of flexible and adaptive emotion regulation capacities via its influence on emotion regulation neural circuits, medial prefrontal cortex and the amygdala. A deficiency of these neural circuits has been documented in alexithymic individuals (Mancinelli et al., 2021; van der Velde et al., 2013).

Alexithymia has been reported to be a major risk factor for depression, anxiety, medical and psychiatric disorders and lower quality of life (Gao et al., 2018; Zhang et al., 2014). In compatible with these findings, our data show that alexithymia might also produce an unfavourable influence on nursing students' social anxiety. Alexithymia might exert its impact on social anxiety via multifaceted mechanisms based on existing literature. Alexithymic individuals lose the ability to identify and express the emotions of their own and others and tend to adopt maladaptive suppression strategies, resulting in impairment in the ability to empathize, interpersonal relationship impairment and kinds of psychological distress (Chen et al., 2011; Nicolò et al., 2011). Previously, a negative and

FIGURE 2 The structural equation model regarding the influence of family function on social anxiety through alexithymia. Data are standardized regression coefficients. DDF, difficulty describing feeling to others; DIF, difficulty identifying emotions and distinguishing them from the bodily sensations of emotions; EOT, an externally oriented cognitive style of thinking; e1-e8, the measurement error of each observed variable to estimate latent variables; e9-e10, the residual that affect the endogenous latent variables except the exogenous variables.

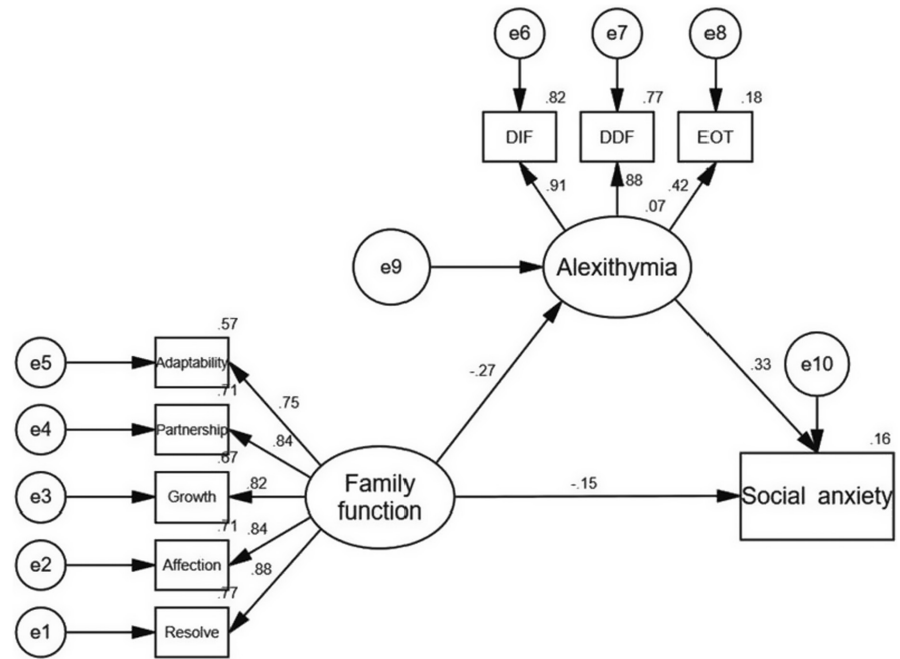


TABLE 6 Results for the total, indirect and direct effects of family function on social anxiety with alexithymia as a mediator

Effect	Point estimate	SE	Bias-corrected 95% CI		Percentile 95% CI	
			Lower	Upper	Lower	Upper
Total effect	-0.241	0.075	-0.383	-0.092	-0.381	-0.090
Direct effect	-0.152	0.076	-0.308	-0.003	-0.303	-0.002
Indirect effect	-0.089	0.033	-0.169	-0.034	-0.159	-0.029

Abbreviations: CI, confidence interval; SE, standard error.

moderate correlation between the levels of alexithymia and communication skills has been reported among Turkish nursing students sample (Sancar & Aktas, 2019). In other cohorts of nursing students, alexithymia was found to be correlated positively with professional burnout, depression, emotional exhaustion, depersonalization and health anxiety (Bratis et al., 2009; Katsifaraki & Tucker, 2013; Zhang et al., 2014). In addition, alexithymia might also provoke influence on stress-related disorders via certain biological mechanisms, including increased baseline cortisol level and resultant poor resistance to stress (de Timary et al., 2008). The data in the present work, in combination with those from literatures, suggest that alexithymia intervention presumably would help decrease mental health in the affected individuals. Previously, expressive writing was suggested as a potentially effective strategy for health anxiety improvement (Harris, 2006; Zhang et al., 2014), whether this strategy also applies to individuals with social anxiety warrants future exploration. Unexpectedly, our data showed that as high as 31.9% of participants were severely alexithymia, which is much higher than that previously reported in the general population (10%) (Zhang et al., 2014). Although the reason for this high incidence of this mental disorder in Chinese nursing students remains unclear, aberrantly increased prevalence of alexithymia in adolescents with depressive symptoms from 26.75% before to 76.45% after the COVID-19 outbreak, as reported

recently implies that the ongoing COVID-19 pandemic might be a potentially critical risk factor (Wang et al., 2021). In actual fact, alexithymia is a cumulative process and may be enhanced following negative life events due to the disruption of normal emotions (Berenbaum, 1996; Joukamaa et al., 2008). In compatible with this, a Turkish study conducted at the time of COVID-19 pandemic showed that the prevalence of alexithymia in nursing students was 46.03% (İlter & Ovayolu, 2022), even higher than our reported incidence of 31.9%. Besides, increased social media usage may be an alternative risk factor for alexithymia among nursing students (İlter & Ovayolu, 2022; Mersin & İbrahimoglu, 2020). The high prevalence of alexithymia suggests that it signifies to timely identify and improve alexithymic status of Chinese nursing students so as to decrease their social anxiety.

4.1 | Limitation and prospects

This study was aimed at clarifying the influence mechanism of family function and alexithymia on social anxiety. Although the current work manages to provide an innovative solution to social anxiety concerns among Chinese nursing students via examination of the hypothesized structural modelling between family function, alexithymia and social anxiety, several limitations still should be taken

into account. First, the subject origin in this study was confined to a local medical university with a relatively small sample size, and thus the representativeness of the sample may be inadequate. In order to generalize our findings, future researches should include larger sample size and fairly representative nursing student population. Second, due to the cross-sectional design, any causal inferences cannot be rendered in the findings. Future longitudinal study is needed for confirmation our arguments. Third, only 16% of the variance in social anxiety was explained by our process model, future studies should examine additional social context factors to better understand the influence of psychosocial variables on social anxiety among Chinese nursing students.

5 | CONCLUSIONS

In conclusion, this study showed that family function might have a significant bearing on social anxiety among Chinese nursing students through the mediator alexithymia. Improvement of alexithymia is expected to be an effective strategy to ameliorate the severity social anxiety in Chinese nursing students, especially for those with a dysfunctional family context. In spite of that, additional longitudinal research is warranted to confirm these findings and more psychosocial factors should be included for exploration of mechanisms of social anxiety disorder among nursing students.

AUTHOR CONTRIBUTIONS

YC, YZ, DY, SW, CL, XW and HD conceived and designed the study. YC, DY and XW collected data. YC, YZ, SW and CL were involved in analysis and interpretation of data. YC and HD wrote the paper. All authors read and approved the final submitted version.

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (<http://www.icmje.org/recommendations/>)]:

- substantial contributions to conception and design, acquisition of data or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The raw data set used to support the findings of the present study is available from the corresponding author upon request.

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