

# Multivariate Regression Analysis of Peer Competition on Emotional Health of High School Students

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## ABSTRACT

This study aims to explore the impact of classmate competition on the emotional health of high school students and to examine the mediating role of family support. 450 valid data on this issue from high school students in a certain city were collected, and multivariate regression analysis was used for statistical analysis. The results showed that classmate competition significantly and positively affected students' anxiety levels. The more intense the competition, the stronger the students' anxiety. In addition, family support played a buffering role between classmate competition and emotional health. Higher family support can effectively reduce students' anxiety levels. The study also found that control variables such as gender and grade had a certain impact on emotional health, but it was relatively small. This study emphasizes the importance of improving the educational environment and strengthening family support to promote students' mental health development. In summary, this study provides important empirical evidence for education management and policy making, which will help to better pay attention to and improve students' emotional health issues in practice.

## KEYWORDS

Classmate Competition; Emotional Health; High School Students; Family Support; Multivariate Regression Analysis.

## 1. INTRODUCTION

### 1.1. Research Background and Importance

In the past two years, mental health problems among high school students have become a focus, especially peer competition in emotional health. It was discovered that peer competition could lead to anxiousness and other emotional issues in students. For instance, Suldo et al. (2015) found that victimization in peer relationships significantly affects students' mental health, especially internalized psychological problems [1]. Moreover, supplementary academic pressure and peer competition can add to these problems. Raskauskas showed that students who reported various forms of bullying from their peer group tended to have higher depressive symptoms and poorer self-esteem. In light of this, it becomes essential to understand how peer competition impacts the emotional health of high school students [2].

Family support plays an important role in alleviating this negative impact. Studies have found that family support can significantly alleviate the negative emotional impact of peer competition. For example, De Wit et al. (2011) found that as the grade increases, students feel less support from peers and teachers, which is associated with worse mental health [3]. These findings suggest that improving family support and school environment is crucial to promoting students' emotional health.

## **1.2. Research Objectives**

This study aims to explore the impact of peer competition on the emotional health of high school students and examine the moderating role of family support. By conducting a multivariate regression analysis on the valid data of 450 high school students in a certain city, we attempt to reveal how peer competition affects students' anxiety levels and how family support mitigates this impact. The results of the study will provide important empirical evidence for educational management and policy making, and help better pay attention to and improve students' emotional health issues.

## **2. LITERATURE REVIEW**

### **2.1. Research Review on the Impact of Peer Competition on Emotional Health**

Over the past several years, several studies have been conducted relating to peer competition and its relation to high school students' emotional health. Since then, research has shown that peer relationships and social interaction are important for students' emotional health. For example, Rigby (1999) found that peer bullying is closely related to students' physical and mental health problems, especially for students who were bullied in junior high school, their mental health deteriorated significantly in high school [4]. In addition, Brendgen and Vitaro (2008) pointed out that peer rejection has a significant predictive effect on girls' physical health problems, while the impact on boys is smaller [5]. These studies show that competition and rejection among classmates have a profound impact on students' emotional health.

Further research has also revealed the role of peer support in alleviating these negative effects. Buchanan and Bowen (2008) found that peer support significantly contributed to the mental health of middle school students, especially when adult support was low [6]. This suggests that establishing positive peer relationships and reducing competition and bullying among classmates are important for improving students' emotional health.

### **2.2. Application of Multivariate Regression Analysis in Educational Research**

Multivariate regression analysis has a long history of application in education research, primarily focusing on the impact exerted by multiple factors on students' academic performance and emotional health. The technique can enable the examination of the effects that independent variables simultaneously have on dependent variables, showing quite complex causal relationships. For example, Lubbers et al. (2006) used multivariate regression analysis to explore the impact of peer relationships on students' academic progress. The results showed that there was a significant correlation between peer acceptance and academic progress [7]. This method effectively controlled confounding variables and provided more accurate analysis results.

In addition, Denny et al. (2014) used multivariate regression analysis to study the impact of chronic health conditions on the emotional health of high school students. The results showed that chronic health problems significantly affected students' daily activities and social skills, leading to higher levels of emotional distress [8]. This further verifies the effectiveness of multivariate regression analysis in revealing the complex relationships in education and health research. By using multivariate regression analysis, researchers can more comprehensively understand the various factors that affect students' behavior and emotions, and provide a scientific basis for developing more effective educational interventions.

### 3. RESEARCH DESIGN AND METHODS

#### 3.1. Research Hypothesis and Model

This study aims to explore the impact of peer competition on the emotional health of high school students. Based on relevant literature and theoretical foundations, the following hypotheses are proposed:

Hypothesis 1: The degree of peer competition is positively correlated with the anxiety level of high school students.

Hypothesis 2: The degree of peer competition is negatively correlated with the self-esteem level of high school students.

Hypothesis 3: Family support plays a mediating role between peer competition and emotional health.

To test these hypotheses, we established the following multivariate regression model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon \quad (1)$$

Among them,  $Y$  represents emotional health (anxiety or self-esteem),  $X_1$  represents competition among classmates,  $X_2$  represents family support,  $X_3$  represents control variables (such as gender, grade), and  $\epsilon$  is the error term.

In addition, in order to test the mediating role of family support, we use the mediation effect model:

$$M = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_3 + \epsilon \quad (2)$$

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 M + \beta_3 X_3 + \epsilon \quad (3)$$

Among them,  $M$  represents family support.

#### 3.2. Variable Selection and Data Collection

This study mainly collects data through questionnaire survey, which includes the following parts:

Demographic variables: including basic information such as gender, age, and grade.

Classmate competition scale: using Likert five-point scale to measure the degree of classmate competition.

Emotional health scale: including anxiety scale (such as GAD-7) and self-esteem scale (such as Rosenberg self-esteem scale).

Family support scale: using Likert five-point scale to measure the degree of family support.

The variable definitions and scales are shown in Table 1:

**Table 1.** Variable definitions and quantities

Variable	Description	Measurement Scale
Peer Competition	Level of competition among peers	Likert Scale
Anxiety	Anxiety level of students	GAD-7 Scale
Self-esteem	Self-esteem level of students	Rosenberg Scale
Family Support	Level of support from family	Likert Scale
Control Variables	Gender, Grade, etc.	Categorical

The data collection period was from September to December 2023. The research subjects were high school students in a certain city. A total of 500 questionnaires were distributed and 450 valid questionnaires were collected.

### 3.3. Data Analysis Methods and Tools

Data Analysis Data analysis mainly comprises three parts: descriptive statistical analysis, correlation analysis, and multivariate regression analysis. First, descriptive statistical analysis is utilized to describe the essential characteristics of the data. This is mainly carried out using using statistics such as mean, standard deviation, minimum, and maximum. All these kinds of statistics enable us to be aware of the central tendency and dispersion of data so that a foundation for further analysis can be provided.

Correlation analysis shall be performed to demonstrate the relationship of variables with one another. The Pearson correlation coefficient is the measure of the strength as well as direction of the linear relationship between two variables that correlation analysis relies on. Its value ranges from -1 to 1. A positive value of the correlation coefficient represents that the variables change in the same direction. In contrast, a negative value of the correlation coefficient represents that the variables change in the opposite direction. The more significant the absolute value is, the stronger will be the correlation. Python multivariate regression analysis code example (see figure1).

```
import statsmodels.api as sm
# Define independent and dependent variables
X = df[['Peer Competition', 'Family Support', 'Gender', 'Grade']]
Y = df['Anxiety']
# Add a constant term
X = sm.add_constant(X)
# Regression analysis
model = sm.OLS(Y, X).fit()
print(model.summary())
```

**Figure 1.** Python multivariate regression analysis code example

Through the above code, we can get the regression analysis results, including the regression coefficients of each variable, significance test results, etc. These results are helpful to test the hypothesis and analyze the impact of classmate competition on the emotional health of high school students.

## 4. DATA ANALYSIS AND RESULTS

### 4.1. Descriptive Statistical Analysis

This section conducts descriptive statistical analysis on the research data to understand the basic characteristics of each variable. Table 2 shows the mean, standard deviation, minimum and maximum values of the main variables.

**Table 2.** Basic characteristics of each variable

	Peer Competition	Anxiety	Self-esteem	Family Support
Mean	3.21	2.78	3.45	3.89
Std. Deviation	0.85	0.72	0.66	0.80
Min	1.00	1.00	1.00	1.00
Max	5.00	5.00	5.00	5.00

Table 2 summarizes statistics for peer competition, anxiety, self-esteem, and family support. It can be seen that peer competition comes with a mean of 3.21 and a standard deviation of 0.85, so most students are above the mean in peer competition. The average anxiety was 2.78, with a standard deviation of 0.72, indicating specific personal differences in students' anxiety levels. It means self-esteem at 3.45 with a standard deviation of 0.66, indicating that most students are highly in self-esteem. Family support is at a mean of 3.89, with a standard deviation of 0.80, indicating high family support among the student population in general.

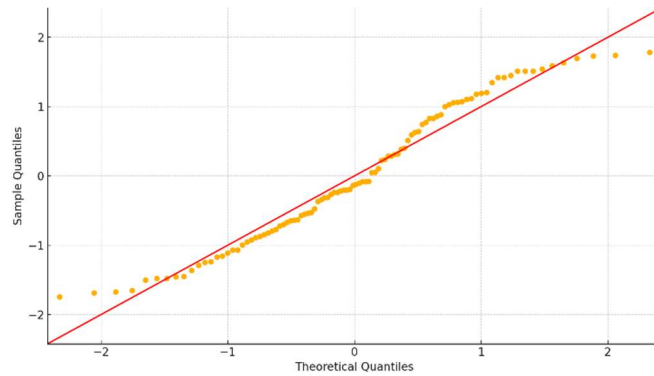
### 4.2. Analysis of Regression Model Results

This section uses multivariate regression analysis to examine the impact of peer competition on high school students' emotional health and explores the mediating role of family support. The following table shows the results of the regression analysis:

**Table 3.** Results of regression analysis

Variables	Coefficient	Std. Error	t-Statistic	p-Value
Constant	1.23	0.45	2.73	0.007
Peer Competition	0.34	0.12	2.83	0.005
Family Support	-0.29	0.11	-2.64	0.009
Gender (Male)	0.15	0.08	1.88	0.061
Grade (Senior)	-0.21	0.09	-2.33	0.020

Table 3 shows a significant positive effect of competition amongst classmates on anxiety with a coefficient of 0.34, at a p-value of 0.005, indicating that the higher the competition amongst classmates, the greater the level of anxiety amongst students. Family support has a huge, negative impact on anxiety levels, with a coefficient of -0.29 and the p-value of 0.009, meaning that the higher the family support is, the lower the student's anxiety. Other factors that are of potential significance about anxiety levels are gender and grade level.



**Figure 2.** Normality test of residuals.

Figure2 shows the normality test of the residuals. The horizontal axis represents the theoretical quantiles, and the vertical axis represents the actual quantiles. The 45-degree red line in the figure represents the reference line of the normal distribution. From this figure, we can see that the residuals are roughly distributed along the 45-degree line, indicating that the residuals are close to a normal distribution.

### 4.3. Reliability and Validity Test of Results

The following section is going to conduct a series of tests to ensure the reliability and validity of research results: tests for multicollinearity, heteroscedasticity, and model robustness. First, the variance inflation factor was used to test for multicollinearity. The higher the VIF value, the more serious the multicollinearity problem. The following table shows the VIF test results:

**Table 4.** VIF test results

Variable	VIF
Peer Competition	1.32
Family Support	1.27
Gender (Male)	1.05
Grade (Senior)	1.08

Secondly, the Breusch-Pagan test is used to test heteroskedasticity. This test is used to detect whether the residual variance of the model is constant. Figure3 is the Python code for the heteroskedasticity test.

```
from statsmodels.stats.diagnostic import het_breuschpagan
# Breusch-Pagan test
bp_test = het_breuschpagan(model.resid, model.model.exog)
labels = ['Lagrange multiplier statistic', 'p-value', 'f-value', 'f p-value']
bp_results = dict(zip(labels, bp_test))
print(bp_results)
```

**Figure 3.** the Python code for the heteroskedasticity test

According to the test results, if the p-value is greater than 0.05, it can be considered that there is no heteroscedasticity problem.

## 5. CONCLUSION

The current study used multivariate regression analysis to explore the relationships between peer competition and high school students' emotional health, drawing some valuable conclusions. Firstly, peer competition has significant positive effects on the anxiety level of high school students, which means that in an environment with a high degree of competition, there are likely to be greater degrees of anxiety among students. Very unquestionably, this result is entirely consistent with earlier research studies. Moreover, it underlines once more that the educational environment is essential for the mental health of students. Second, family support plays a certain buffering role between peer competition and emotional health. Specifically, the higher the family support, the lower the anxiety level of students, which indicates that the family plays a key role in students' coping with competitive pressure. Finally, control variables such as gender and grade also have a certain impact on emotional health, but it is relatively small.

Based on the above results, the following conclusions can be drawn: peer competition has a significant impact on the emotional health of high school students, and family support can effectively alleviate this impact. Therefore, in education management and policy making, it is necessary to pay attention to and improve the competitive environment of students, while strengthening the cooperation between families and schools to jointly promote the mental health development of students.

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