

Factors Influencing the Mental Health Status of Adolescents and Their Analysis

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Abstract:

This article explores how family environment, school education, and academic pressure are the main factors affecting the mental health of adolescents. Analyzed the proportion of depression and anxiety among adolescents caused by family, school, and study. A comprehensive analysis framework was constructed using the Chinese Psychological Health Scale (Simplified Version) and the Depression Scale (Simplified Version) of the Survey Center, as well as multidimensional indicators such as the Generalized Anxiety Disorder Scale (Simplified Version). Using a selection linear regression model to study the effects of family factors, school factors, and social factors on the scores of adolescent mental health scales. Research has found that the frequency of parent-child communication is negatively correlated with the risk of depression and anxiety, and the impact of left-behind status on the risk of mild depression is not statistically significant. The risk of depression and anxiety among left-behind adolescents is still higher than that of non-left-behind adolescents, indicating the importance of the family environment. In the school environment, good teacher-student and peer relationships reduce the risk of depression and anxiety, but the coefficient of the relationship with teachers cannot be accurately estimated in the model due to collinearity issues. Learning stress is complex; moderate stress is beneficial, but excessive stress can be harmful.

Keywords: teenagers, mental health issues, family, school, academic

1. Introduction

In the context of exam-oriented education, teenagers face enormous academic pressure. Factors such as family relationships, interpersonal communication, social competition, diverse values, and online culture

may lead to psychological reactions such as anxiety and tension. A survey shows that the detection rate of depression among Chinese adolescents is 24.6%, with a detection rate of 7.4% for severe depression. The detection rate of depression in primary school is about 1.9% -3.3%, in junior high school it is about

7.6% -8.6%, and in high school it is about 10.9% -12.5%. These data indicate that adolescent psychological problems are trending towards younger age groups. Without timely and effective intervention and resolution, it may lead to negative emotions such as depression, anxiety, and an inferiority complex, and in severe cases, even extreme behaviors such as suicide. In addition, the existence of adolescent mental health problems may also trigger a series of physiological problems, such as insomnia, headaches, indigestion, etc., and may have a negative impact on the cognitive development of adolescents, such as a lack of concentration and memory decline. Adolescent mental health issues not only affect individual growth and development, but also directly relate to the stability of families, schools, and society.

Yang Qi et al. Explored the characteristics of psychosocial factors such as personality characteristics, social support, family environment, and coping style of adolescent patients with depression, and provided the basis for the implementation of psychotherapy for adolescent patients with depression [1]. 36 adolescent patients with depression and 33 normal adolescents were evaluated with the Eysenck Personality Questionnaire (EPQ), the social support rating scale (SSRs), the family environment scale (FES-CV), and the Coping Style Questionnaire (TCSQ), and the results were analyzed. Conclusion unstable personality characteristics, insufficient social support, family environment and poor coping style are closely related to adolescent depression [2]. Yangwenjuan's research on the prevention and intervention of adolescent depression should start from the aspects of mental health education, family education guidance, and the cultivation of social support resources [3]. Zhao Xia's research on primary and secondary school students' depression highlights that the prevention and treatment of students' depression should focus on the psychosocial factors and lifestyle factors that promote depression [4].

Yanzhaoxiu showed that the sources of middle school students' academic pressure: teachers, family, society; Influence: on behavior tendency, emotional health and interpersonal communication; Coping strategies: building a harmonious and orderly campus culture, parents' expectation pressure should be effectively controlled, and the promotion of social support system [5]. Yang Lei's research results show that according to the baseline data of the education tracking survey, using OLS linear regression

model, based on Coleman's family social capital theory and the ecosystem theory of psychology, this paper investigates the impact of middle school students' family social capital and school environmental factors on their mental health. The results show that parent-child interaction and parent-child relationship in family social capital have a significant impact on adolescents' mental health, and adolescents with large intergenerational education expectations have poor mental health [6]. To sum up, adolescent mental health is the result of the interaction of family, school, society and individual factors.

Therefore, this paper aims to explore the social and psychological factors of adolescent depression and the implementation of depression prevention and treatment measures at the family and school levels. The analysis of key influencing factors will help to improve the mental health level of adolescents.

2. Data Selection and Research Methods

2.1 Data Source and Description

In recent years, the superposition of students' mental health problems and learning problems has aroused widespread concern from families and society. In this context, China's data open released the 2024 mental health Blue Book of the development report of Chinese national mental health (2023-2024) on April 23, 2025. According to the two key factors of family and school, the National Mental Health Assessment and Development Center of the Institute of Psychology, Chinese Academy of Sciences, conducted a survey on more than 50000 students from grade 4 of primary school to grade 3 of high school. The three stages of primary school, junior high school, and high school each accounted for about 1/3, of which 51.4% were female students, 48.7% were rural residents, and 33.3% were only children. The survey included 8937 left-behind teenagers. The report showed that the detection rate of depression in high school students was 40%, that in junior high school students was 30%, and that in primary school students was 10% [7]. The variables in Table 1 are the factors that affect adolescents' mental health, and the range of values is the degree to which they affect adolescents' mental health.

Table 1. Defining variables

Variable	Value Range
Left behind status	25%-30%
Parent-child communication	35%-48%
Intimacy between teachers and teenagers	40%-45%

Intimacy between friends, classmates and teenagers	25%-35%
Learning problems	26%-46%
Learning quality	15%-22%

2.2 Method Introduction

The comprehensive analysis framework was constructed by using the Chinese Mental Health Scale (short version) and the Center for Epidemiological Survey Depression Scale (short version), and other multidimensional indicators such as the generalized anxiety disorder scale (short version). Linear regression model was selected to study the influence of family factors, school factors and social factors on the scores of adolescent mental health scale

$$\text{Mental health score} = \beta_0 + \beta_1 \times \text{family atmosphere} + \beta_2 \times \text{academic pressure} + \beta_3 \times \text{social competitive pressure} + \varepsilon$$

β_0 β_1 β_2 β_3 are the regression coefficients, and ε is the error

term. Using the correct formula format, the model is fitted by statistical software, and the estimated values and significance test results of each regression coefficient are obtained, so as to understand the impact of family atmosphere, learning pressure, and social competition pressure on Teenagers' mental health.

3. Data Analysis

3.1 The Intimacy Between Family and Adolescents Determines the Mental Health Index

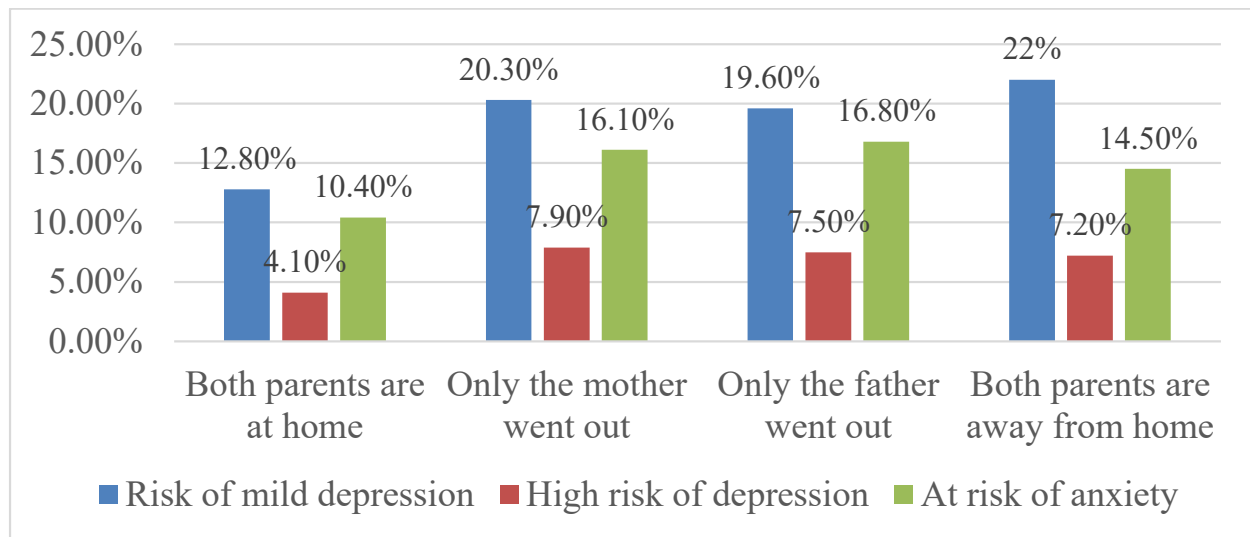


Fig. 1 Distribution of risk proportions of depression and anxiety among adolescents with different left-behind status [7]

Fig. 1 The survey shows that the risk of depression and anxiety among left-behind adolescents is higher than that of non-left-behind adolescents.

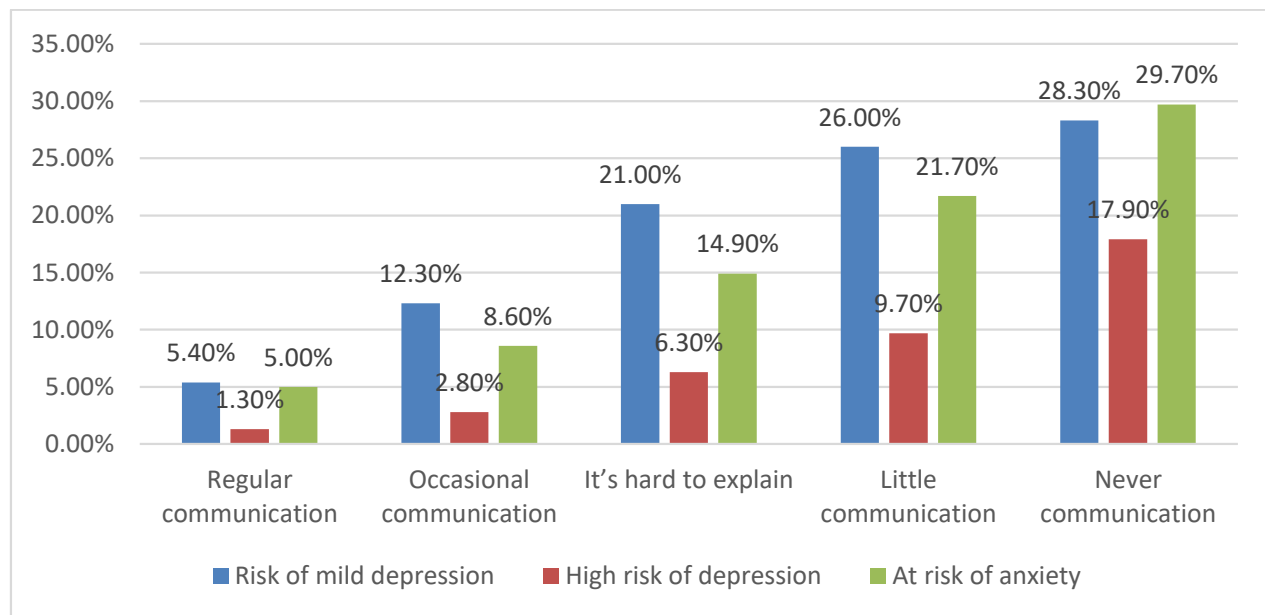


Fig. 2 Distribution of risk proportions of depression and anxiety among adolescents with different parent-child communication frequencies [7]

Fig. 2 The survey shows that the higher the frequency of communication between parents and children, the lower the risk of depression and anxiety in adolescents.

To sum up, a good family environment, positive parenting style, harmonious parent-child relationship, and sound family function are all conducive to the formation of

healthy psychology and sound personality of teenagers, which are the key to comprehensively improving the mental health level of teenagers.

3.2 The Intimacy Between School and Teenagers Determines the Mental Health Index

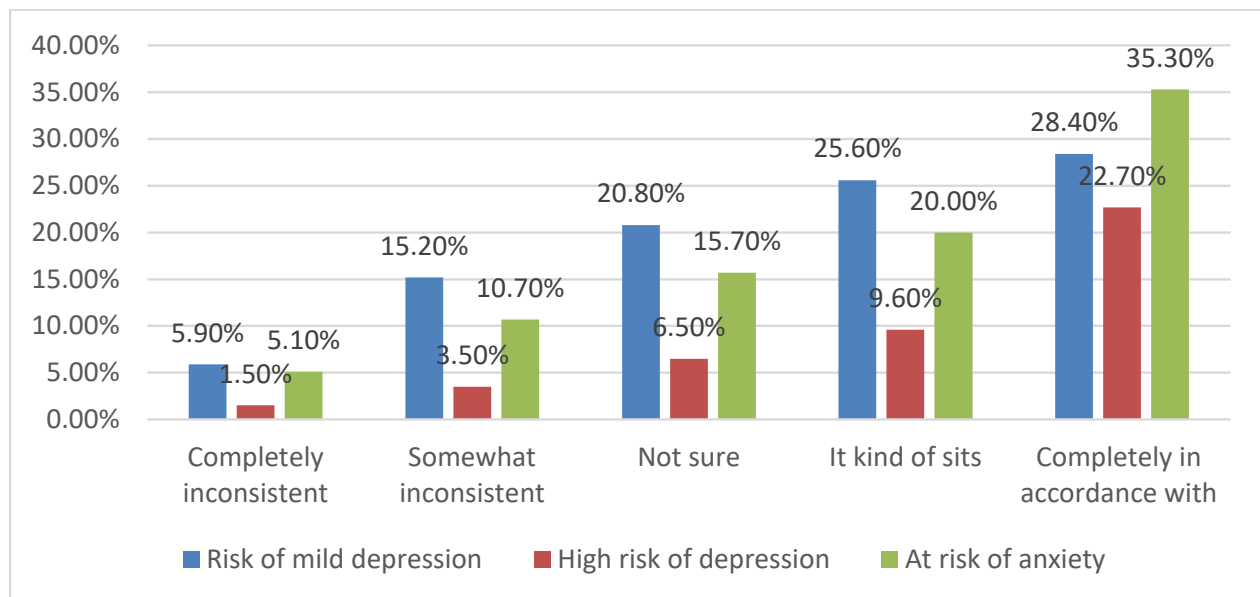


Fig. 3 Distribution of risk proportions of depression and anxiety among adolescents with different degrees of estrangement from teachers [7]

Fig. 3 shows that teenagers who are unfamiliar with their teachers, the more inconsistent with their own situation, the lower the risk of depression and anxiety.

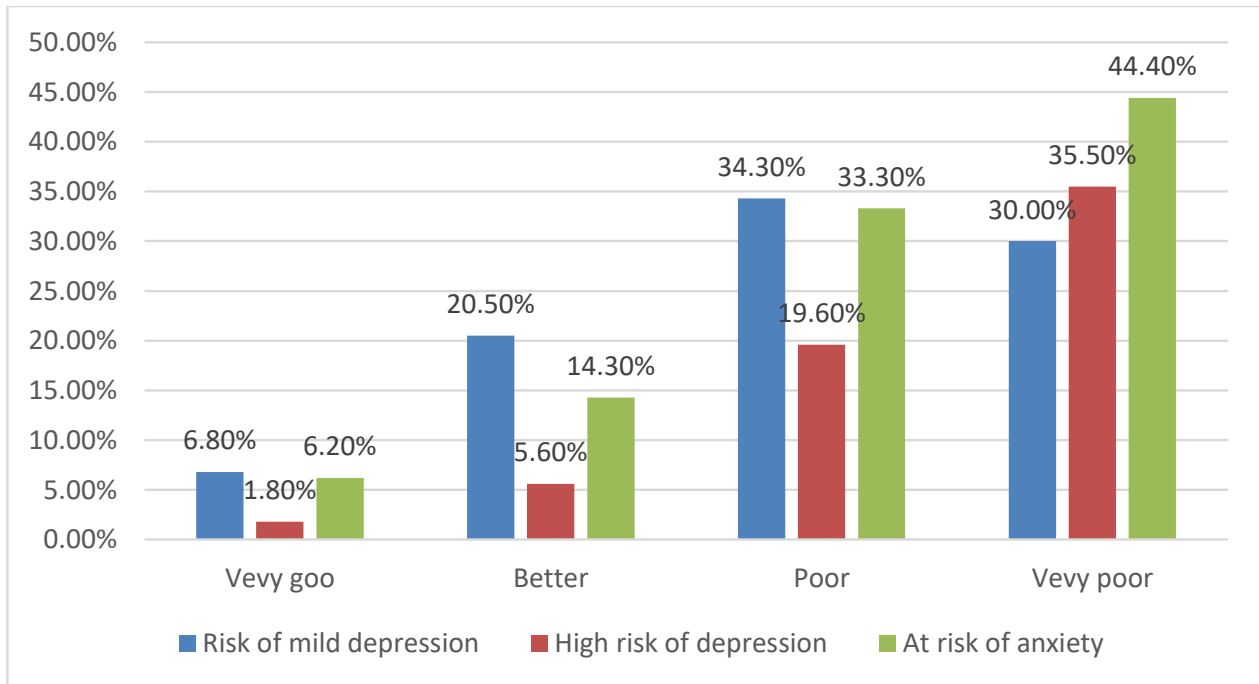


Fig. 4 Distribution of risk proportions of depression and anxiety among adolescents in different groups of classmate relationships [7].

Fig. 4. The survey results show that teenagers who have never been cared for by their friends and have a poor relationship with classmates in the class have different degrees of depression and anxiety risk. In summary, schools

have a significant impact on the mental health of adolescents through various factors.

3.3 Adolescents' Learning Status Determines Their Mental Health Index

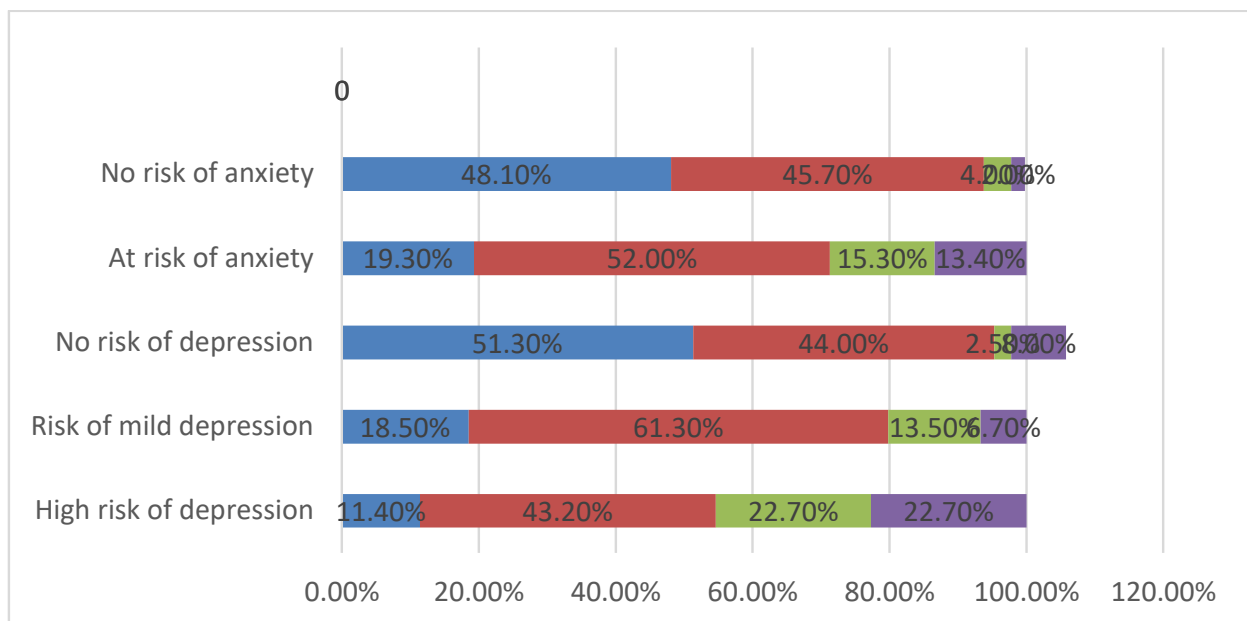


Fig. 5 Distribution of the proportion of people with different mental health statuses who do not want to go to school [7]

Fig. 5 shows that the proportion of adolescents with anxiety risk who have these academic problems is also significant.

cantly higher than those without anxiety risk.

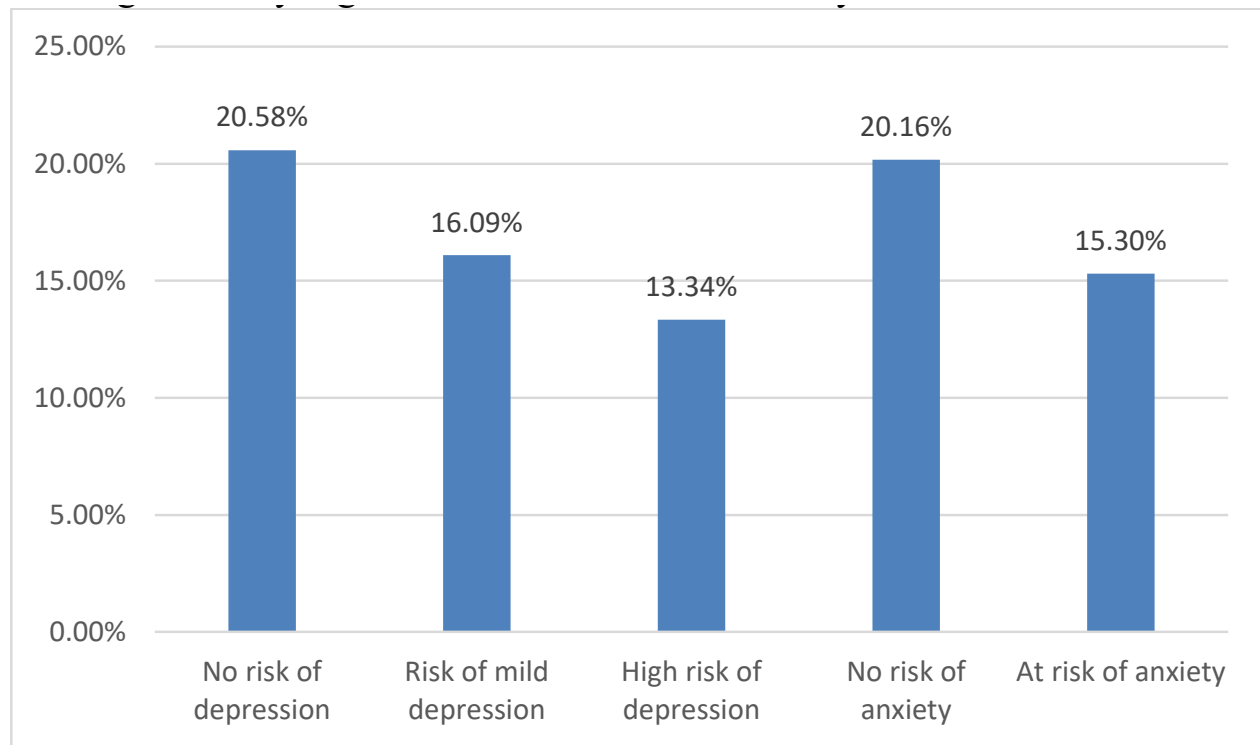


Fig. 6 Academic resilience scores of adolescents with different mental health conditions [7]

Fig. 6 The survey results show that adolescents with the risk of depression and anxiety are significantly less diligent and diligent than those without the risk of depression and anxiety.

To sum up, the impact of learning on mental health is multidimensional and complex. It has a positive role in promoting mental health. It can promote the development of mental toughness through cognitive regulation and behavioral intervention, and may also lead to psychological problems due to pressure or burden.

4. Model Establishment and Solution

This study reduced the collected data of three groups, retaining only the situation of being left behind, communication frequency, and relationship with teachers for quantification. A table 2 of the relationship with mental health was created, and a model was established and analyzed for the data.

4.1 . Linear Regression

Analyze the influence of independent variables on dependent variables.

Table 2. Model verification results

Statistic	Value
Residual standard error	0.029
Degrees of freedom	11
Multiple R-squared	0.871
Adjusted R-squared	0.848
F-statistic	37.26
DF1	2
DF2	11
p-value	1.26×10^{-5}

Table 3. Model results

Variable	Estimated value	standard error	t value	p value
(Intercept)	0.093	0.015	6.109	7.63×10^{-5}
Left-behind situation	0.002	0.007	0.3	0.777
Communication frequency	0.05	0.006	8.341	4.38×10^{-6}
Relationship with teachers	NA	NA	NA	NA

This paper establishes a linear regression model to predict the risk of mild depression. The formula of the model is:

Mild depression risk

= left – behind status + communication frequency

+relationship with teachers

The model includes three independent variables: left-behind status, communication frequency, and relationship with teachers.

According to Tables 3 and 4, the model intercept is 0.093, which means the predicted baseline level of mild depression risk when all independent variables are 0. The p-value of the intercept is less than 0.05, indicating that it is statistically significant, that is, it is caused by non-random errors at the baseline level. The coefficient of left-behind status is 0.002, and the p-value is 0.770, which is much greater than 0.05, indicating that the left-behind status has no statistically significant effect on the risk of mild depression, and its change has little effect on the risk of mild depression. The coefficient of communication frequency is 0.050, and the p-value is much less than 0.05, indicating that the communication frequency has a significant positive effect on the risk of mild depression, and an in-

crease in the communication frequency will significantly increase the risk of mild depression. The coefficient of mental health and teacher relationship is undefined due to collinearity problems, and its impact on the risk of mild depression cannot be estimated.

The overall F statistic of the model is 37.260, and the p value is 0.000, which is much less than 0.05, indicating that the model is statistically significant and at least one independent variable has a significant effect on the dependent variable. The goodness of fit of the model is indicated by the multiple R-squared value of 0.871, indicating that the model explains 87.1% of the variation of the dependent variable. The adjusted R-squared value is 0.848, which provides a more rigorous fit measure after considering the number of variables.

In summary, communication frequency is a significant positive influencing factor for the risk of mild depression, and the left-behind status has no significant effect. The coefficient of relationship with teachers is undefined due to collinearity, and further data or model adjustment is needed to clarify its impact on the risk of mild depression.

4.2 Hypothesis Testing

Table 4. Hypothesis test results

Statistic	Value
t	9.34
Degrees of Freedom	13
p-value	3.95
95% Confidence Interval	[0.1447346, 0.2318368]
Sample Mean	0.1882857

In the next step, this paper conducted a t-test on the mild depression risk variable to test whether its mean is significantly different from zero. According to Table 5, the t value is 9.340, the degree of freedom is 13, the p value is 3.95×10^{-7} , and the sample mean is 0.188. The 95% confidence interval is [0.149, 0.232], and there is 95% confidence that the true mean falls within this interval. Since the p-value of the t-test is much less than 0.05, there is sufficient evidence to reject the null hypothesis, that is,

the mean of the mild depression risk is statistically significantly different from zero. The analysis of this study shows that communication frequency is a significant factor affecting the risk of mild depression, while the effect of left-behind status is not significant. The potential impact of the relationship with the teacher was not accurately estimated in the model due to collinearity problems, which suggests that a deeper exploration of the data or consideration of other model forms is needed to better understand

the impact of this variable. These findings provide this paper with an in-depth understanding of the factors affecting the risk of mild depression and provide a basis for future research directions.

4.3 Model Diagnostics

In the process of hypothesis testing of linear regression models, this paper focuses on three core assumptions: random distribution, homoscedasticity, and normality.

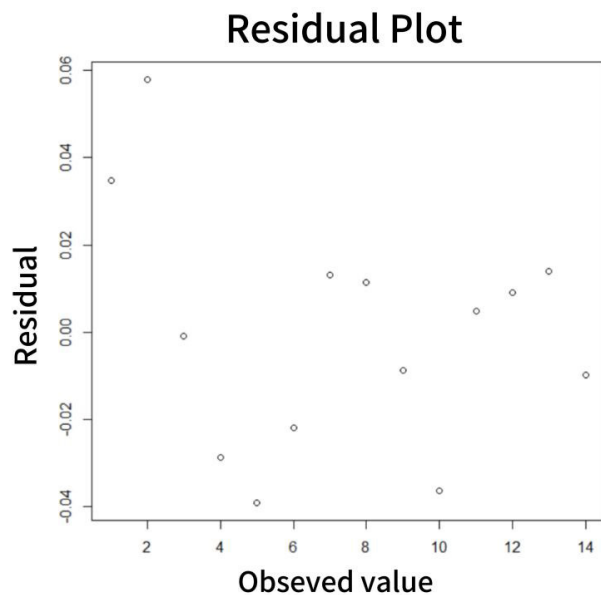


Fig. 7 Residual distribution diagram

Fig. 7 shows the random distribution of the model residuals. Ideally, the residuals should be randomly distributed around 0 without obvious patterns or trends. The observations show that the residual points are randomly distributed above and below 0 without forming an obvious pattern, indicating that the model meets the linear relationship and independence assumptions. Second, homoscedasticity was evaluated. Homoscedasticity requires that the residuals are evenly distributed in the horizontal direction and the variance does not change with the predicted value. There is no funnel or fan-shaped distribution in the residual plot, indicating that the variance assumption is generally established and there is no obvious heteroscedasticity problem. Finally, the normality assumption was considered. Although the residual plot cannot directly verify normality, the residuals should be randomly distributed around 0 without obvious skewness. Despite the small sample size, the residual plot did not show obvious skewness, so the Shapiro-Wilk test was used for further verification. The Shapiro-Wilk normality test results are W value 0.959 and p value 0.707. The closer the W value is to 1, the closer the data is to a normal distribution. The W value of the result is close to 1, indicating that the model residuals are

close to a normal distribution. The p-value of 0.707 is much greater than 0.05, indicating that there is insufficient evidence to reject the null hypothesis that the residuals satisfy a normal distribution. Therefore, the model residuals satisfy the normality assumption, which is an important condition for the validity of the linear regression model.

4.4 Model Summary

In the present study, a linear regression model was developed to investigate the impact of left-behind status, communication frequency, and relationship with teachers on the risk of mild depression. The coefficient for left-behind status was 0.002, which suggests that for each unit increase in left-behind status, the risk of mild depression increases by an average of 0.002 units. However, with a p-value of 0.770, this effect is not statistically significant ($p > 0.050$), indicating a limited impact on the risk of mild depression.

The model's intercept was 0.093, representing the baseline level of mild depression risk when all independent variables are zero. Communication frequency had a coefficient of 0.050, with a p-value significantly less than 0.001, indicating a strong positive association with the risk of mild depression. The relationship with teachers could not be defined in the model due to multicollinearity, preventing firm conclusions from being drawn.

To enhance the credibility of the findings regarding factors affecting mental health, increasing the sample size and modifying the model are planned.

5. Model Optimization

5.1 Optimization Ideas

This paper re-quantified the data based on Figs 1-4 in 3.2 and constructed a comprehensive index using the weighted average method to evaluate the impact of left-behind conditions, communication frequency, relationships with teachers, and relationships with classmates on mental health. In this index, the weights of mild depression risk, high depression risk, and anxiety risk were set at 0.300, 0.500, and 0.200, respectively. Through calculation, the study obtained the comprehensive impact index of these four factors, which were 52.200, 70.960, 75.200, and 84.860, respectively. These indices quantify the comprehensive impact of each factor on mental health.

5.2 Optimization Process

This optimization process uses the comprehensive impact index to simulate the relationship between mental health

and various factors. By setting a random seed to ensure data repeatability, a data frame containing the comprehensive impact index is created. It is assumed that the mental health score is negatively correlated with the index; that is, the higher the index, the lower the score, which is achieved by subtracting the index from 100 and adding normal noise with a mean of 0 and a standard deviation of 5. This simulates the variability of real data and makes the analysis closer to reality.

For hypothesis testing and ANOVA, a repeated data set was created, with each factor repeated 10 times, adding normal noise with a mean of 0 and a standard deviation of 2. Normal noise with a mean of 0 and a standard deviation of 5 was also added to the mental health score.

The median of the comprehensive impact index was calculated as 73.080, which was used as the hypothesis value of the one-sample t-test. The t-test is used to test whether the sample data is significantly different from the median. This study generates sample data and performs a t-test.

The t-statistic for the stay-behind status is -51.802, the p-value is $1.870e-12$, and the confidence interval (52.924, 71.394) does not include the median 73.080, indicating a significant difference. Other factors also show significant differences from the median.

The results show that the combined impact index of these factors is significantly different from the median hypothesized value, indicating that their impact on mental health may be significantly different from the median level.

Table 5. Optimization data results

(Intercept)	89.583
Standard error (Std.Error)	15.261
t value	5.87
P-value (Pr>)	t
Comprehensive Impact Index (InfluenceIndex)	-0.838
Standard error (Std.Error)	0.213
t value	-3.943
P-value (Pr>)	t
Residual standard error	5.044
Multiple R-squared	0.886
Adjusted R-squared	0.829
F-statistic	15.54
Degree of Freedom (DF)	1 and 2
p-value	0.05873

This paper analyzes the relationship between the comprehensive influence index and mental health and establishes a model: MentalHealth~InfluenceIndex. According to Table 5, the coefficient of the comprehensive influence index is estimated to be -0.838, the standard error is 0.213, the t value is -3.943, and the p value is 0.059. Although the p-value is slightly higher than 0.05, indicating that it is not completely significant statistically, it is close to 0.05, suggesting that there may be a negative correlation.

The R-squared of the model is 0.886, and the adjusted R-squared is 0.829, indicating that the model can explain about 88.6% of the variation in mental health scores, and

the adjusted R-squared also shows that the model has strong explanatory power. The F statistic is 15.54, and the p value is 0.059, which is slightly higher than 0.05, indicating that the overall model is not completely significant at the 95% confidence level, but the high R square value indicates that the comprehensive influence index has a strong explanatory power for mental health scores.

In summary, although it is not statistically significant, the high R-squared value shows that the comprehensive influence index is an important predictor of mental health scores.

Table 6. Coefficient confidence interval

Coefficient	Lower limit of 95% confidence interval	Upper limit of 95% confidence interval
Intercept	23.92	155.247
Comprehensive Impact Index	-1.753	0.077

At the final stage of model analysis, this study examined the confidence intervals of the coefficients to assess the reliability of the coefficient estimates in the model. According to Table 6, for the intercept, the 95% confidence interval is [23.920, 155.247], which means that there is 95% confidence that the true intercept value is within this interval. For the coefficient of the comprehensive impact index, the 95% confidence interval is [-1.753, 0.077]. Since this interval contains 0, this indicates that at the 95% confidence level, the coefficient of the comprehensive impact index may not be significant, that is, it may not have a significant effect or have a small effect on the mental health score.

Secondly, the results of the analysis of variance (ANOVA) provide a test of the overall significance of the model. The F value in the ANOVA table is 97.140, and the corresponding p value is less than 0.000002, which is much less than 0.05, indicating that at least one predictor variable in the model has a significant predictive effect on the mental health score. The degrees of freedom of the model are 3, indicating that three influencing factors are taken into account, and the degrees of freedom of the residual are 36.

In summary, although the confidence interval analysis shows that the coefficient of the comprehensive impact index may not be significant, the variance analysis results strongly indicate that at least one influencing factor in the model has a significant effect on the mental health score. This difference may be due to the small sample size or the presence of other unconsidered variables in the model. Therefore, further research may need to increase the sample size or consider other potential influencing factors to more accurately assess the specific effects of each influencing factor on mental health. At the same time, considering the high F value and very low p value of the model, it can believe that the model as a whole has a good explanatory power for mental health scores.

The analysis results show that adolescent mental health is affected by multiple factors such as left-behind status, communication frequency, and teacher-student and peer relationships. Although the negative correlation between the comprehensive impact index and mental health scores was not completely significant in some statistical tests, the high R-squared value and variance analysis showed that these factors had a significant impact. In the growth

of adolescents, the family, school, and peer environment interweave to affect mental health, and comprehensive consideration and measures should be taken to promote their mental health.

6. Conclusion

This paper constructs an analytical framework and uses a linear regression model to explore the impact of family environment, school education, and learning pressure on adolescent mental health. The study found that the frequency of parent-child communication is negatively correlated with the risk of depression and anxiety, and the impact of left-behind status on the risk of mild depression is not statistically significant. Despite this, the risk of depression and anxiety among left-behind adolescents is still higher than that of non-left-behind adolescents, showing the importance of the family environment. In the school environment, good teacher-student and peer relationships reduce the risk of depression and anxiety, but the relationship with the teacher has a coefficient that cannot be accurately estimated in the model due to collinearity problems. Learning pressure is complex; moderate pressure is beneficial, but too high pressure is harmful.

The linear regression model shows that the frequency of communication is the only independent variable that statistically significantly affects the risk of mild depression. The entire model is statistically significant and can explain 87.14% of the variation in the dependent variable. This result shows that factors such as family, school, and learning have an important impact on adolescent mental health.

The study reveals the impact of family, school, and learning factors on mental health, but also points out shortcomings. It is recommended that future studies use more complex models and optimize data collection and model construction to accurately estimate the impact of teacher-student relationships.

In conclusion, this article provides empirical evidence for understanding the factors affecting adolescent mental health and provides a useful reference for families, schools, and society in mental health education and intervention. By improving the family environment, optimizing school education, and rationally regulating learning pressure, it can effectively improve the mental health level

of adolescents and promote their all-around development.

Authors Contribution

This article was jointly completed by Jiang Kunyan and Li Hongyu. They made equal contributions, and the order of their names is arranged alphabetically.

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