

The relationship between exam anxiety, academic performance and peer support among 9th grade students in Shenzhen, China

Yating Yang*, Shuhao Wang

School of Education Management, Tianjin University, Tianjin, China

*Correspondence: yangyt062@yeah.net

Abstract: In recent years, with the incentive of competition, various industries have introduced many exams to assess and screen the overall level of personnel. Faced with exams, especially those that carry significant weight, most students experience some degree of anxiety. Moderate exam anxiety can stimulate the excitement of the cerebral cortex, which has a positive effect on active thinking, concentration, information extraction, and so on. However, excessive exam anxiety can cause cognitive impairments for students, such as blocked thinking, memory lapses, restless emotions, low learning efficiency, and other adverse reactions. This can also affect students' exam performance and even their mental and physical health, keeping them in a state of anxiety for a long time. This study aimed to investigate the relationship between exam anxiety, academic performance, and the moderating effect of peer support on student learning and development among 9th grade students in Shenzhen, China. The study used a questionnaire survey to collect data from 300 valid respondents and conducted data analysis. The results showed that: There was a significant gender difference in academic performance, with 9th grade male students performing better than female students; The greater the exam anxiety, the lower the academic performance of 9th grade students; Peer support can positively predict the academic performance of 9th grade students.

Keywords: Exam anxiety; academic performance; peer support

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1. Introduction

The 9th grade students begin to face pressure from the high school entrance exam, especially in China, where the competition for the exam is extremely fierce. The high level of test anxiety caused by this has become a pressing issue that needs to be addressed [1]. Research surveys have shown that the detection rate of test discomfort among participants is 68.2%, with mild anxiety at 19.4%, moderate anxiety at 41.2%, and severe anxiety at 39.4%. It is clear that test anxiety among 9th grade students are very serious. Excessive anxiety not only affects students' academic performance and efficiency, but also has a great impact on their physical and mental health [2]. According to literature and research data, test anxiety among 9th grade students in Shenzhen, China is very severe. Although Shenzhen has excellent educational resources in the field of education, it also has a stronger sense of competition. The harshness of this competition can be seen through government policy. For example, the government work report proposed that since the promotion of vocational schools and regular high schools to communicate with each other, 100,595 third-year graduates took the high school entrance exam, but only 47.2% of students ultimately passed the exam and entered regular high schools, with the rest attending vocational schools [3]. Insisting on the development of vocational education as an important foundation for popularizing high school education ensures that the ratio of regular high schools to vocational high schools is equal [4]. This means that more 9th grade students will enter vocational schools after graduation, so students face great competition



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pressure, the key to solving this problem is to provide psychological guidance and effective interventions for 9th grade students, and to help them find the right methods to manage their learning anxiety [5].

Many scholars have explored the relationship between test anxiety and academic performance among middle school students. For example, test anxiety is significantly negatively correlated with academic performance, with students at low levels of anxiety achieving significantly higher grades than those with high levels of anxiety. Research results regarding the relationship between test anxiety and academic performance are not always consistent [6]. Moderate anxiety may promote learning and performance, but excessively high levels of anxiety can have a negative impact on academic performance. At the same time, even moderate levels of anxiety can interfere with learning and performance. Therefore, it is necessary to analyze and intervene based on specific situations, and to help students manage and relieve test anxiety [7]. 9th grade students bear pressures from school management, parental expectations, peer competition, and their own demands that lower-grade students cannot experience [8]. A survey on academic pressure among 9th grade students found that more than 70% of them have heavy academic burdens, with heavy homework and many tutorials. Academic performance has become the only criterion for achieving their goals [9]. Many schools try to improve students' grades, parents expect students to achieve excellent grades, and students themselves demand excellent grades, but all of these expectations have turned into invisible test pressure, and the anxiety they feel is becoming increasingly heavy [10].

Peer support is a form of psychological support obtained through peer relationships to relieve and alleviate psychological stress reactions, Mental tension, and other negative psychological reactions [11]. The buffer theory of peer support suggests that peer support alleviates stress by providing emotional, cognitive, or tangible resources, which can reduce or eliminate the effects of stressors on individuals [12]. Peer support can also have a positive effect on mental health, social skills, and academic performance.

2. Literature Review

There are different views among scholars on the definition of exam anxiety. Some believe that exam anxiety is the negative reaction or subjective feeling that learners experience when they feel unable to adapt to the environment or perceive a threat from their surroundings [13]. Exam anxiety is the tension and helplessness that students feel when they judge the demands of learning-related tasks or events during exams [14]. The exam anxiety of junior high school students is influenced by various factors, such as school, family, society, and themselves, and it tends to increase year by year. Excessive exam anxiety is not conducive to the physical and mental health development of adolescents, nor is it conducive to the achievement of the national education reform goals [15]. Some believe that exam anxiety stems from students' desire for knowledge, but they feel burdened by the difficulty of the knowledge or their weak acceptance ability [16]. In a large-scale survey of middle school students in northern Thailand, exam anxiety was found to be related to academic performance, interpersonal relationships, teacher instruction, personal inner feelings, parents, and social groups [17]. At present, there is also considerable controversy among Chinese scholars regarding the definition of exam anxiety. This study adopts the more widely accepted view that exam anxiety is a psychological state manifested by different degrees of emotional reactions, with the prominent feature being the cognitive and evaluative self-ability in the exam situation, which is constrained by personality traits and psychological factors, and is managed through defense or avoidance [18].

Academic achievement is proof of a student's learning outcomes, including the knowledge, skills, and abilities gained during educational and teaching activities, as well as the student's learning interests, attitudes, and habits. Academic achievement is reflected in exam scores, which reflect a student's learning effectiveness by measuring the

results of their learning [19]. The three subjects of Chinese, math, and English are the best indicators of academic achievement [20]. Different scholars have different views on the concept of academic achievement. Given the current educational situation, the meaning of academic achievement can be broadly divided into two categories. The broad meaning of academic achievement refers to the assessment of the extent of students' learning of textbook and extracurricular knowledge under the current quality education system, combined with the results of students' overall development in morality, intelligence, physical fitness, aesthetics, and labor. The narrow meaning of academic achievement is the test results of the knowledge that students have learned in the short term [21]. This study mainly focuses on the narrow meaning of academic achievement.

The concept of peer support was initially applied to student safety education, controlling youth smoking, and drug monitoring, and was gradually applied to various fields. Information and emotional support and help provided by people with similar experiences are more easily understood and accepted by the supported individuals [22]. Peer support can provide a dependent and reciprocal support relationship for peers [23]. The empathy of the supporter can facilitate deeper communication and learning and emotional exchanges, and truly experience and share the feelings of the other person, which family members and teachers cannot provide [24]. Peer support is widely applied in the education field and is an important type of social support. This study defines peer support in line with the above research views and believes that obtaining peer support can enrich students' self-skills, improve academic achievement, and ultimately promote students' mental health.

3. Materials and Methods

3.1. Research object

The study selected 400 9th grade students from two middle schools in two districts of Shenzhen, China as research subjects. After removing invalid questionnaires with response times less than 60 seconds and questionnaires with single answers, 300 valid questionnaires were obtained.

3.2. Research Hypothesis

Currently, the main sources of exam anxiety in 9th grade students are individual and environmental factors. Exam anxiety is the feeling of pressure and suppression that students experience in the face of numerous exams and their surrounding environment. Exam anxiety is a state of anxiety that involves a range of physiological, cognitive, emotional, and behavioral reactions, and may be accompanied by a fear of poor results and a tendency towards negative emotions when personal performance is being evaluated. A group activity survey conducted among Chinese children found that good peer support can help students adapt to learning and improve their group cooperation skills. Based on the collation of previous literature and the integration of survey results, this study clarifies the current situation, reasons, and corresponding needs of the problem, and proposes corresponding countermeasures and suggestions. The research questions of this study are as follows:

Hypothesis 1: To explore the correlation between exam anxiety and academic performance in 9th grade students.

Hypothesis 2: To explore whether exam anxiety in 9th grade students positively predicts academic performance.

Hypothesis 3: To explore whether peer support plays a positive moderating role between exam anxiety and academic performance.

3.3. Research Instruments

This study used three measurement tools, namely the "Test Anxiety Scale", "Academic Performance Scale", and "Peer Support Scale". The Likert 5-point scoring scale was

used to score the questionnaires, with a score of 1 to 5 for regular questions, and 5 to 1 for reverse-scored questions.

3.3.1. Test Anxiety Scale

The "Test Anxiety Scale" is a self-assessment tool for anxiety [25]. It consists of 20 items and has a modeling standard in China that the boundary score for standard scores is 50 points. Scores below 50 are considered normal, 50-59 are considered mild anxiety, 60-69 are considered moderate anxiety, and scores above 70 are considered severe anxiety. There are 15 positively scored items and 5 negatively scored items, which are questions 5, 9, 13, 17, and 19. The total raw score is obtained by adding up the scores for all 20 items, and then the raw score is multiplied by 1.25 and rounded to the nearest integer to obtain the standard score. The original reliability and validity of the scale are good, with a Cronbach's α and a combination reliability both greater than 0.8, meeting the reliability test standards, and CITC index ranging from 0.69-0.78.

3.3.2. Academic Performance Scale

The "Academic Performance Scale" in the study used the total score of subjects in the most recent exam. Since the selected subjects were from different schools, the scores were standardized according to their respective schools to obtain standard scores, which were used to represent the academic performance of the students.

3.3.3. Peer Support Scale

The "Peer Support Scale" is adapted from the Social Support Scale [26]. The total score of social support is the sum of the scores from each scale. The higher the score, the higher the level of social support. This scale has a total of 10 items without any reverse scoring items. The reliability of this scale is acceptable, with a Cronbach's α value of 0.892 and CITC index between 0.69-0.87.

4. Result and Discussion

For the purpose of research, test anxiety is divided into three levels: Low moderate and high, based on the degree of test anxiety. Scores lower than one standard deviation from the mean indicate low test anxiety, Scores within one standard deviation of the mean indicate moderate test anxiety, and scores higher than one standard deviation from the mean indicate high test anxiety [27]. Students with low test anxiety, also known as mild test anxiety, experience little fear or nervousness during the review phase before the test. They rarely think about the test scenario until the test date approaches, especially when the teacher emphasizes the exam repeatedly. At that point, they gradually begin to feel a sense of tension.

Students with moderate test anxiety, also known as appropriate test anxiety, tend to feel nervous and anxious for a relatively long time before the test. However, this anxiety does not affect their normal eating, sleeping, and pre-test review. Moreover, it naturally subsides after the test. This type of anxiety can sometimes serve as a motivation for students to study harder. Students with high test anxiety, also known as excessive test anxiety, experience a lot of negative emotions, such as distress, fear, worry, and anxiety, for a long period of time before the test. They lack confidence in their performance, and their spirits are highly tense, often accompanied by headaches, insomnia, loss of appetite, and irritability, and sometimes even severe fear of the test. This type of anxiety can have a significant harmful impact on a student's learning and test performance. If left untreated, it can also cause a variety of physical and mental illnesses, endangering the student's health.

The results of this study's questionnaire showed that 49.3% of the students surveyed were at a severe level of anxiety, 11.3% were at a moderate level of test anxiety, and 24.7% were at a mild level of test anxiety. The competition pressure is high for junior high school

students in Shenzhen, China, and their level of test anxiety is relatively serious, as shown in **Table 1**.

Table 1. Overall situation of exam anxiety among 9th grade students.

Anxiety level	Total score	Number of students	Proportion
Normal level	<50	44	14.7%
Mild anxiety	50-59	34	11.3%
Moderate anxiety	60-69	74	24.7%
Severe anxiety	≥ 70	148	49.3%

Based on the research results, there was no statistically significant difference in test anxiety between male and female students ($F=1.140$, $P>0.05$). According to the research findings, the main reason for this result may be the intense educational competition in Shenzhen, China, as well as the open-minded attitudes of parents in this region. Additionally, parents in Shenzhen tend to have higher levels of education and socio-economic status, and place great emphasis on their children's education. Parental upbringing and support are also relatively well established, as shown in **Table 2**.

Table 2. t-Test Analysis of Test Anxiety for Different Genders (N=300).

Dimension	Male		Female		T-value	P-value	F-value
	M	SD	M	SD			
Exam anxiety	64.19	11.205	65.27	10.903	-0.841	0.401	1.140

According to this table, in terms of gender, the average score of male students (438.49) is significantly higher than that of female students (420.33), with a T-value of 1.677 and a P-value less than 0.05, indicating a statistically significant difference. Under the condition of being a class leader or not, there is no significant difference in academic performance between class leaders and non-class leaders, with a T-value of 2.919 and a P-value greater than 0.05. Under the condition of being an only child or not, there is no significant difference in academic performance between only children and non-only children, with a T-value of 2.517 and a P-value greater than 0.05, as shown in **Table 3**.

Table 3. T-Test Analysis of Academic Achievement for Third-year Junior High School Students.

Variable	M \pm SD	N	T-value	P-value
Gender				
Male	438.49 \pm 87.244	154	1.677*	0.030
Female	420.33 \pm 99.609	146		
Class Monitor				
Yes	459.32 \pm 91.076	65	2.919	0.499
No	421.45 \pm 93.004	235		
Only Child				
Yes	446.42 \pm 89.497	118	2.517	0.220
No	418.78 \pm 95.076	182		

The purpose of this study is to investigate the moderating effect of peer support on the relationship between exam anxiety and academic achievement. First, the correlations among exam anxiety, academic achievement, and peer support of the third-grade students were analyzed. The results showed a significant negative correlation between exam anxiety and academic achievement ($r=-0.270$, $p<0.001$), a significant negative correlation between exam anxiety and peer support ($r=-0.154$, $p<0.05$), and a significant positive correlation between peer support and academic achievement ($r=0.605$, $p<0.001$). All correlation

coefficients were below 0.7, indicating moderate to low correlations without multicollinearity, as shown in **Table 4**. Means, standard deviations, and correlations among variables.

Table 4. Means, standard deviations, and correlations among variables.

Correlation	1	2	3	M	SD
Exam anxiety	1			64.72	11.054
Academic performance	-0.270***	1		429.65	93.751
Peer support	-0.154*	0.605***	1	31.26	6.348

Note: * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Hierarchical multiple regression was used to investigate the moderating effect of peer support on the relationship between test anxiety and academic achievement. To reduce the problem of multicollinearity, the data for test anxiety and peer support were standardized. As some previous studies found significant gender differences in test anxiety and peer support among students, gender was included as a control variable in the model.

First, the control variable (gender) and test anxiety were entered into regression equation to establish Model 1. The results showed that test anxiety had a significant negative effect on academic achievement ($\beta = -0.277$, $P < 0.001$), indicating that the higher the test anxiety, the lower the academic achievement. Test anxiety brought stress rather than stimulation to students. Second, the control variable (gender), test anxiety, and peer support were entered into regression equation to establish Model 2. The results showed that test anxiety had a significant negative effect on academic achievement ($\beta = -0.182$, $P < 0.001$), and peer support had a significant positive effect on academic achievement ($\beta = 0.575$, $P < 0.001$). Finally, the control variable (gender), test anxiety, peer support, and the interaction term of test anxiety and peer support were entered into regression equation to establish Model 3. The results showed that peer support had a significant negative moderating effect on the relationship between test anxiety and academic achievement ($\beta = -0.103$, $P < 0.05$). Moreover, $VIF < 10$, indicating that there was no multicollinearity problem. Refer to **Table 5** for details.

Table 5. Hierarchical Regression Analysis of Peer Support, Test Anxiety, and Academic Achievement.

Variable items	Model1	Model2	Model3	VIF
	Academic achievement β	Academic achievement β	Academic achievement β	
Gender (male)	-.157**	-.008	-.015	1.081
Test Anxiety	-.277***	-.182***	-.191***	1.041
Peer Support		.575***	.588***	1.117
Test Anxiety X Peer Support			-.103*	1.039
F-value	15.979***			
ΔR^2	9.1%			
R^2	9.7%			

Note1: * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$; Gender (male=1, female=2)

To further understand the specific features of the moderating effect of peer support on the relationship between academic stress and depression, this study used simple slope regression analysis to examine the moderating effect of peer support. First, all three variables were standardized, and then the unstandardized coefficients were selected. Participants were divided into high and low groups based on the unstandardized coefficients of their peer support scores, and then regression analyses were conducted separately for each group. The dependent variable was academic achievement, and the independent variable was test anxiety. The results showed that compared with 9th grade students with high peer support, test anxiety had a stronger negative predictive power on academic achievement for 9th grade students with low peer support. Based on the data results, two regression equations were obtained and illustrated in **Figure 1**. The moderating effect of peer support on the relationship between test anxiety and academic achievement.

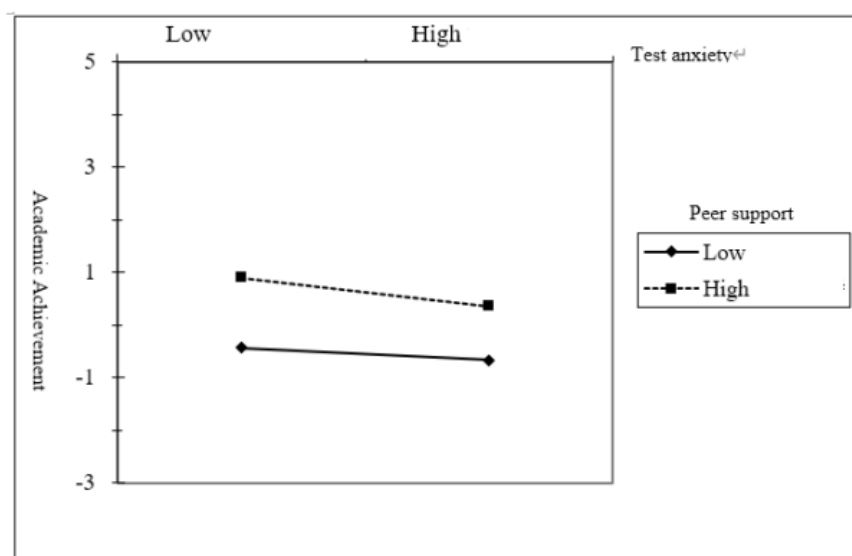


Figure 1. The moderating effect of peer support on the relationship between test anxiety and academic achievement

5. Summary of Finding

This study found that there is a significant gender difference in academic performance, with male students in the third year of junior high school performing better than female students. The main reason for this is believed to be that male students in Shenzhen are more mature and exposed to a wider range of things, hobbies, and interests, and are more adept at using information technology to assist in learning. Meanwhile, female students are experiencing more prominent physical and psychological changes during adolescence, leading to unstable emotions and affecting academic performance. This study is consistent with an empirical study in China that found significant gender differences in math grades among eighth-grade students, with male students outperforming female students. Moreover, the study also pointed out that in mainland China, gender differences in academic performance are a common phenomenon, with male students generally performing better than female students. This is similar to the gender differences in academic performance among 9th grade students found in this study. However, it should be noted that students from different regions and cultural backgrounds may have different gender differences. Therefore, more research is needed to explore this issue [28].

This study found that there is a negative correlation between test anxiety and academic performance among third-year middle school students, which is consistent with our expectations. For Chinese teenagers, studying not only means mastering knowledge but also involves various factors such as class honors, family responsibilities, and personal

future. Especially for third-year students, their self-awareness is more developed, and they feel more pressure from their parents' expectations and the competition of the high school entrance examination [29]. This is consistent with scholars' research, which suggests that academic performance is significantly negatively correlated with study anxiety. The higher the total score of the "Study Anxiety Scale," the lower the academic performance [30].

This study found that peer support can positively predict the academic performance of third-year middle school students, which is consistent with the previous hypothesis. This conclusion is also consistent with the findings of many scholars who suggest that peer support has a significant positive impact on the academic performance of teenagers [31]. The reason for this phenomenon may be that third-year middle school students in Shenzhen have gradually shifted their emotional dependence from parents and teachers to close friends, and they are in a rebellious phase with a strong desire for independence [32]. Peer relationships play a unique role in the personality and social development of adolescents that adults cannot replace [33]. Negative peer relationships are an important factor that leads to declining academic performance. Research has shown that unpopular teenagers in a group generally have lower academic performance than popular teenagers, and their absenteeism and dropout rates are also high [34]. Peer support, as a special form of peer relationships, plays an extremely important role in the academic performance of middle school students [35].

This study found that peer support can suppress the relationship between test anxiety and academic performance. This suggests that if middle school students have more peer support resources, the negative impact of test anxiety on academic performance will be relatively small. It is precisely because of the presence of factors such as peer support that the experience of test anxiety and other factors has resulted in differentiation among adolescents, and some adolescents have not shown expected symptoms of test anxiety [36]. In fact, in addition to peer support, there may be other protective factors such as learning strategies, academic self-efficacy, and time management that may also have a moderating effect on the relationship between academic stress and depression [37].

This study found that there is a significant gender difference in academic performance, with male students outperforming female students. It is speculated that the main reason for this is that the study participants are from first-tier cities, where male students are relatively more mature, exposed to a wider range of experiences and interests, and better able to use information technology to assist their learning. On the other hand, female students are experiencing a more pronounced physical and psychological puberty, which is affecting their academic performance. This result suggests that in daily education, it is important to treat male and female students equally. In addition, Account the characteristics of female puberty, it is necessary to provide appropriate physical and mental counseling and improve female students' ability to use information technology to assist their learning.

This study also found that the higher the test anxiety of junior high school students, the lower their academic performance. This suggests that parents and educators should be vigilant in detecting children's emotions and pay attention to cultivating positive emotions in each student, especially guiding junior high school students to develop a correct outlook on life and values, correctly understanding grades, reducing academic pressure, and minimizing negative emotions such as frustration. Students with test anxiety should be given understanding and help. We should not only focus on preventing and counseling students' negative emotions, but also pay attention to cultivating and experiencing their positive emotions. Positive affirmations should be given regularly, and positive emotions such as pride, joy, hope, satisfaction, and confidence should be promoted through appreciation and other means. Additionally, offering elective courses such as yoga and music can help students enjoy learning and grow healthily. Especially for students with poor

test scores, teachers and parents should not only focus on their "explicit" learning problems but also strengthen their understanding of their internal psychological state, especially when students exhibit negative emotional states, timely support and care should be given.

In this study, the positive effect of peer support has been verified. Peer support not only directly predicts the academic performance of junior high school students in a positive way, but also suppresses the negative effects of exam anxiety. This result suggests that although reducing exam anxiety is an important way to promote academic performance. Therefore, it is especially important to fully utilize the role of peer groups for adolescents. Peer groups can not only play a role in academic tutoring, but also provide emotional and practical help to adolescents. In addition, peer support is interactive, so while providing support to others, individuals can also benefit from the support of others. Peer tutoring broadens students' learning methods and thinking through exchange of learning experiences, method exploration, and skill training among peers, enabling students to think about problems more systematically and from multiple perspectives, enhancing problem-solving skills, and thereby deepening their learning and improving their academic performance. This suggests that parents and educators can leverage the role of peer support by establishing formal adolescent groups, as well as encouraging and guiding the formation of informal groups to achieve the effect of peer support.

6. Conclusions

This study innovatively used peer support as a moderating variable to investigate its effect on test anxiety and academic achievement through a questionnaire survey. Although some research findings were obtained, there were also some limitations. Firstly, the research method was relatively simple. The study mainly used a questionnaire survey, without rigorous experimental methods, and the data collected may be subjective due to self-report by students. The study only focused on ninth-grade students whose psychological development may not be mature enough, and their self-assessment of test anxiety may not be objective. Secondly, the sampling of this study was limited. The research subjects were randomly selected from seven classes of two key middle schools in two districts of Shenzhen, China. Therefore, it cannot represent the situation of urban middle school students in Shenzhen as a whole. In future studies, the sampling scope should be expanded to cover schools of different levels to improve the representativeness of the research subjects. Thirdly, the selected scales were not precise enough. The test anxiety scale used in this study was adapted from the self-assessment anxiety scale. In fact, some researchers have developed more complex test anxiety scales and adolescent psychological resilience scales, which future researchers can refer to according to actual situations. Finally, the focus of the peer support variable in this study was on the positive aspect. Future researchers are recommended to conduct more comprehensive exploration, such as studying how academically successful students cope with test anxiety, which can provide reference and learning methods for others.

In summary, there are still many aspects worthy of further in-depth research on the relationship between test anxiety and academic achievement among ninth-grade students. Efforts will be made to explore these aspects in future studies and work.

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