

# Is the Self-efficacy of Single Kid in Remote Education Higher?

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**Abstract:** This study uses the PISA database to explore the impact and mechanism of the family background of only children on self-efficacy in distance education. The analysis results show that (1) family background prominent and positively predicts self-efficacy; (2) Self educational expectations partially mediate the connection between family background and self-efficacy; (3) The direct effect of family background on self-efficacy and the mediating effect of self-education expectations are both moderated by the presence or absence of only children: family background in non only child families has a stronger predictive effect on self-education expectations than in only child families; The impact of family background on self-efficacy and self-education expectations on self-efficacy is stronger in only child families than in non only child families. This study is beneficial in revealing the pathways and influence of the family background of only child and non only child families on self-efficacy under distance education, which has certain implications for demographic research related to social fertility.

**Keywords:** Distance education; Expectations for self-education in distance education; Single-kid; Self Efficacy; Family Background.

## 1. 1. Introduction

The education industry divides the influencing factors of students' academic performance into external factors and internal factors, with external factors including school and family factors. For example, the Coleman Report pointed out that the most important factor affecting student academic success is family background, and this factor has a sustained impact. [1] Internal factors refer to individual factors of students, among which self-efficacy is an internal factor. And efficacy refers to a psychological expectation of an individual's ability to successfully complete tasks. [2] Therefore, this study focuses on exploring the relationship between family background in the external environment and self-efficacy of internal factors. Some existing studies have also focused on the connection between family background and self-efficacy, while others have focused on the mediating function of family support and the moderating function of gender. [3] Some pay more attention to the mediating effect of self-efficacy as a mediator between family background and other factors. [4] At the same time, there are abundant research results in the academic community on family background and self-education expectations. Scholars are highly concerned about the stratification of educational expectations, and some researchers have proposed that self-education expectations can also significantly affect student academic performance. [5] These studies indicate a strong

correlation among family background and self-efficacy, as well as between family background and self-education expectations. However, few studies have explored the connection among family background and self-efficacy, as well as between family background and self-education expectations, from the perspective of secondary distance education. Therefore, this study proposes that

H1: Family background positively predicts self-efficacy

H2: Self educational expectations can effectively regulate the connection between family background and self-efficacy

Moreover, the scale of family fertility is closely related to the family resources that children can access. A study has found that a decrease in family fertility can help improve academic performance. [6] Will there be significant differences between single-kid families and non single-kid families? Here, this study sets whether being an single-kid is a moderating variable and proposes

H3: Whether being an single-kid significantly moderates the connection between family background and self-efficacy

H4: Whether being an single-kid significantly moderates the mediating effect of self-education expectations on family background and self-efficacy

In summary, this study takes self-education expectations as a mediating variable and whether single-kid is a moderating variable to explore the connection between family background and self-efficacy. The hypothetical diagram of its model is as follows (as shown in Figure 1):

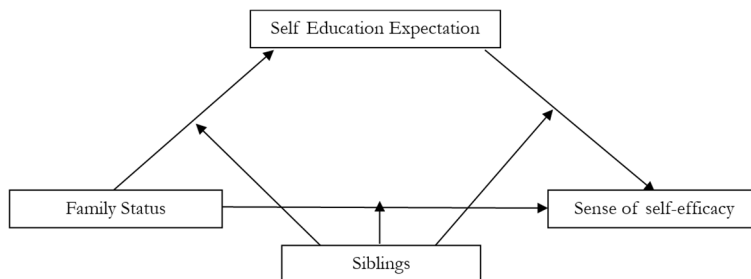


Figure 1. Hypothetical model

## 2. Research Methods

### 2.1. Data Sources

This study used the International Student Assessment Program (PISA) database led by the Organization for Economic Co-operation and Development, with the main test subjects being 15-year-old junior high school students. This study selected countries and regions from the PISA2022 database that have been closed for more than 1 year and have implemented distance education for all students based on test questions ST347Q01JA and SC214Q01JA as the data for this study. After data cleaning, SPSS 25.0 and the SPSS macro program PROCESS developed by Hayes in 2013 were used to organize and analyze the data.

### 2.2. Variable Definition

**2.2.1 Family background.** In PISA, the Family Socio Economic and Cultural Background Index (ESCS) is composed of three indicators: family wealth index, parental education level, and occupational status. This study intended to use this indicator as the research object.

**2.2.2 Self Efficacy Perception.** PISA estimates the Self Efficacy Index (SDLEFF) of students in digital learning using Item Response Theory (IRT), which measures the degree of independence and positive attitude of students in digital learning. This study included this index as a measure of student self-efficacy.

**2.2.3 Self Education Expectations.** PISA uses the International Academic Degrees Code (ISCED) to divide educational levels into eight levels. A questionnaire is used to

test the highest educational level that students expect to achieve, thereby generating the Self Education Expectations Index (EXCECEDU)

**2.2.4 Whether it is an single-kid or not.** PISA2022 uses the test question ST230Q01JA to test the number of brothers and sisters in a student's family. In the scale, the number 1 represents 0 siblings, the number 2 represents 1 siblings, the number 3 represents 2 siblings, and the number 4 represents 3 or over siblings. This research recoded it in the way that the number 1 represents single-kid, and the number 0 represents non single-kid, and obtains a binary variable of whether or not the single-kid is an single-kid as a regulating variable.

## 3. Result Analysis

### 3.1. Descriptive statistics, independent sample t-tests, and correlation analysis

The independent sample t-test results (Table 1) indicate that the family background ( $p < 0.001$ ), self-efficacy ( $p < 0.001$ ), and self-education expectations of single-kidren ( $p < 0.001$ ) are significantly higher than those of non single-kid families. The partial correlation analysis results (Table 2) indicate that self efficacy is positively correlated with family status ( $p < 0.001$ ) and self education expectation ( $p < 0.001$ ), and that single-kidren have significantly higher self-efficacy ( $p < 0.001$ ) than non single-kidren. There is a significant positive correlation among self-education expectations and family background ( $p < 0.001$ ), and the family background and self-education expectations of single-kidren ( $p < 0.001$ ) are significantly higher than those of non single-kid families.

**Table 1.** Summarize statistic and comparison of main variables between single kid and non-single kid

Variable	Mean	SD	Group	Mean $\pm$ SD	95%CI		T-test	
					Upper	Lower	t-value	p
Sense of self-efficacy	482.519	90.445	Non-single Kid	0.026 $\pm$ 0.969	0.021	0.030	-9.118	<0.001
			Single Kid	0.097 $\pm$ 0.989	0.111	0.082		
Family Status	-0.266	1.103	Non-single Kid	-0.210 $\pm$ 1.088	-0.205	-0.215	-9.068	<0.001
			Single Kid	-0.139 $\pm$ 0.974	-0.125	-0.154		
Self Education Expectation	0.172	5.632	Non-single Kid	6.95 $\pm$ 2.040	6.94	6.96	-8.556	<0.001
			Single Kid	7.08 $\pm$ 1.947	7.11	7.05		

\*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$

**Table 2.** Correlation analysis of main variables

Variable	Sense of self-efficacy	Family Status	Self Education Expectation	Siblings
Sense of self-efficacy	1.000			
Family Status	0.149***	1.000		
Self Education Expectation	0.176***	0.146***	1.000	
Siblings	0.019***	0.020***	0.017***	1.000

\*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$

### 3.2. Moderated mediation model testing

According to Wen Zhonglin and Ye Baojuan (2014), testing the parameters of three regression equations is necessary for the moderated mediation model test. Equation 1 estimates the moderating impact of single-kids or not on the connection among family background and self-efficacy, while controlling for family background and study time. Equation 2 estimates the moderating effect of single-kids or not on the connection between family background and self-education expectations. Equation 3 estimates the moderating effect of single-kids or not on the connection between self-education expectations

and self-efficacy.

The processing results after parameter centralization indicate (Table 3) that in Equation 1, family background prominent and positively predicts self-efficacy ( $\beta = 0.130$ ,  $t = 0.002$ ,  $p < 0.001$ ), hypothesis 1 holds. And the interaction within family background and single-kids or not has a evident predictive effect on self-efficacy ( $\beta = 0.051$ ,  $t = 0.008$ ,  $p < 0.001$ ), indicating whether being an single-kid significantly moderates the connection between family background and self-efficacy, hypothesis 3 holds.

In Equation 2, family background significantly positively predicts self-education expectations ( $\beta = 0.318$ ,  $t = 71.39$ ,

$p < 0.001$ ), and the interaction term of family background and whether one child is only has a significant predictive effect on self-education expectations ( $\beta = 0.121, t = 7.57, p < 0.001$ ). This indicates whether being an single-kid moderates the connection between family background and self-education expectations.

In equation 3, significant positive prediction of academic scores from family background ( $\beta = 0.279, t = 62.61, p < 0.001$ ), self-education expectations significantly positively predict academic scores ( $\beta = 0.301, t = 60.08, p < 0.001$ ), and has a partial mediating function in the impact of teacher engagement on self-efficacy, with a relative effect of 16.54%.

Hypothesis 2 is valid. The interaction between family background and being only has a significant predictive effect on self-efficacy ( $\beta = 0.114, t = 7.10, p < 0.001$ ), the interaction term between self-education expectations and whether one is an single-kid has a significant predictive effect on self-efficacy ( $\beta = -0.046, t = -2.89, p < 0.001$ ). In summary, whether being an single-kid moderates the effects of family background on self-efficacy, family background on self-education expectations, and self-education expectations on self-efficacy, that is, it moderates the direct effect of family background on self-efficacy and the mediating effect of self-education expectations, Hypothesis 4 is valid.

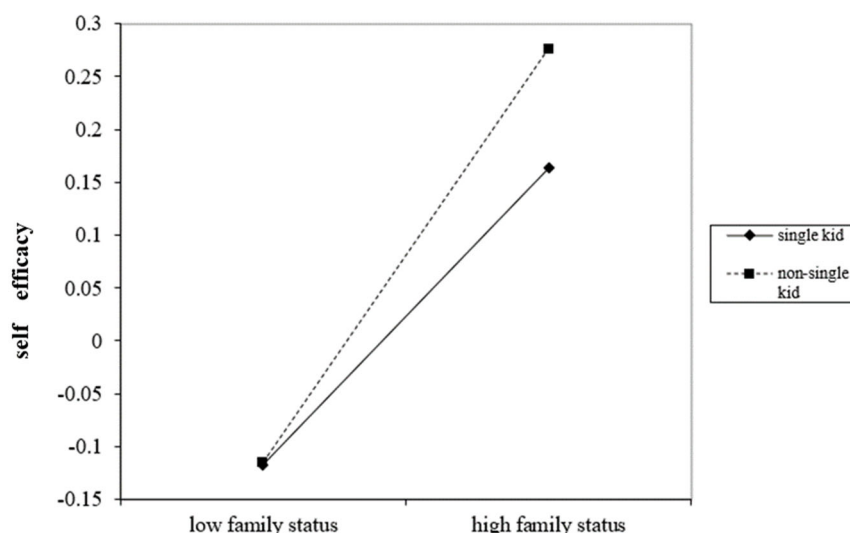
**Table 3.** An examination of the moderating mediating effect of family status on sense of self-efficacy

Variable	Reg1 Sense of self-efficacy			Reg2 Self Education Expectation			Reg3 Sense of self-efficacy		
	$\beta$	t	95%CI	$\beta$	t	95%CI	$\beta$	t	95%CI
Family Status	0.130	0.002***	[0.125,0.134]	0.318	71.39***	[0.310,0.327]	0.279	62.61***	[0.271,0.288]
Siblings	0.068	0.008***	[0.053,0.083]	0.127	7.97***	[0.096,0.158]	0.1115	7.05***	[0.081,0.143]
Family Status× Siblings	0.051	0.008***	[0.036,0.066]	0.121	7.57***	[0.090,0.152]	0.114	7.10***	[0.082,0.145]
Self Education Expectation							0.301	60.08***	[0.291,0.311]
Self Education Expectation × Siblings							-0.046	-2.89***	[-0.077,-0.015]
R <sup>2</sup>	0.023			0.031			0.050		
F	1457.00***			1995.81***			2000.48***		

\*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$

In order to reveal the essence of the interaction impact, a simple slope plot is drawn using the moderating variable 0 as the non only child and the moderating variable 1 as the only child. As shown in Figure 2, in only child families, family background has a evident and positive predictive effect on self-efficacy ( $\beta_{\text{Simple}} = 0.130, p < 0.01$ ). It is worth noting that

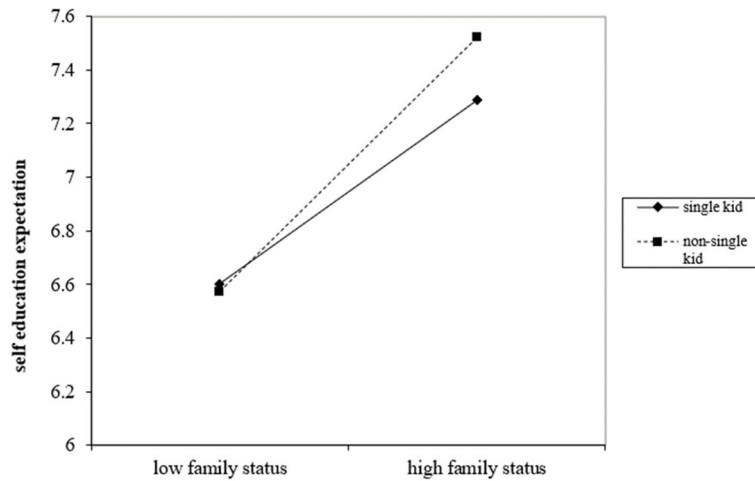
although the slope of the influence of family background on self-efficacy increases in non only child families, the effect is not significant ( $\beta_{\text{Simple}} = 0.181, p = 0.101$ ). This indicates that family background in distance education has a stronger positive predictive effect on self-efficacy in only child families than in non only child families.



**Figure 2.** The moderating effect of siblings on family status and sense of self-efficacy

As shown in Figure 3, in single-kid families, family background has a evident and positive predictive effect on self-education expectations ( $\beta_{\text{Simple}} = 0.318, p < 0.001$ ). However, in non single-kid families, the positive predictive effect of family background on self-education expectations is

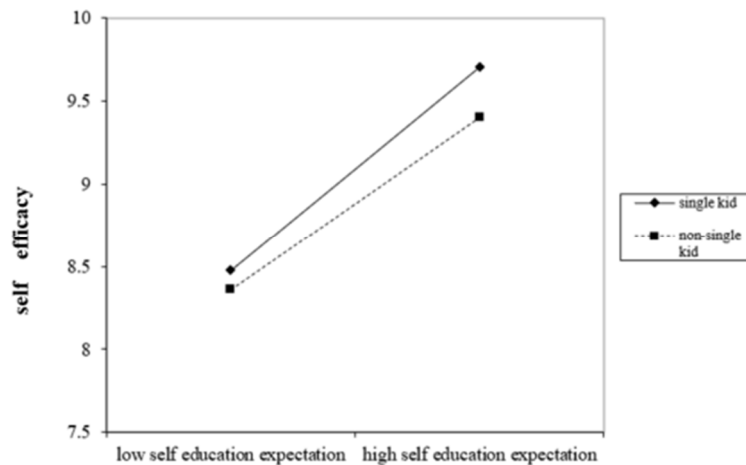
significantly enhanced ( $\beta_{\text{Simple}} = 0.439, p < 0.001$ ). This means that in distance education, family background has a stronger effect on self-education expectations in non single-kid families than in single-kid families.



**Figure 3.** The moderating effect of siblings on family status and self education expectation

As shown in Figure 4, self-education expectations have a significant positive predictive effect on self-efficacy in non single-kid families ( $\beta_{\text{Simple}}=0.255, p<0.05$ ). However, in single-kid families, the positive predictive effect of self-education expectations on self-efficacy is significantly

enhanced ( $\beta_{\text{Simple}}=0.301, p<0.001$ ). This means that the impact of self-education expectations on self-efficacy in single-kid families in distance education is stronger than that in non single-kid families.



**Figure 4.** The moderating effect of siblings on self education expectation and sense of self-efficacy

## 4. Discussion

This study explores the influence of family background on self-efficacy through a moderated mediation model, further revealing the mediating function of self-education expectations and the moderating effect of being single. The research findings not only answer how family background affects self-efficacy, but also examine the differences in the interaction between family background, self-education expectations, and self-efficacy between only and non only children. This helps to access a deeper understanding of the relationship and mechanism among family background and self-efficacy.

### 4.1. Positive prediction of self-efficacy based on family background

This study found that family background positively predicts self-efficacy, which is similar with previous research. Meanwhile, there are many studies in the academic community on the connection between family background

and personal emotions, regarding the career choices of college students [7], regarding personality formation. [8] Most believe that family background is negatively correlated with negative emotions. In this sense, this study found that family background positively predicts self-efficacy as one of the positive emotions, which is consistent with the logic of previous conclusions. It can be seen that the family background in modern society still has a profound impact on human development.

### 4.2. The mediating function of self-education expectations

This study found that self-education expectations play a partial mediating role among family background and self-efficacy. In other words, the impact of family background on self-efficacy is predicted through a direct path, and is achieved through the mediating function of self-education expectations. According to Bourdieu's cultural reproduction theory, cultural capital has three forms of existence: bodily form, reflected in an individual's cultural atmosphere;

Objectified forms, such as cultural goods, etc; Institutionalized forms, such as formal diplomas, academic qualifications. [9] These cultural capital, as part of the family background, can significantly influence students' pursuit of culture, thereby forming higher expectations for self-education. When high-quality family resources are combined with high self-education expectations, it often enhances students' self-efficacy, thereby enabling them to better achieve academic improvement.

### 4.3. The regulatory effect of being an single-kid

In single-kid families, family background, career expectations, and self-efficacy are generally higher than those in non single-kid families. Moreover, in single-kid families, the influence of family background on self-efficacy and self-education expectations on self-efficacy is stronger than in non single-kid families. In non single-kid families, the influence of family background on self-education expectations is stronger than in single-kid families. There is a wealth of research on the relationship between the number of children and family upbringing in foreign countries, and in recent years, many have focused more on discussing family resource allocation and parenting methods. The resource dilution theory suggests that the more children there are, the less internal resources per capita in the family. In this sense, non only children are more likely to receive less family resources than only children, [10] this to some extent has an impact on children's educational expectations and self-efficacy.

## 5. Conclusion

(1) Family background significantly positively predicts self-efficacy; (2) Self educational expectations partially mediate the relationship between family background and self-efficacy; (3) The direct effect of family background on self-efficacy and the mediating effect of self-education expectations are both moderated by the presence or absence of only children: family background in non only child families has a stronger predictive effect on self-education

expectations than in only child families; The impact of family background on self-efficacy and self-education expectations on self-efficacy is stronger in only child families than in non only child families.

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