

Family Factors and Adolescents' Academic Performance

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Abstract. Family is one of the most significant environments in children's development, thus family factors have an important influence on adolescents' personal growth. To provide a theoretical basis for pedagogy research and helpful guidance for parents and teachers to educate children, this study explores the impact of various family factors on adolescents' academic performance, including family size, parent's cohabitation status, parent's educational level, parent's job, family educational support, and the quality of family relationships. This study uses data from secondary school students from Portugal, which contains information on student's families and grades. This study uses ANOVA and Pearson correlation coefficient to analyze the relationship between family factors and adolescents' academic performance. Then, this study uses multiple linear regression analysis and stepwise regression to analyze the impact. Results show that parent's educational level and the quality of family relationships could both affect adolescents' grades. Besides, the impact of the mother's educational level is most significant.

Keywords: Family, Adolescent, Academic performance, impact.

1. Introduction

Studying the effects of family factors on adolescents' academic performance has important theoretical implications. Family factors in this study include family size, parent's cohabitation status, parent's educational level, parent's job, family educational support, and the quality of family relationships.

The factors that influence adolescents' academic performance are complex and diverse. As for the impact of schools, extracurricular activities and co-extracurricular activities such as clubs, library visits, and labs could improve students' group learning skills and cultivate students' interests [1]. Students' performance could also be influenced by the school's learning environment, learning and teaching material in school, and school management [2]. Moreover, according to Haylee's research, academic support from the closest same-sex friends could positively affect adolescents' academic performance, by increasing students' engagement [3].

In addition to the above aspects, family is one of the most significant environments in children's development, greatly affecting their behavior and thoughts [4]. All of the family's factors and changes could impact adolescents' character, development, and physical and mental health. Ullah's study also shows that the family's financial situation and the parent's attitude toward a student's academic performance could both greatly affect students' grades [1]. However, the study fails to present the degree of the impact, including which factor's impact is more significant and influencing factors' ability to explain academic performance. Additionally, most studies about family factors and academic performance only addressed the effect of family structure, which means the single-parent family and two-parent family. Uwaifo's study shows that students from two-parent families usually have better academic performance [5]. However, the influence of other family factors, such as family size and parents' education and jobs, on students' academic performance has not been given adequate attention in research.

In this study, eight potential influencing factors were involved, including family size, parents' cohabitation status, mother's education, father's education, mother's job, father's job, family educational support, and the quality of family relationships. This study aims to explore the impact of family factors on adolescents' academic performance.

2. Research Methods

2.1. Data

This study is based on a dataset published on Kaggle by UCI Machine Learning. The data was obtained from a survey of students in Portuguese language courses in two secondary schools. The two schools were Gabriel Pereira and Mousinho da Silveira. The dataset contains a lot of interesting information from students about their gender, family, and studies [2].

A total of 649 adolescents were included, of whom 383 were female and 266 were males, and the mean age was 16.74.

2.2. Variables and Measures

To study the impact of family factors on students' academic performance, it selects some of the data to be the variables in our research. The independent variables and their measures are shown in Table 1.

Table 1. Variables and measures

Variables	Measures
Pstatus	parent's cohabitation status (binary: 'T' - living together or 'A' - apart)
famsize	family size (binary: 'LE3' - less or equal to 3 or 'GT3' - greater than 3)
Medu	mother's education (numeric: 0 - none, 1 - primary education (4th grade), 2 – 5th to 9th grade, 3 – secondary education or 4 – higher education)
Fedu	father's education (numeric: 0 - none, 1 - primary education (4th grade), 2 – 5th to 9th grade, 3 – secondary education or 4 – higher education)
Mjob	mother's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at_home' or 'other')
Fjob	father's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at_home' or 'other')
famsup	family educational support (binary: yes or no)
famrel	quality of family relationships (numeric: from 1 - very bad to 5 - excellent)

As for the dependent variable, it uses the sum of G2 and G3, which are the second period grade (numeric: from 0 to 20) and the final grade (numeric: from 0 to 20, output target). Considering the accuracy of the outcome, it chooses to use the sum of two grades, reducing the impact of chance on outcomes.

2.3. Methods of Data Analysis

R studio was used for data analysis in this study. Firstly, the data were analyzed descriptively and visually. Then, it removed the omitted values. Thirdly the ANOVA method was used to analyze the relationship between parents' cohabitation status, family size, educational level, job, family educational support, and quality of family relationship and adolescents' academic performance. Then, the Pearson correlation coefficient was used to analyze the linear correlation between the independent variables and the dependent variable. Finally, the multiple linear regression model, which was optimized by stepwise regression, was used to analyze the effect of independent variables on the dependent variable, including whether there was an effect and the significance of the effect.

3. Results

Table 2 presents the results of the ANOVA.

Table 2. ANOVA results

	Df	F value	Pr
Pstatus	1	0.145	0.704
famsize	1	1.186	0.276
Medu	1	39.16	7.37e-10
Fedu	1	29.41	8.48e-08

Continue Table 2.

Mjob	4	6.71	2.75e-07
Fjob	4	3.452	0.0084
famsup	1	3.057	0.0809
famrel	1	3.981	0.0465

As shown in Table 2, there were no significant relationships between parent’s cohabitation status ($p>0.05$), family size ($p>0.05$), and family educational support ($p>0.05$) and the academic performance of students. However, statistically significant differences were found in parent’s educational level ($p<0.05$), job ($p<0.05$), and quality of family relationships ($p<0.05$). Therefore, there were significant relationships between them and adolescents’ grades.

After examining the relationship between the independent and dependent variables, it further explored the degree of linear correlation between parent’s educational level, parent’s job, family educational support, quality of family relationship and adolescents’ academic performance by Pearson correlation coefficient. Fig. 1 presents the results.

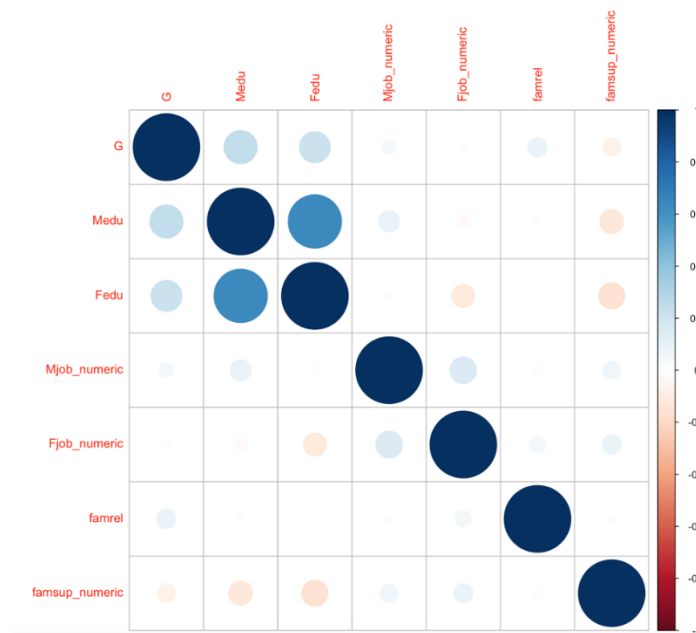


Fig. 1. Pearson correlation coefficient analysis (Photo/Picture credit: Original).

Fig. 1 shows that both the mother’s educational level ($r\approx 0.2464$) and the father’s educational level ($r\approx 0.2151$) have a positive linear correlation with students’ grades, meaning that a higher mother’s educational level slightly relates to a higher student’s grade, which is the same as the father’s. The plot presents that parent’s jobs ($r\approx 0.0463$ and $r\approx 0.0184$) are also linearly correlated to academic performance, but the relation is so weak that it could neglect. In addition, the quality of family relationships has a positive linear correlation with grades ($r\approx 0.0808$), and family educational support has a negative linear correlation with grades ($r\approx -0.0708$), but both relationships are weak.

Through multiple linear regression analysis and further stepwise regression analysis to optimize the model, it obtained Table 3.

Table 3. Multiple linear regression

	Estimate	Std. error	t value	Pr (> t)
famsizeLE3	0.7620	0.5180	1.4710	0.1418
Medu	0.9757	0.2723	3.5830	0.0004
Fedu	0.5601	0.2815	1.9900	0.0471
famrel	0.5026	0.2512	2.0010	0.0458

It developed a linear model of the adolescents' academic performance as a function of family factors including "famsize", "Medu", "Fedu", and "famrel". The model was significant ($F(4, 603) = 12.34, p < 0.00$).

According to the result, student's grades are positively associated with the mother's educational level, the father's educational level, and the quality of the family relationship. Moreover, the linear relationship between the mother's academic level and the adolescent's grade is most significant.

4. Discussion

4.1. Findings

This research reveals that family factors, including the mother's education, the father's education, and the quality of family relationships, could impact adolescents' academic performance. All of the three family factors have a positive correlation with adolescents' academic performance. Furthermore, the mother's educational level has the most significant effect on students' grades. Whereas family size, parent's cohabitation status, parent's jobs, and family educational support have no significant effect on academic performance. Firstly, since a high intelligence quotient is associated with higher academic performance, parents' educational level is probably related to their IQ to some degree [6]. The IQ of children is inherited from their parents. In most cases, the children's level of intelligence is consistent with that of their parents. Therefore, the higher the parent's educational level is related to the higher intelligence level of their children, which could cause a higher academic performance of their children. Furthermore, parents with higher education levels could help adolescents with their homework and exams and give helpful suggestions for learning skills [7]. Educated parents could create a better family environment that is suited for study for adolescents [8]. Additionally, according to the research from Danna Naurzalina, the absence of pedagogy of parents will affect the efficiency of the socialization of children in the family. Therefore, the pedagogical culture of parents is significant to the children's successful family socialization, which is important to their personal development and the formation of their character, and further affects their academic performance [9].

However, the reason why a mother's educational level has a much greater impact on an adolescent's academic performance than a father's is still unknown. One possible hypothesis is that the mother is often involved in children's education more than the father.

In addition, higher quality of the family relationship is associated with better adolescent academic performance. By adding psychological distress to adolescents, family conflicts can greatly reduce academic performance [10]. According to studies, positive family relationships are associated with a high level of well-being [4]. Adolescents living in families with high-quality family relationships can have better mental conditions and a more positive attitude toward life than those living in families with bad relationships. Therefore, adolescents in families with good relationships are more likely to acquire high academic performance.

4.2. Limitations

However, there are some limitations in this study. Firstly, the sample size of the data in this study is small, with only 649 students. Moreover, since all of them only come from two secondary schools' Portuguese courses in Portugal, the randomness of the data is very poor. Therefore, the generality of

the findings is limited, and it's difficult to avoid special circumstances. To improve the study, surveying adolescents who come from different countries, including developing and developed countries, is a good method. Moreover, the researcher can randomly sample students at different levels of secondary schools to increase the sample size.

Besides, since the low adjusted R^2 of the multiple linear regression model, the family factors in this study have limited explanatory power for adolescents' academic performance. In terms of enhancement, the researcher can include other possible family factors, such as the family's economic level and parenting styles. Moreover, the researcher could explore whether there is any difference in the degree of influence on adolescents of different genders.

5. Conclusion

By analyzing the data of 649 Portuguese secondary school students, this study finds that parent's education level and the quality of family relationships can affect adolescents. The impact of the mother's education level is most significant. However, there is no significant correlation between family size, parent's cohabitation status, parent's jobs, and family educational support. Parents with high education levels could provide genes of high IQ and offer help with children's studies. Besides, high-quality family relationships could lead to healthy mental conditions and a positive attitude to life. All of them could contribute to good academic performance.

The findings in this study could provide a theoretical basis for further pedagogy research. This study presents the impact of parent's educational background and family relationship quality on student's grades, which can help people have a better understanding of the equality of education.

This study can help parents to understand their behavior's influence on children's academic performance. Therefore, they can improve their parenting style and enhance the quality of family relationship, which is beneficial to adolescent development. Besides, this study guides government and education departments to develop policies that offer more educational resources for families with low parental educational levels. Furthermore, this study could help schools and teachers take different educational approaches to meet the needs of students with diverse family situations.

The effects of family factors on adolescents are complex and diverse, and there are various relationships between those factors. In future studies, researchers could conduct interaction analysis to explore the compound effect between the variables. For instance, whether the effect of the quality of family relationships on adolescent's academic performance is influenced by another family factor. With further research, an understanding of how family influences adolescents' academic performance can be improved, which could promote adolescents' personal growth and help them achieve their goals.

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