



Understanding the role of social anxiety in the relationship between peer rejection and sleep quality

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ABSTRACT

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Sleep is vital for children's development, yet many primary school students suffer from poor sleep quality. This study explores whether social anxiety mediates the relationship between peer rejection and sleep quality in elementary school children. A sample of 439 students from Jiangsu Province, China, completed the peer rejection scale, self-rating scale of sleep, and the social anxiety scale for children. Data were analyzed using the bootstrap method with standardized questionnaires assessing sleep quality, peer rejection, and social anxiety levels. The findings revealed that peer rejection was significantly associated with poorer sleep quality and increased social anxiety. Moreover, social anxiety partially mediated the relationship between peer rejection and sleep quality. Children who experienced peer rejection reported higher levels of social anxiety, which in turn predicted greater sleep problems. These results indicate that peer rejection may indirectly impact sleep through its influence on emotional well-being. The study underscores the importance of addressing both peer relationships and emotional health in school settings. Creating a more inclusive peer environment and supporting students with social anxiety could improve sleep quality and overall well-being. Educational and psychological interventions targeting social skills and anxiety management may be effective in promoting healthier sleep patterns during this critical developmental period. This research contributes to a better understanding of the psychological pathways linking social experiences to sleep quality and highlights the need for early interventions aimed at improving both interpersonal and emotional functioning among primary school children.

Contribution/Originality: This study contributes to the existing literature by examining the mediating role of social anxiety between peer rejection and sleep quality among primary school students. It is one of the few studies investigating this relationship in China, providing empirical evidence and offering the first logical analysis within this developmental context.

1. INTRODUCTION

1.1. Sleep Quality Issues

Sleep is a crucial part of human life and an essential condition for the growth and development of children and adolescents. Many important physiological functions and brain activities occur during sleep (Barone & Chokroverty, 2017; João, De Jesus, Carmo, & Pinto, 2018; Liu et al., 2020; Wang et al., 2017) adequate and high-quality sleep is

significantly benefits for children and adolescents in terms of their physical and neurological development of brain (Danker-Hopfe, 2011; Mason, Lokhandwala, Riggins, & Spencer, 2021). So that it plays a key role in ensuring their healthy growth, learning, and daily functioning (Qin, Chen, Luo, & Chen, 2022). The National Sleep Foundation (NSF) suggests that the recommended daily sleep duration for children aged 6-13 years is 9-11 hours (Hirshkowitz et al., 2015; Sundell & Angelhoff, 2021). Insufficient sleep and poor sleep quality can affect children's brain development, reduce their growth hormone production, and lead to a range of cognitive, emotional, and social dysfunctions (Lyu et al., 2024; Norell-Clarke & Hagquist, 2017; Wang et al., 2024).

Students are more likely to experience mental health problems from poor sleep than the general population (Agathão, Lopes, Cunha, & Sichieri, 2020; Kaneita et al., 2009). Especially in Asian countries, children are sleeping nearly 1 hour less than the NSF-recommended amount of sleep per night (Lyu et al., 2024; Matricciani, Olds, & Petkov, 2012) found that primary school students in China suffer from severe sleep deprivation, with 28% getting less than 8 hours of sleep on weekdays and 19% going to bed later than recommended. In addition to insufficient sleep, deterioration in the quality of sleep is also a problem encountered by children and adolescents. A Meta-analysis of the reported rate of sleep disorders in Chinese children by Wu and Huang (2015) found that more than thirty percent (35.1%) of primary school students in China had sleep disorders. Difficulty in falling asleep, inability to sleep soundly, snoring, teeth grinding, and sleep talking are very common, and the overall sleep situation of primary school students is worrying.

To further understand the factors affecting the sleep quality of primary school students and to discuss the causes of their sleep problems, scholars have conducted extensive research on the relationship between sleep quality and students' age, physical condition, psychological and psychiatric factors, stressful events, medication or food factors, and environmental factors. These studies confirm that the sleep quality of students is influenced by a combination of internal individual factors and external socio-environmental factors (Liu & Gao, 2021).

However, most current research focuses on discussing school hours (Appleman, Gilbert, & Au, 2015; Gupta et al., 2008; Meltzer, Wahlstrom, Plog, & Strand, 2021) academic stress and performance (Crowley, Wolfson, Tarokh, & Carskadon, 2018; Rayyan et al., 2020; Stormark, Fosse, Pallesen, & Hysing, 2019; Zhang et al., 2022; Zhou, 2021) family environment and living habits (Lang et al., 2013; Sun, Zhang, Zhou, Zhou, & Luo, 2021; Wang & Sun, 2021; Wen, Xie, Wang, & Wang, 2023; Yuan et al., 2017) use of mobile phones or other electronic devices (Cheraghi, Bozorgmehr, Tapak, & Tehrani, 2021; Mullins et al., 2017; Ramer, Santiago-Rodríguez, Vukits, & Bustamante, 2022; Zhang et al., 2022; Zhou, 2021) etc. But relatively little research has been done on interpersonal relationships on campus, particularly peer relationships, and the psychological mechanisms by which they affect sleep. As primary school students spend the majority of their time in school, interpersonal interactions between peers on campus are a daily and unavoidable occurrence. Although previous research has tested and validated the mechanisms of association between bullying and sleep problems in schools (He et al., 2022) the importance of this issue has not been discussed in the wider context of peer relationships, and there is still a lack of evidence to support the quality of peer relationships and the mechanisms of the relationship between psychological problems and sleep quality. Based on this, this study intends to investigate the effects of the external factor peer rejection and the internal factor social anxiety on the sleep quality of primary school students and their internal mechanisms, and proposes the first research hypothesis that there is a positive correlation between these three variables.

1.2. Peer Rejection

Peer relationships are one of the main sources of social support for children and adolescents. Being accepted and welcomed by peers is an essential task for children to build friendships and learn to integrate into society, which can help them achieve proper emotional, cognitive, and social development (Monjas, Martínez, & Casares, 2014). In contrast, being rejected by peers is a stressful and painful experience that distorts self-perception and negatively affects cognition, emotion, behaviour, and physiology (Nergaard, 2020; Reinhard, Konrath, & Lopez, 2020).

Primary school students' interactions with their peers in the school environment are the embryonic form of social interaction and a means of acquiring social skills. If they are excluded or rejected by their peers at this stage, students' individual needs for belonging and relationships are hindered, and they are gradually marginalized by other members of their group (Du & Xia, 2008) which, in turn, largely induces antisocial intentions and behaviors (Twenge, Baumeister, Tice, & Stucke, 2001) as well as negative emotions such as anger, feelings of humiliation, and feelings of helplessness (Chow, Ruhl, & Buhrmester, 2008; Gazelle & Druhen, 2009; Lee & Shrum, 2012) and even lead to various somatic reactions (Allen, French, Dumani, & Shockley, 2015). Sleep is one of those easily affected (Dahl & Lewin, 2002; Doane & Thurston, 2014) but is underappreciated and understudied (De Lise, Bacaro, & Crocetti, 2023). Qu et al. (2024) argued that exploring the impact of peer rejection on children's sleep quality is an important step in providing targeted interventions for vulnerable groups of children. Therefore, the second research hypothesis formulated for this study was that peer rejection could be a risk factor for predicting sleep quality in primary school children.

1.3. The Mediating Role of Social Anxiety

Social anxiety is a common psychological discomfort experienced in daily social interactions, referring to the phenomenon where individuals exhibit negative emotional reactions such as nervousness, anxiety, and even avoidance behaviors when entering social situations (Guo, 2000). Research has demonstrated that peer rejection is closely related to social anxiety. It is an important factor in the social anxiety of primary school students. Pupils who are rejected by their peers may see this as evidence of their unpopularity, become fearful of future peer interactions, and feel more anxious. Negative evaluations and emotions may be the greatest factors in the development and maintenance of social anxiety in peer relationships (Chiu, Clark, & Leigh, 2021; Wong & Rapee, 2016).

Social anxiety causes insomnia in primary school children (Lima et al., 2020). The cognitive-behavioral model of social anxiety suggests that social anxiety may contribute to students' social isolation as well as poorer self-perception, which in turn affects their sleep quality (Burke, McCormick, Pellis, & Lukkes, 2017; Coffey, Banducci, & Vinci, 2015). Lima et al. (2020) investigated the sleep quality of children and adolescents aged 6 to 18 years in Beijing, and confirmed that social anxiety was associated with sleep quality, increased number of night wakings, and prolonged time to sleep. The results of a study on a group of normal subjects also showed that social anxiety was significantly and positively associated with the prevalence of sleep disorders such as excessive daytime sleepiness (Li, Tang, Zhou, Yu, & Mao, 2015). Together, these findings indicate that social anxiety may mediate the relationship between peer rejection and sleep quality in primary school children, which is the third research hypothesis of this study.

Based on the above issues, the present study intends to test the mediation model of social anxiety between peer rejection and sleep quality in primary school students using psychometric methods, to understand the psychological mechanisms underlying the association between peer rejection and sleep problems, and to provide empirical evidence as a guide for improving sleep quality for primary school students.

2. METHOD

2.1. Research Samples

The participants of this study were primary school students from two public institutions in Jiangsu Province, China: Nanjing Yuhua Primary School and Xuzhou Pei County Experimental Primary School. Using a stratified cluster sampling method, 12 classes were randomly selected—one class from each grade level (Grades 1 to 6) at both schools. Prior approval was obtained from the school administrations, and data collection was facilitated by classroom teachers. The study adhered to the principles of anonymity and voluntariness. All students and their guardians were informed of the study's purpose, their right to confidentiality, and their freedom to withdraw at any point. Written informed consent was obtained, but students were not required to provide their names. Questionnaires were

administered in class and completed independently under teacher supervision. Upon completion, all responses were sealed and collected immediately. The study received ethical approval from the Research Ethics Committee of the author's institution. Out of 453 distributed questionnaires, 14 were excluded due to missing or invalid responses, resulting in a final sample of 439 valid questionnaires (Validity rate: 96.9%). Among the respondents, 233 were male students and 206 were female students.

2.2. Instruments

The questionnaire included the following 4 items.

2.2.1. General Information Questionnaire

To investigate the basic information of primary school students, such as gender, grade, and whether they are the only child in the family.

2.2.2. Peer Rejection Scale

Using the Peer Exclusion Scale adapted by Xu and Niu (2019) which is based on the Social Rejection Scale (Thau, Derfler-Rozin, Pitesa, Mitchell, & Pillutla, 2015) with a modification of the descriptions of the questions, setting the perpetrator of the rejection behavior as a peer, and also making the descriptions of the questions as applicable as possible to the child. The scale consists of 6 items and is scored on a 5-point Likert scale. 5 means strongly agree, 4 means agree, 3 means neutral, 2 means disagree, 1 means strongly disagree. Higher scores indicate more severe rejection. The Cronbach's alpha coefficient for this scale in this study was 0.92.

2.2.3. Self-Rating Scale of Sleep

The Self-rating Scale of Sleep (Li, 2012) was used, which is suitable for measuring sleep problems in different populations, screening patients with sleep disorders, and is also commonly used in studies comparing the effectiveness of ratings before and after treatment for sleep problems. This scale is a Likert 5-point scale with 10 items, where 5 indicates strongly agree, 4 indicates agree, 3 indicates neutral, 2 indicates disagree, and 1 indicates strongly disagree. Higher scores reflect more severe sleep problems and poorer sleep quality. The Cronbach's alpha coefficient for this scale in this study was 0.81.

2.2.4. Social Anxiety Scale for Children

Using the Children's Social Anxiety Scale developed by La Greca and Stone (1993), this study assessed and screened for social anxiety disorders and symptoms in children aged 7–16 years. The 10-item scale comprises two factors fear of negative evaluation and social avoidance rated on a 3-point Likert scale (0 = no anxiety, 1 = moderate anxiety symptoms, 2 = severe anxiety). The total possible score is 20, with scores ≥ 8 indicating potential social anxiety disorder; higher scores reflect greater social anxiety. In this study, the Cronbach's alpha coefficient was 0.89.

2.3. Data Analysis

The study was statistically analyzed using SPSS 27.0, with peer rejection as the independent variable, sleep quality as the dependent variable, and social anxiety as the mediating variable.

Firstly, Harman's one-factor approach was used to test for the presence of common method bias (Zhou & Long, 2004). Secondly, descriptive analyses were conducted using independent samples t-test pairs. Subsequently, a Pearson correlation analysis was performed to initially determine the correlation between the variables. Finally, mediation effects were tested using the PROCESS software and the bias-corrected percentile bootstrap method (Fang, Zhang, & Qiu, 2012). The mediating role of social anxiety between peer rejection and sleep quality was tested using Hayes' PROCESS model 4 (version 2.16.3). The indirect effects of the mediating variables were tested using the percentile

bootstrap method of correcting for bias (5000 iterations). No zeros within the 95% confidence interval (CI) indicate statistical significance. All continuous variables were standardized before testing.

3. RESULTS

3.1. Common Method Bias Test

Harman's single-factor method (Zhou & Long, 2004) was applied to examine common method bias. Exploratory factor analysis identified five factors with eigenvalues exceeding 1. The first factor explained 32.34% of the total variance, below the 40% threshold, indicating an acceptable level of common method bias. Thus, further data analysis was deemed appropriate.

3.2. Descriptive Analysis

As shown in Table 1, all the primary school students who participated in the survey, 233 (53.1%), were male students, and 206 (46.9%) were female students. There were 195 (44.4%) students from one-child families and 244 (55.6%) students from non-only-child families. Girls had significantly higher mean social anxiety scores than boys ($p < 0.05$), and no significant differences between boys and girls on peer rejection and sleep quality scores. In addition, there were no significant differences in peer rejection, sleep quality, and social anxiety scores between students from one-child families and those from non-only-child families.

Table 1. Descriptive analyses regarding the scores of peer rejection, sleep status, and social anxiety (n=439).

Variables	Category	N (%)	Statistical values	Peer rejection	Sleep quality	Social anxiety
Gender	Male	233 (53.1%)	M \pm SD	14.021 \pm 6.425	21.833 \pm 7.093	6.10 \pm 4.889
	Female	206 (46.9%)	M \pm SD	14.641 \pm 6.295	20.927 \pm 6.628	7.25 \pm 5.314
			<i>t</i>	-1.018	1.376	-2.35
			<i>p</i>	0.309	0.169	0.019 (< 0.05)
Single child	Yes	195 (44.4%)	M \pm SD	14.220 \pm 6.120	21.631 \pm 6.953	6.26 \pm 4.474
	No	244 (55.6%)	M \pm SD	14.385 \pm 6.565	21.230 \pm 6.841	6.95 \pm 5.388
			<i>t</i>	-0.269	0.606	-1.405
			<i>p</i>	0.788	0.545	0.161

3.3. Correlation Analysis of Peer Rejection with Sleep Quality and Social Anxiety

The results are shown in Table 2 is the correlational analysis of peer rejection, social anxiety, and sleep quality. The peer rejection was significantly and positively correlated with social anxiety and sleep quality, respectively ($p < 0.001$); and social anxiety was also significantly and positively correlated with sleep quality ($p < 0.001$). The research hypothesis 1 is valid. This provides preliminary support for social anxiety mediating peer rejection and sleep quality in further testing.

Table 2. Correlational analysis results among variables (n=439).

Variables	Peer rejection	Sleep quality	Social anxiety
Peer rejection	1		
Sleep quality	0.413 **	1	
Social anxiety	0.506 **	0.433 **	1

Note: ** indicates $p < 0.01$.

3.4. Analysis of the Mediating Role of Social Anxiety in the Relationship Between Peer Rejection and Sleep Quality

The results of the correlation analyses showed that peer rejection, sleep quality, and social anxiety were each significantly positively correlated with each other, satisfying the premise of the mediation model analysis.

To determine whether social anxiety mediates the relationship between peer rejection and sleep quality, this study conducted a mediation effect test with a step model. As shown in Table 3, Model 1 constructed a regression model with sleep quality as the dependent variable and peer rejection as the independent variable, which showed that peer rejection was a significant predictor of sleep quality ($\beta = 0.447$, $t = 9.488$, $p < 0.001$). This suggests the existence of a total effect of peer rejection experiences on the sleep quality of primary school children. Model 2 was constructed as a regression model with social anxiety as the dependent variable and peer rejection as the independent variable, and it was found that peer rejection significantly and positively affected social anxiety ($\beta = 0.407$, $t = 12.272$, $p < 0.001$). It indicates that the experience of peer rejection elevates the level of social anxiety in primary school students. Model 3 was constructed as a regression model with sleep quality as the dependent variable and social anxiety as the mediator variable, showing that the regression coefficient of the effect of social anxiety on sleep quality was significant ($\beta = 0.405$, $t = 6.215$, $p < 0.001$). This demonstrates that the mediating effect of social anxiety is significant in the relationship between peer rejection and sleep quality among primary school students. Additionally, Model 3 showed that the marginal effect of peer rejection decreased from 0.447 to 0.282 after the inclusion of social anxiety but remained significant, suggesting that peer rejection is an independent predictor of sleep quality and that social anxiety partially mediates the effect of peer rejection on sleep quality among primary school students. The indirect effect value = 0.165, SE = 0.031, 95 % CI = [0.107, 0.228], with 36.91 % variance of sleep quality by peer rejection accounted for by the mediating effect of social anxiety (Table 4).

Thus, the pathway of 'peer rejection → social anxiety → sleep quality' was tested, the mediating effect of social anxiety existed, and hypotheses 2 and 3 were verified.

Table 3. Multivariable regression analysis of social anxiety and sleep quality (n=439).

Variable	Model 1		Model 2		Model 3	
	Sleep quality		Social anxiety		Sleep quality	
	β	t	β	t	β	t
Peer rejection	0.447	9.488***	0.407	12.272***	0.282	5.381***
Social anxiety					0.405	6.215***
R ²	0.171		0.256		0.238	
F	90.024***		150.603***		68.197***	

Note: *** indicate t value > 1.67 .

Table 4. Mediating model test for social anxiety (n=439).

Effect type	Effect value	SE	Bootstrap 95% CI		Proportion of relative effect
			LLCI	ULCI	
Total effect	0.447	0.047	0.355	0.54	
Direct effect	0.282	0.052	0.179	0.385	
Indirect effect	0.165	0.031	0.107	0.226	36.91%

Note: SE, standard error; CI, confidence interval; LLLCI, lower limit confidence interval; ULLCI, upper limit confidence interval.

4. DISCUSSION

This study explores the relationship between peer rejection and sleep quality, as well as the mediating role of social anxiety, among primary school students. Findings revealed that girls reported significantly higher social anxiety than boys, while no gender differences were observed in peer rejection or sleep quality. Similarly, the number of children in a family showed no significant effect on these variables. Peer rejection was significantly and positively associated with both sleep quality problems and social anxiety, and sleep quality problems were also significantly related to social anxiety. To investigate the underlying mechanism, a mediation model was developed based on previous research. Results indicated that social anxiety partially mediates the relationship between peer rejection and sleep quality, suggesting that peer rejection influences sleep quality both directly and indirectly through social anxiety.

Firstly, peer rejection directly and positively predicts sleep quality for primary school students. The negative emotions and psychological pressure brought about by peer rejection can affect the quality of sleep of primary school pupils, causing sleep fragmentation and several other sleep problems. When primary school students experience more peer victimization than their average, this powerful stressor can cause distress to the victim, which not only increases negative emotions but also contributes to poor externalizing behaviors and problems with peer interactions (Bender, 2010) thereby increasing the risk of poor physical health and poorer perceived physical health in primary school children, (De Bruine, Denissen, & Giletta, 2022; El-Sheikh, Buckhalt, Mark Cummings, & Keller, 2007; Shimizu, Zeringue, Erath, Hinnant, & El-Sheikh, 2021) further decreasing children's sleep quality. Chronic low-quality sleep, in turn, further exacerbates unhealthy physical conditions and perceptions, increasing the risk of negative emotions and discrimination, which can lead to more severe peer rejection and victimization (El-Sheikh, Zeringue, Saini, Fuller-Rowell, & Yip, 2022; Morency et al., 2024; Yip, Feng, Lorenzo, & El-Sheikh, 2023), creating a vicious cycle.

Secondly, peer rejection indirectly affects the quality of sleep among primary school students through social anxiety. It was found that not only did peer rejection significantly and positively predict social anxiety, but both peer rejection and social anxiety positively predicted sleep problems. This indicates that the more severe the peer rejection experienced by primary school pupils, the higher their levels of social anxiety. Research has shown that individuals who experience peer rejection will have negative emotional experiences after being rejected by their peers, such as frustration and helplessness. These painful emotions can lead to fear of social activities, resulting in characteristics such as fearfulness, hesitation, fear of self-expression, and unwillingness to communicate with others in social situations. Consequently, these individuals may struggle to establish good interpersonal relationships and become more susceptible to withdrawal and avoidance behaviors (Chiu et al., 2021; Guo & Zhang, 2002). Students who experience frequent peer rejection also develop severe negative self-evaluation biases (Gurbuz, Riby, South, & Hanley, 2024). On the one hand, students who have experienced rejection may develop low self-esteem, perceiving themselves as different from others in terms of self-perception. Their self-identity can become relatively weak, and they might attribute the reason for rejection to themselves, engaging in self-doubt. On the other hand, the unpleasant experience of rejection can motivate students to develop the desire to build or re-establish relationships with their peers. This need for relational belonging causes students to show excessive concern for others' evaluations, fearing negative critiques, and thus becoming stricter with themselves, striving to be liked by everyone and avoiding negative evaluations. Such high standards can exacerbate the fear of negative comments, which over time can deepen their social anxiety, leading them into a persistent social anxiety rut (Chen, Zhao, Wang, & Liu, 2021; Dong, Hu, & Shen, 2023). Furthermore, social anxiety significantly and positively predicted sleep quality, with higher levels of social anxiety being associated with more sleep problems. Constant worrying and overthinking caused by social anxiety can invade the mind at bedtime, constantly causing physical and mental arousal and preventing a person from entering a sleep state. Negative self-evaluation and distressing emotions of socially anxious individuals can also contribute to sleep disturbances (Alfano, Zakem, Costa, Taylor, & Weems, 2009; Blöte, Miers, & Westenberg, 2022; Pillai, Steenburg, Ciesla, Roth, & Drake, 2014; Zhang et al., 2024). In summary, primary school students experiencing peer rejection are more likely to experience social anxiety, and elevated levels of social anxiety in turn cause fear and resistance to peer communication and interaction, further leading to sleep problems. Therefore, the combined effects of peer rejection and the mediating role of social anxiety will reduce the sleep quality of primary school students.

5. SUGGESTION

Children are going through an important period of growth and development, during which various behavioral or psychological problems can affect their future growth or long-term development. Interventions during this period can have a lasting impact on lifelong health (Dahl, Allen, Wilbrecht, & Suleiman, 2018). Gaskin et al. (2024), in a review of research on sleep education programmes and suggested that schools are highly conducive external natural environments for interventions to improve sleep health, school-based solutions could be provided to increase teacher

involvement in sleep education and to develop and deliver content on sleep health (Rigney, Watson, Gazmararian, & Blunden, 2021). So, to help primary school students reduce the harm of being rejected by their peers, reduce social anxiety, form good interpersonal relationships, and improve the quality of their sleep and their physical and mental health, we put forward educational suggestions from the following aspects:

Firstly, educate students to interact with each other in the correct way to reduce peer rejection. Primary schools should pay attention to the impact of peer rejection on students' personal and social activities in the educational process, and provide courses on social interaction, helping them to understand that respect for others is the basis of good qualities and partnerships, what behavior and language in communicating with others are welcomed by all, and what kind of behavior will hurt others. To make efforts to create an atmosphere of mutual respect, understanding, and democratic and equal learning, so that students are in a safe and favorable environment for interaction. At the same time, students are taught to form a correct view of the collective, so that they understand that each student is a member of the collective and has his or her role and tasks in the collective, and they are guided to get along with others in a correct way, establish a positive mentality towards friendship, improve their social skills, and build a harmonious and friendly relationship with their peers, to reduce the incidence of peer rejection.

Secondly, helping students develop correct perceptions to overcome the negative evaluative fears and avoidance behaviors of social anxiety. For one thing, teachers should evaluate students correctly and encourage them to participate in social activities. In daily life and study, students are encouraged to actively participate in social activities. Follow the principles of diversity, dynamism, and openness, and affirm students' essential attributes. When evaluating the students, they should not treat the students as individuals, give them positive and pertinent evaluations, and do not easily make negative evaluations of the students. Students should also be guided not to make easy negative comments about others in social situations. Besides, teachers should guide students to clarify the inner meaning of evaluation, and help them to understand that others' evaluation of themselves is only a one-time evaluation at the moment, and is not eternal. If you experience negative comments from your peers, don't be afraid; these comments may not be correct. Help students to dispel the stereotypes in their minds, such as 'I'm afraid that people won't like us', 'I'm afraid that I've done something wrong', 'I don't want to get in touch with others', and so on. Emphasize the non-permanent and changeable nature of evaluations, and steer students away from focusing on worrying too much about evaluations that have not yet happened. Encourage students to express themselves boldly and give them positive support, so as to gradually develop students' self-confidence in interpersonal interactions and reduce self-denial, thereby overcoming the fear of negative evaluation and avoidance behavior of social anxiety. Finally, a scientific psychological intervention mechanism needs to be constructed to improve the quality of students' sleep and promote their physical and mental health. The school's mental health education department can regularly organize individual and group counseling training to design and carry out school activities suitable for primary school students' group cooperation, so that students can communicate and cooperate in a healthy and enjoyable atmosphere, and evacuate depressing and negative emotions, to improve the quality of sleep, and promote the healthy growth of their body and mind.

6. CONCLUSION

This study has confirmed the correlation between peer rejection, sleep quality, and social anxiety among primary school students and constructed a model with peer rejection as a predictor variable, sleep quality as an outcome variable, and social anxiety as a mediator variable. The study demonstrated that peer rejection may not only affect sleep quality directly but also indirectly through social anxiety levels among Chinese primary school students. At the theoretical level, it enriches research on the sleep quality of primary school students and its intrinsic mechanisms. At the practical level, it reveals that the effect of social anxiety on sleep quality is significant at the primary school level, which is important for early intervention. It also inspires educators to address sleep quality issues through peer rejection and early intervention of social anxiety among primary school students. This provides empirical evidence

for subsequent researchers and educators to consider the relationships among these three factors. Future research could better focus on the dynamic interactions between the involved factors and on the interactions between the external school environment, students' perceptions, and physical health.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

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