

The Relationship between Academic Stress Mental Toughness and Anxiety in Adolescents

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Abstract

The study found a significant positive correlation between academic pressure and anxiety, while Mental Toughness showed significant negative correlations with both academic pressure and anxiety. A questionnaire survey was conducted on 503 adolescents from 31 provinces across the country using a cluster sampling method to explore the relationship between academic stress and anxiety. The study also investigated the mechanism of Mental Toughness and social support in this relationship, as well as any differences in demographic variables. Mental Toughness partially mediates the relationship between academic stress and anxiety, while social support moderates the relationship between Mental Toughness and anxiety. Adolescents generally experience medium to low academic pressure, report good anxiety status, and exhibit medium to high levels of Mental Toughness and social support. Significant differences exist in academic pressure among adolescents based on gender and school type. Additionally, there are significant differences in adolescent anxiety based on grade and school type, as well as in adolescent social support based on gender and school type. The research findings demonstrate the correlation between academic stress and anxiety, the underlying mechanism, and the variations in demographic variables, offering recommendations for assisting adolescents in mitigating the adverse effects of academic pressure on anxiety and enhancing their academic and mental well-being.

Keywords: Academic Stress, Mental Toughness, Social Support, Anxiety, Adolescents

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Introduction

With time, education has attracted growing attention, and young people now face pressure from multiple sources. Society and the education system, along with the college entrance examination, public opinion, and the “score-only” mindset, place heavy burdens on students. Academic performance is often viewed as the sole measure of ability, leading students to equate higher education with personal worth (Cheng Jing, 2018). Additional stress comes from school management, teachers, peer competition, and parental expectations, while many students impose high demands on themselves. The gap between actual performance and self-realization goals can be substantial. Although moderate pressure can motivate, excessive pressure common among adolescents can reduce performance, harm mood, and negatively affect health and relationships (Livingstone, 2024; Hans Selye, 1956). Anxiety, particularly test anxiety, is prevalent, with well-recognized impacts across academic, social, and personal domains. Given its complex mechanisms, various strategies exist to mitigate stress-induced anxiety, highlighting the importance of exploring potential mediating factors.

Across life stages, individuals face distinct pressures. Erikson’s theory posits that each stage involves psychological crises that shape future development; successful resolution fosters growth, while failure leads to difficulties. Adolescence is a pivotal stage requiring adaptation to physical, emotional, and academic demands, particularly those tied to high-stakes examinations (Lazarus, 1984). The COVID-19 pandemic intensified these challenges, with online learning replacing regular classes and introducing new stressors. As anxiety significantly impairs health and learning efficiency, understanding the mechanisms linking academic stress to anxiety holds vital practical importance.

Research's objective

According to research questions, this research aims to complete following research objectives:

1. To clarify the current state of academic pressure, Mental Toughness, social support, and anxiety in adolescents;
2. To explore the relationship between academic stress, Mental Toughness, social support, and anxiety in adolescents;

3. To find out the mediating role of Mental Toughness in the relationship between academic stress and anxiety in adolescents;
4. To study the moderating role of social support;
5. To propose the feasibility of improving current adolescent anxiety problems suggestion.

Literature review

The term "pressure" derives from the Latin word "stringere," meaning "to draw out, expand, extend," and so on. (Cheng Jing, 2018) According to Hans Selye, stress is the result of an imbalance between demands that emerge intrinsically or extrinsically and our perceived capacity to manage them. In contrast. (Livingstone, 2024; Hans Selye, 1956) Ji Wenjie defines it as a physically or psychologically painful and unpleasant experience or sensation. Stress is a maladaptation that arises from a gap between an individual's psychological expectations and reality. (Ji Wenjie, 2018) According to Lazarus, stress is the response of an individual to an event that exceeds their maximum ability to withstand. (Lazarus, 1984)

Academic pressure is the primary cause of stress amongst teenagers. Despite varying definitions put forth by scholars, there is currently no unified concept. The World Health Organization (WHO) defines academic stress as a negative emotional response, such as anxiety, resulting from individuals facing challenges in their academic pursuits. (Cheng Jing, 2018) According to Stankovska et al, academic stress is characterized by anxiety and pressure from education and school. (Stankovska, 2018) Putwain defines academic stress as the anxiety pertaining to a student's future academic achievement. (Putwain, 2007) Meanwhile, Cui Weiguo argues that academic pressure is a product of both external factors and the individual's psychological load, imposing a burden on the student. (Cui Weiguo, 2003) To summarize, academic pressure stems from the interconnectedness of student individuals and their respective learning environments and often results in negative emotional experiences.

Conceptual framework

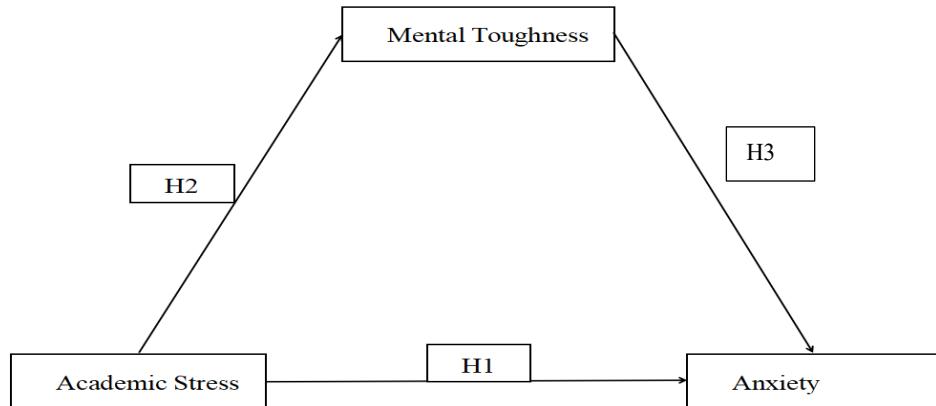


Figure 1 Conceptual Framework

Source: data and information from research

Hypothesis

According to following conceptual framework, the research hypothesis is as follow:

H1: There is a direct correlation between academic stress experienced by adolescents and the level of anxiety they exhibit.

H2: Adolescent academic stress can predict anxiety levels, with mediating roles played by Mental Toughness.

H3: Social support moderates the relationship between Mental Toughness and anxiety levels among adolescents.

Methodology

Research Method

Questionnaire By administering surveys on academic pressure, Mental Toughness, social support, and anxiety, we can gain insights into the experiences of young people. This approach allows for the efficient gathering of relevant data within a short period of time.

Individual Interview Due to the deficiencies of the questionnaire, the author conducted personal interviews with the students being investigated. The objectives of these interviews were two fold: to perform a more extensive examination of specific data acquired in the questionnaire, as well as to obtain information about certain topics not featured in the questionnaire. All responses from individual interviews were meticulously examined to yield a combined quantitative and qualitative investigation.

Literature Research Method After conducting research, we consulted relevant domestic and foreign literature and works through various sources such as the Internet, libraries, and books in order to establish the framework of this article.

Population and samples size

This study utilized participants from 31 provinces in the country who were young students. A total of 540 questionnaires were randomly distributed, and all 540 were retrieved for analysis. After excluding 37 invalid questionnaires that contained the same answers, regular responses, or disagreements between reverse-scored and forward-scored inquiries, 503 valid questionnaires were obtained with a success rate of 93%.

Research Tool

Academic Stress Scale Xu Jiajun and colleagues utilized the "Learning Stress Questionnaire," consisting of 21 items categorized into four dimensions: parental pressure (2, 3, 4, 7, 11, 15), self-pressure (8, 9, 12, 13, 16, 17), teacher pressure (5, 6, 10, 18, 19), and social pressure (1, 14, 20, 21). The questionnaire implemented a five-point scoring system, where higher scores correspond to increased academic pressure. The questionnaire exhibits good reliability and validity, as evidenced by an internal consistency coefficient of 0.81.

Data collection

The author applied stratified random sampling to collect the data from the samples.

Data analysis

Use Citespace software to organize and analyze relevant data. Employ SPSS 22.0 to perform descriptive statistics, common method deviation, independent sample T test, and more on the gathered data. Use PROCESS to execute mediation effect testing,

and use the Bootstrap method to analyze the significance of the regression coefficient. If the confidence interval does not encompass zero, it denotes that the statistical result is significant.

Results

1. Current Status of Academic Pressure, Mental Toughness, Social Support, and Anxiety among Adolescents

Table 1 Basic Statistics on Adolescent Academic Pressure (N=503)

		Number of Individuals	Percentage
No Pressure		25	5.0%
	Less Stress	158	31.4%
Under Pressure	Stressful	235	46.7%
	A lot of Pressure	85	16.9%

Source: data and information from research

The study examined the academic pressure, Mental Toughness, social support, and anxiety levels of 503 teenagers using questionnaires. Tables 1, 2, and 3 display the descriptive statistical findings for each dimension and the four variables.

Table 2 Adolescents' Overall Anxiety Levels (N=503)

		Number of Individuals	Percentage
No Anxiety Symptoms		385	76.5%
	Mild Anxiety	72	14.3%
Experience Symptoms of Anxiety	Moderate Anxiety	34	6.8%
	Severe Anxiety	12	2.4%

Source: data and information from research

Table 3 Descriptive statistical analysis of the overall characteristics of four variables among adolescents (N=503)

Variable	Factors for Each Variable	M	SD
Academic Stress		2.59	0.55
Anxiety		1.59	0.49
Mental Toughness		3.37	0.76
Social Support		3.65	0.95
	Interpersonal Assistance	3.30	0.97
Social Support	Subjective Support	3.60	0.94
Factor			
	Objective Support	3.86	0.96
	Support Utilization	3.49	1.20

Source: data and information from research

Tables 1 and 3 demonstrate that the adolescent demographic experiences an overall academic pressure level of 2.59 ± 0.55 . This scale implements a 5-point scoring method. With an average score of 2.59, it is clear that the high school students exhibit moderate to low levels of academic pressure. Academic pressure may be partitioned into four groups, whereby a total score not surpassing 35 corresponds to the group with no academic pressure. In this study, 5% of the total participants (25 individuals) were identified as having no academic pressure, as evidenced by a total score ranging from 35 to 50 points. Individuals within the total score range of 50 to 65 were considered to experience relatively low academic pressure. Among the total participants, 31.4% (158 individuals) were identified as experiencing less academic pressure, with total scores falling within the 50-65 range indicating greater academic pressure. In the study, 235 individuals were determined to be under high academic pressure, representing 46.7% of the total participants. Those who achieved a total score equal to or greater than 65 were classified as being under high academic pressure, and among the study population, 85 individuals met this criterion. Stress accounted for 16.9% of the total.

According to Tables 2 and 3, the average level of anxiety among adolescents is 1.59 ± 0.49 . Furthermore, 385 individuals scored 50 points or lower on the standard scale

and 76.5% of them were detected. In addition, 118 individuals reached the anxiety level based on standard scores, resulting in a detection rate of 23.5%. Seventy-two individuals exhibited mild anxiety, leading to a detection rate of 14.3%; 34 individuals displayed moderate anxiety, resulting in a detection rate of 6.8%; and 12 individuals suffered from severe anxiety, resulting in a detection rate of 2.4%.

From Table 3, it is evident that the average level of Mental Toughness amongst adolescents scores 3.37 ± 0.76 using a 5-point scoring method. The average score of 3.37 exceeds the mean scale value of $M=3$, which indicates that adolescents' overall Mental Toughness is in medium to high levels and good condition.

According to Table 3, the average level of social support for high school students is 3.65 ± 0.95 , with a 5-point scoring system employed. The average value of 3.65 exceeds the scale's average value of 3, signifying a positive overall level of social support for high school students.

2. Test of a moderated mediation model of academic stress, Mental Toughness, social support, and anxiety in adolescents

Wen Zhonglin's research suggests that a model with more than three variables may have both moderating and mediating variables. Previous research indicates that anxiety is significantly impacted by gender, class cadre status, and being an only child. First, this research utilized Model 4 to examine whether there is a mediating influence of Mental Toughness amidst academic stress and anxiety. The analysis involved controlling for gender, grade, whether the participant is a class leader, if they are an only child, and their school type. The data presented in Table 4 indicates that academic pressure has a significant impact on anxiety ($\beta=0.44$, $t=11.05$, $p<0.001$). Furthermore, even after introducing the mediating variable Mental Toughness, the impact of academic pressure on anxiety remains significant ($\beta=0.15$, $t=3.93$, $p<0.001$). It is noteworthy that academic stress has a significant negative predictive effect on Mental Toughness ($\beta=-0.52$, $t=-13.25$, $p<0.001$). Furthermore, the 95% confidence intervals of the bootstrap analysis for the direct impact of academic stress and the mediating influence of Mental Toughness on anxiety do not contain 0, demonstrating that academic stress predicts anxiety both directly and indirectly through Mental Toughness. This is supported by Figure 2, which shows the detailed pathways of the mediating effect. See Table 5 for more information.

The direct effect (0.15) and the mediation effect (0.29) account for 34.09% and 65.91% of the total effect (0.44) respectively.

Table 4 Testing the Mediating Role of Mental Toughness

Regression Equation (N=503)		Fit Index			Coefficient Significance	
Outcome Variable	Predictor Variable	R	R2	F (df)	β	t
Anxiety		0.48	0.23	24.60(6)***		
	Gender				0.01	0.16
	Grade				0.19	3.64***
	Are you a class cadre				-0.08	-0.94
	Is it an only child				0.05	0.60
	Types of School				0.08	0.90
	Academic Stress				0.44	11.05***
Mental Toughness		0.52	0.27	30.64(6)***		
	Gender				0.03	0.39
	Grade				-0.12	-2.36*
	Are you a class cadre				-0.80	-0.97
	Is it an only child				-0.04	-0.50
	Types of School				0.29	3.38***
	Academic Stress				-0.52	-13.26***
Anxiety		0.68	0.46	59.43(7)***		
	Gender				0.03	0.44
	Grade				0.12	2.79**
	Are you a class cadre				-0.12	-1.74
	Is it an only child				0.03	0.39

Table 4 Cons.

Regression Equation (N=503)	Fit Index	Coefficient Significance
Types of School	0.24	3.22**
Academic Stress	0.15	3.93***
Mental Toughness	-0.56	-14.34***

Note: * $p<0.05$, ** $p<0.01$, *** $p<0.001$, the standardized data for each variable is input into the regression equation as indicated below.

Table 5 Analysis of Total Effect, Direct Effect, and Mediating Effect

	Effect Size	Boot Standard	Boot	Boot	Effect
		Error	Lower	Upper	Proportion
			Limit	Limit	
Total Effect	0.44	0.04	0.37	0.52	
Direct Effect	0.15	0.04	0.08	0.23	34.09%
The mediating effect of Mental Toughness	0.29	0.03	0.23	0.35	65.91%

Source: data and information from research

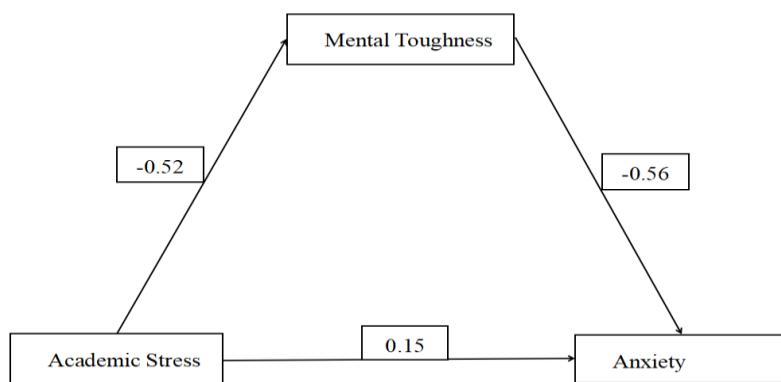


Figure 2 Illustrates the mediating effect of Mental Toughness on the relationship between academic stress and anxiety

Source: data and information from research

Secondly, a moderated mediation model test was conducted using Model59 while controlling for gender, grade, class cadre status, only child status, and school type. Results from Table 6 demonstrate that after integrating social support into the model, academic pressure significantly and positively predicts anxiety ($\beta=0.13$, $t=4.09$, $p<0.001$), while Mental Toughness significantly and negatively predicts anxiety ($\beta=-0.17$, $t=-3.42$, $p<0.001$). Social support significantly and negatively predicts anxiety ($\beta=-0.38$, $t=-11.49$, $p<0.001$), while the interaction between Mental Toughness and social support has a significant predictive effect on anxiety ($\beta=0.26$, $t=8.66$, $p<0.001$). It is evident that social support can moderate the predictive impact of Mental Toughness on anxiety. Specifically, social support serves as a mediator in the latter half of the mediating pathway through which academic stress influences anxiety by way of Mental Toughness (please refer to Figure 3 for further details).

Table 6 Test of Moderated Mediation Effect

Outcome Variable	Predictor Variable	Regression Equation (N=503)			Fit Index		Coefficient Significance	
		R	R2	F(df)	β	t		
Anxiety		0.80	0.64	86.55				
	Gender				0.07	1.26		
	Grade				0.10	2.87**		
	Are you a class cadre				-0.01	-0.24		
	Is it an only child				-0.02	-0.31		
	Types of School				0.37	6.10***		
	Academic Stress				0.13	4.09***		
	Mental Toughness				-0.36	-10.10***		
	Social Support				-0.38	-11.49***		
	Mental Toughness × Social Support				0.26	8.66***		

Note: ** $p<0.01$, *** $p<0.001$

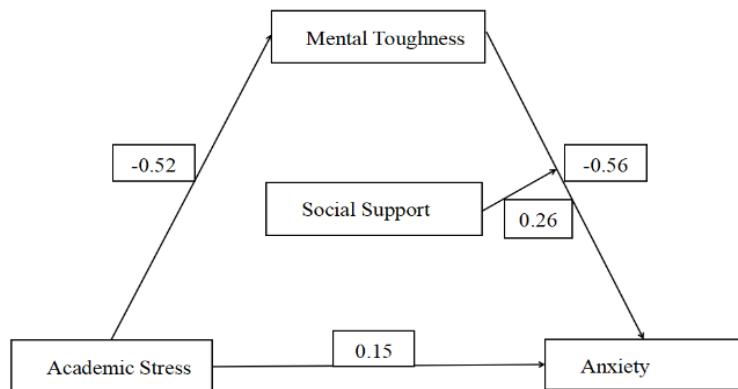


Figure 3 Displays the path diagram demonstrating the moderating impact of social support on anxiety's Mental Toughness effect

Source: data and information from research

Further analysis using a simple slope test (refer to Table 7 and Figure 4) indicates that when social support levels are low ($M-1SD$), the effect value is 0.24, with a confidence interval that excludes 0 [0.18, 0.31]. This suggests that Mental Toughness can significantly predict anxiety. Conversely, when social support levels are high ($M+1SD$), the effect value is 0.04, and the confidence interval excludes 0 [0.01, 0.08]. Mental Toughness significantly and positively predicts anxiety levels, but this effect weakens as individual social support increases. Additionally, a moderated mediating effect is observed.

Table 7 Mediating effect of social support at different levels

	Social Support	Effect Size	Boot	Boot	Boot
			Standard	Lower	Upper
			Standard	Lower	Upper
The mediating effect of Mental Toughness	2.70($M1SD$) 3.65(M) 4.60($M+1SD$)	0.24 0.14 0.04	0.03 0.02 0.02	0.18 0.11 0.01	0.31 0.17 0.08

Source: data and information from research

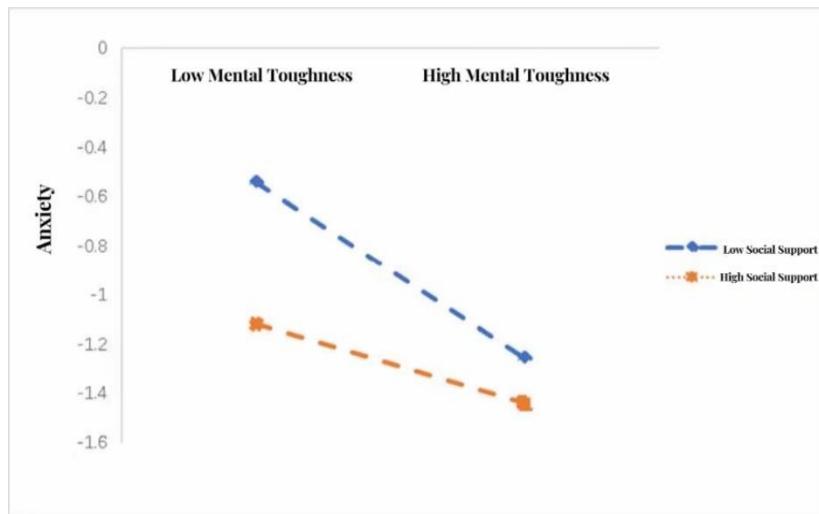


Figure 4 The Moderating Effect of Social Support on the Relationship Between Mental Toughness and Anxiety

Source: data and information from research

Discussion and conclusions

The present study confirms a significant positive association between academic stress and anxiety among adolescents. This is consistent with the findings of Hosseinkhani et al. (2020), who reported that various sources of academic stress—such as family conditions, educational system demands, teacher interactions, and peer pressure—significantly influenced adolescents' mental health, with self-concept acting as a mediator. Such results highlight how sustained academic demands can trigger anxiety symptoms and impair overall well-being.

Our results also show that mental toughness is negatively correlated with both academic stress and anxiety and partially mediates their relationship. This is in line with Gerber et al. (2017), who demonstrated that adolescents with higher mental toughness adapt better to perceived stress, thus reducing their vulnerability to anxiety. The findings suggest that interventions aimed at fostering mental toughness may serve as effective strategies for mitigating the adverse effects of academic stress on adolescent mental health.

Furthermore, the study identified that social support moderates the association between mental toughness and anxiety, with higher levels of social support buffering the negative effects of lower mental toughness on anxiety. This aligns with research showing that supportive relationships within schools—particularly teacher support and positive peer interactions—are associated with reduced anxiety and depressive symptoms among students (Aldridge et al., 2023). These results reinforce the protective role of social support in adolescent mental health.

Overall, these findings underscore the importance of multi-faceted intervention strategies. Reducing academic stress, strengthening mental toughness, and fostering supportive social environments should be integrated into educational and mental health programs to safeguard adolescents' psychological well-being.

Recommendation

The physical and mental wellbeing of youth is crucially connected to their personal familial satisfaction and the future of our nation. Therefore, it is of utmost importance to enhance the mental health education of young people. Drawing from the outcomes of this study, the subsequent recommendations are proposed:

First, the excessive academic pressure on students should be reduced. Teenagers face challenging academic tasks and intense exam competition. This prolonged high-pressure environment can negatively impact their psychological well-being, causing anxiety and other emotional distress. For students, setting realistic learning objectives based on their individual circumstances while cultivating effective study habits, actively engaging in extracurricular activities, and prioritizing physical exercise can help mitigate academic stress. Teachers and parents should approach their interactions with students and children proactively by establishing positive relationships with them. They should remain attentive to students' psychological well-being and continuously learn about mental health education to provide proper guidance in managing the stress associated with studying. Mental health education courses in schools aim to teach students self-help strategies to manage stress, such as abdominal breathing relaxation, meditation training, and exercise. Targeted psychological lectures, such as those on study adaptation for first-year high school students, can also be included. Psychological

lectures aimed at reducing stress during the college entrance examination can be held for high school students. These lectures can help students effectively manage academic pressure.

Second, enhance students' Mental Toughness by improving their ability to control emotions. The study reveals that adolescent's average score on the emotional control dimension of Mental Toughness is low, indicating the need for improvement. Teenagers face situations daily that trigger emotional fluctuations, which is particularly true in high school – a critical period for developing emotional control. Schools, educators, and parents should actively guide and educate students in a variety of aspects. This will help them maintain a positive and optimistic outlook while facing pressure or difficulties, strengthen their ability to control emotions, and ultimately improve their Mental Toughness. In terms of education at schools, regularly conducting psychological screenings and establishing psychological profiles of students can help understand their psychological dynamics and teach them the skills to improve their Mental Toughness. Seeking psychological consultations can improve students' problem-solving abilities. Additionally, schools should offer timely and professional services to students requiring guidance and intervention. Schools should collaborate with parents to ensure students develop positive psychological traits. Similarly, parents must communicate more effectively with their children to comprehend their true thoughts and provide them with essential family support that fosters warmth and love, assisting them in enhancing their Mental Toughness.

Third, providing students with strong social support can be crucial in helping them overcome setbacks and challenges. Within schools, psychology teachers should assist students in identifying their available support resources and encourage students to actively seek support when confronted with difficulties, as well as teaching them effective ways to use their available support. Teenagers primarily rely on social support from their schools and families. Schools can assist students in establishing healthy and lasting social relationships through organized group activities and psychological lectures. To promote positive family dynamics, parents should reject outdated educational concepts, embrace new ones, allocate more time to their children, foster

communication with the school, empathize with their children's circumstances, and offer timely social support whenever necessary.

Fourth, Alleviate Students' Anxiety. Exam-oriented education leads to inevitable anxiety in teenagers. In order to address this, students should first establish a rational understanding of anxiety and learn how to respond to it in a scientific way. Additionally, they can choose viable methods to release their anxiety, such as confiding in teachers, classmates, family, and friends when facing difficulties, to avoid anxiety. One can listen to music, engage in relaxation exercises such as deep breathing and meditation, and participate in physical activities to alleviate anxiety. Schools should implement mental health education classes, instruct students on anxiety relief techniques and methods, and offer professional psychological counseling to students with severe anxiety. Additionally, to assuage the anxiety of students, more campus activities such as art festivals, poetry and debate contests will be implemented. A harmonious parent-child relationship is also crucial for reducing students' anxiety. Parents should prioritize providing evidence-based guidance for their children on family dynamics, fostering positive and supportive relationships, and cultivating a comfortable and nurturing home environment where their children feel valued and appreciated.

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