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Factors influencing parents' educational anxiety of primary and secondary school students: evidence from parents in China

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Abstract

Background Current research has focused on exploring the sources of parents' anxiety about children's education (*PAE*), and we continue in this direction by exploring the factors influencing parental educational anxiety in primary and secondary school students and the interactions among them.

Methods Parental Educational Anxiety Measurement Questionnaire was used to measure the level of *PEA*. Pearson correlation coefficient analysis was used to examine the correlation between the level of *PAE* and the demographic variables. The method of multiple stepwise regression analysis was used to explore the demographic factors correlated with *PAE*. Two-way interactions in moderated multiple regression to examine the moderating effects of educational attainment on monthly household mortgage payments and *PAE*.

Results Our results indicate that there were statistical differences among education level, average monthly household income, child's stage of learning and monthly household mortgage payments; *PEA* were negatively correlated with education level and average monthly household income, and positively correlated with monthly cost of educational inputs. The results of multiple regression analysis showed that education level, average monthly household income, monthly household mortgage payment, and monthly cost of educational inputs were direct influences on *PEA*. Education level has a significant moderating effect on the monthly mortgage payment and *PEA*.

Conclusion Education level, average monthly household income, monthly household mortgage payment, and monthly cost of educational inputs were direct influencing factor of *PEA*.

Keywords Primary and secondary students, Parents, *PAE*, Influencing factors, Empirical studies

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Introduction

General Office of the CPC Central Committee and General Office of the State Council issued on July 24, 2021, called for the effectual improvement of the level of school education, continuous regulation of after-school training (including online training and offline training), and effective reduction of the excessive burden of homework and after-school training on students in compulsory education (referred to as "double reduction"). This initiative has clearly defined the comprehensive regulation of after-school training institutions, releasing a signal to create a good education ecology. As a result of the "double reduction" policy, most of the after-school training institutions in China were closed down, standing on the edge of an abyss. Take Hefei, Anhui Province, for example, 1,142 after-school training institutions of compulsory education were closed, with only 57 remaining, a survival rate of 4.75%. Meanwhile, the 2021 Statistical Yearbook released on January 12, 2022 showed that by the end of 2020, there were 340 general secondary schools in Hefei with 429,627 students enrolled; 481 elementary schools with 572,838 students enrolled. The number of primary and secondary school students is nearly one million [1]. With only 57 training institutions remaining, there is an objective situation that the supply of "after-school training" opportunities exceeds the demand, and some parents have lost their so-called "right-arm man", which leads to a diversified and incremental development of their anxiety, such as "target panic" anxiety, "lack of means to make up for the shortcomings" anxiety, "lack of rescue path" anxiety when facing the decline of their children's performance, and "bewildered" educational anxiety caused by the lack of keen perception of the change of the academic evaluation system, which gradually fills the hearts of parents to the depths, triggering a new type of "involution" in basic education. Parents' anxiety will spread in the family and even outside a certain range, and will have a negative impact on the education of primary and secondary school students through intergenerational transmission [2], fueling students' improper behavior [3] and social behavior [4], and seriously affect the physical and mental health of the majority of adolescents.

The source of parents' educational anxiety appears to be academic pressure, pressure for further education, and economic pressure. The implementation of the "double reduction" has largely reduced the financial pressure on families and relieved the academic pressure on students by reducing exams, not publishing test results, and reducing after-school homework in many ways. At the same time, by increasing investment in education, improving the rate of advancement, and widening the channels of advancement (strengthening vocational high school education), the pressure of advancement has been relieved, but no relief of parents' education anxiety has been found. What is the reason? Are there deeper influencing factors behind these visible pressures? It is urgent to be explored.

Research focus

We searched for the direct factors affecting *PAE* through empirical research, so as to provide theoretical support for educational administrative departments and relevant government agencies to introduce intervention measures for parents' anxiety.

Literature review

Anxiety is a psychosomatic concept that Freud viewed as a warning raised when the ego feels threatened. Jacobson developed Freud's theory of anxiety as a signal from the ego to its interior indicating the approach of danger [4]. Educational anxiety, as the collective manifestation of anxiety research in the field of education [5], has received attention from many scholars. In the 1970s, Sarason and Gardner [6, 7], as the representatives, proposed the problem of educational anxiety in different subjects such as students, teachers and parents, which was then developed rapidly. Before the "double reduction" in China, there were many cases of primary and secondary school students falling from buildings caused to educational anxiety, among which parents' anxiety was more responsible, such as parents' oppression (parents' concern about the educational results), bewilderment (parents' concern about the educational process) and imaginary (spelling family capital) education for their children. Parental anxiety has diversified after the "double reduction", and it can be seen that parental anxiety has become the typical of educational anxiety.

PEA is something that affects family education to a great extent, and may even diffuse and spread in the family or even outside to a certain extent, causing negative effects on primary and secondary school students' education and seriously affecting their physical and mental health of the majority of young people. Therefore, exploring the influencing factors of parental education anxiety is an urgent task to alleviate parental education anxiety, as well as the deep-seated causative factors affecting parental education anxiety.

Domestic scholars' research on *PEA* has focused on the field of education, for example, Liqiong Liu pointed out that parents who are child-centered in their lives will pay more attention to their children's learning attitudes and academic performance, which may trigger parents' anxiety [8]. Sang's study showed that parents' gender, education level and the source of psychological control of their children's education would be predictive of parental anxiety before the college entrance examinations, suggesting that student examinations, further education and employment become sources of *PEA* [9]. In Zhou Ting's

study, it was noted that the more pronounced parental anxiety is in the family environment, the more likely children are to develop anxiety tendencies [10], further reflecting that parental educational anxiety may affect the healthy growth of their children. Lin Li's study pointed out that female parents have higher educational anxiety than male parents [11]. In 2021, Li Jinzhou's study further pointed out that, in terms of personality characteristics, parents of elementary and middle school students differ in educational anxiety across gender, age, children's grade, and children's achievement, etc [12]. Studies in psychology are relatively rare, and therefore there is a lack of clear and unified connotation of educational anxiety, so research on the factors influencing *PEA* needs to be improved.

International scholars have focused on family education's emotional experience and behavioral performance [13]. Mogg suggested that when individuals face exams (e.g., midterm, college entrance exams, etc.), test-taking stimuli may cause and sustain anxiety [14], and Zeidner (1998) suggested that test anxiety is a negative state [15] that affects individual behavior. Celeste et al. used the Mplus 7.4 program to develop a structural equation model [16] to explain the mediating role of social anxiety between parenting styles and schooling. " [17]. There are few current studies involving parents and parental anxiety assessment [18]. This is further evidence of the core value of this study. At the same time, what factors influence parents' anxiety regarding the educational process of their children? What is the degree of influence of each factor? There is a lack of further inquiry into what approaches can improve parental anxiety in education.

Research hypothesis

Several studies in the scientific literature have suggested that excessive behavioral and psychological control can increase *PEA* [19, 20], and that there are individual trait differences in parents' desire for behavioral and psychological control [16], which can be mediated by individual traits through later behavioral interventions (e.g., effortful control is a set of self-regulatory skills associated with externalizing problems, characterized by the ability to inhibit dominant responses and work with subdominant response to work [21]), and there may also be reciprocal influences on parenting styles and children's behavioral internalization [22], i.e. children's behavior may influence parents' behavioral internalization [18]; parenting styles can influence children's life behavior. At the same time, Kendler suggested that anxiety traits are more pronounced in women than in men [23]. Therefore, we propose hypothesis 1 that.

Hypothesis 1 There are differences in the demographic characteristics of *PEA* levels.

Current studies have found that: scarcity of quality teachers triggers educational anxiety, such as fierce competition in junior high school districts versus elementary school districts, and school district houses are more pronounced. High-quality high schools are preferred over regular high schools. At the same time, the phenomenon of "quota allocation in key high schools", "students with special talent" and "selective enrollment" (selective enrollment is the mobile index of the school, it is to point to a college to admit some examinee by name when recruiting students) still exist [24], and the competition never disappears, so hypothesis 2 is proposed.

Hypothesis 2 The level of *PEA* is associated with the school stage of their children.

The more children a family raises, the more educational accompaniment time they need to devote, the higher the mental stress of the parents and the higher the likelihood of having educational anxiety risk. This is in line with Jacobson's theory of anxiety: "the idea that the anxious self sends signals to its interior indicating the approach of danger" (he developed Freud's theory of anxiety) [4], so we propose hypothesis 3.

Hypothesis 3 The level of *PEA* is associated with the number of children (the number of children in the family who are in primary and secondary school).

Both the pursuit of quality learning opportunities and the configuration of the educational environment are inseparable from the intervention of family capital; both the purchase of school district houses before the "double reduction" and the "high-end home economics", "crowdfunding private tutoring" and "study tours" after the "double reduction" are inseparable from the investment of family capital [25]. so we put forward hypothesis 4.

Hypothesis 4 There is a correlation between the degree of *PEA* and educational capital investment.

The number of monthly mortgage repayments may be directly related to the proportion of children's education investment, and children's education investment may affect children's academic performance. The results of existing research show a direct correlation between academic performance and parental anxiety levels [26], and we, therefore, propose Hypothesis 5.

Hypothesis 5 The level of *PEA* is associated with the amount of monthly mortgage repayment for the home purchase.

Adjusting variables are widely used in thematic research, such as exploration of education and title had significant effects on the moderating influences of SSRS, SDS, SAS, and PH [27]. Jiang achieved good results in exploring the Number of children moderation interaction for physical

sub-health and risk perception level [28]. These studies explored the moderating effect of control variables on the dependent variable.Based on this research design, we propose the following hypotheses 6–8.

Hypothesis 6 Education level moderates the impact of monthly household mortgage payment on *PEA*.

Hypothesis 7 The impact of monthly consumption support on *PEA* through moderating the willingness to reproduction.

Hypothesis 8 The effect of the "double reduction" policy moderates *PEA* and affects the willingness to regenerate.

Method

Data collection and quality control

A random sampling method was used to conduct the survey. There were 32 items in the initial questionnaire, and an appropriate sample size should be 10 to 20 times the number of items [29]. Between June and July 2022, data on parents' perceptions of educational anxiety of basic education students in Anhui province were captured, and a total of 6404 questionnaires were collected, 11 self-tested invalid questionnaires were excluded, and 6393 valid questionnaires were left with a valid response rate of 99.94%, meeting the sample size. A web-based survey was used to collect the data, and the teachers in charge of the surveyed schools were given uniform training on the specifications for completing the questionnaire before the survey. The survey was conducted by teachers who were employees in the target primary and secondary school and obtained informed consent from the study participants by means of parent-teacher conferences, and the link of the questionnaire was sent on the spot by the parent-teacher conference presenters. In case of doubt, the researcher was asked in person, and the questionnaire took approximately 8 min to complete, and subjects participated voluntarily. The collected questionnaires were logically verified, and those with obvious logical errors were eliminated.

Research tools

Parental Educational Anxiety Measurement Questionnaire contains 25 items on 5 factors [30]. Factor 1 (F1) as the " Learning Attitude Dimension", Factor 2 (F2) as the "Academic Achievement Dimension", Factor 3 (F3) as the "Educational Ability Dimension", Factor 4 (F4) as "Educational Outcome Dimension" and Factor 5 (F5) as "Family Capital Dimension". The overall Cronbach's alpha coefficient for the questionnaire was 0.956 and the Cronbach's alpha coefficients for each dimension were 0.926, 0.857, 0.913, 0.901, and 0.768. Higher total questionnaire scores indicated higher levels of anxiety and those with higher scores were more likely to have educational anxiety conditions [30].

Demographic factors and related variables include age, gender, educational attainment, monthly household income, monthly household mortgage payment, number of children, child's stage of learning, and monthly cost of educational inputs. Males (=1) and females (=2). Age is measured in years. Educational attainment is a four-category variable, lower secondary school and below (=1), high school/junior college/technical school (=2), college/bachelor's degree (=3), and postgraduate and above (=4). The average monthly household income is categorized by three variables, namely "<¥7000" (=1) ¥7000-¥14,999 (=2), and "≥¥15000" (=3). Four variables were used to classify the monthly household mortgage payment, namely "<¥2000" (=1), ¥2001-¥3999 (=2), ¥4000-¥5999 (=3), and "≥¥6000" (=4). The child's stage of learning is categorized by three variables, primary school (=1), lower secondary school (=2), and upper secondary school (=3), in particular, if the same household has more than one child in the basic education level, the child's stage of learning of the oldest child is included in the data. Four categorical variables were used to classify the monthly input costs of family education, namely "<¥2000" (=1), ¥2001-¥3999 (=2), ¥4000-¥5999 (=3), and "≥¥6000" (=4); The effect of the "double reduction" policy was measured by the difference in time spent on after-school tutoring before and after the double reduction; the intention to have another child in the last three years was measured by a four-category variable, namely, no (=1), probably not (=2), probably will (=3) and yes (=4).

Statistical analysis method

Two members of the group reviewed all questionnaire data and performed data entry using EpiData 3.1. The article conducted an analysis of variance for variables related to parents' educational anxiety levels, and a descriptive analysis of the measured data was conducted using SPSS 19.0 (expressed in the form of means and table means for the observed variables). Pearson's correlation coefficient portrayed the relationship between *PEA* level and demographic characteristics variables as well as other related variables. Stepwise regression analysis was used to explore the factors influencing the level of *PEA*, and two-step interactive multiple regression was used to test the moderating effects of educational attainment on monthly household mortgage payments and parental educational anxiety, the moderating effects of monthly costs of educational inputs on parental educational anxiety and fertility intentions, and the moderating effects of the effectiveness of the double reduction policy on fertility intentions and parental educational anxiety, respectively. When $p<0.05$, it was considered statistically significant.

Results

General demographic factors and differences in information on relevant variables

We obtained the results of the comparison of the difference from the preliminary statistics of the perception of demographic factors and related variables, as shown in Table 1. Among the survey respondents, 2022 were male and 4371 were female. The average age was (42.71±4.817) years old, with the majority of people aged 35–50 years old, 5888. 45.74% of the respondents were anxious about their children's education, of which 16.85% were very anxious. Details are shown in Table 1.

Comparing the basic information of the three cases of normal, comparative anxiety and very anxious parental education perceptions, the results showed that there were statistical differences in all groups except age, gender, monthly payments on the family mortgage and number of children ($P<0.05$), and the results partially confirmed hypothesis 1 and 3, and provided an explorable basis for hypotheses of all.

Correlation study of parental educational PAE with demographic information variables

Based on the sample data of parental educational *PAE* with demographic variables and related variables, we created a binary variable correlation matrix (Table 2).

From Table 2, it can be concluded that *PEA* were negatively correlated with education level and average monthly household income; and positively correlated with monthly cost of educational inputs, confirming

Table 1 Differences in perceptions of demographic factors and related variables

Variables		Total (*N* = 6393)	Normal (*N* = 3979)	More anxious (*N* = 1040)	Extremely anxious (*N* = 1374)	X^2	*P*
Age						2.802	0.591
	≤ 34	169(2.6%)	101(2.5%)	29(2.8%)	39(2.8%)		
	35–49	5622(88%)	3419(88.4%)	898(86.3%)	1205(87.7%)		
	≥ 50	602(9.4%)	359(9.1%)	113(10.9%)	130(9.5%)		
Gender						2.888	0.236
	Male	2022(31.6%)	1232(31%)	350(33.7%)	440(32%)		
	Female	4371(68.4%)	2747(69%)	690(66.3%)	934(68%)		
Education						29.359	< 0.001
	Junior Secondary and below	2717(42.5%)	1632(41%)	455(43.8%)	630(45.9%)		
	Senior Secondary School	1532(24.0%)	924(23.2%)	281(27.0%)	327(23.8%)		
	Undergraduate	2022(31.6%)	1334(33.5%)	289(27.8%)	399(29.0%)		
	Postgraduates and above	122(1.9%)	89(2.2%)	15(1.4%)	18(1.3%)		
Income(¥)						22.996	< 0.001
	<7000	2395(37.5%)	1413(35.5%)	412(39.6%)	570(41.5%)		
	7000–14,999	2757(43.1%)	1740(43.7%)	453(43.6%)	564(41%)		
	≥ 15,000	1241(19.4%)	826(20.8%)	175(16.8%)	240(17.5%)		
Mortgage(¥)						6.820	0.338
	<2000	354(5.5%)	232(5.8%)	47(4.5%)	75(5.5%)		
	2000–3999	131(2.0%)	85(2.1%)	16(1.5%)	30(2.2%)		
	4000–5999	188(2.9%)	108(2.7%)	38(3.7%)	42(3.1%)		
	≥ 6000	5720(89.5%)	3554(89.3%)	939(90.3%)	1227(89.3%)		
Number						1.529	0.825
	1	2479(39.1%)	1577(39.6%)	398(38.3%)	522(38%)		
	2	3579(56.0%)	2205(55.4%)	591(56.8%)	783(57.0%)		
	≥ 3	317(5.0%)	197(5.0%)	51(4.9%)	69(5.0%)		
Stage						14.827	< 0.01
	Primary Schools	387(6.1%)	262(6.6%)	54(5.2%)	71(5.2%)		
	Junior Secondary School	2165(33.9%)	1290(32.4%)	361(34.7%)	514(37.4%)		
	Senior Secondary School	3841(60.0%)	2427(61.0%)	625(60.1%)	789(57.4%)		
MCEE(¥)						91.906	< 0.001
	<2000	3515(55.0%)	2333(58.6%)	543(52.2%)	639(46.5%)		
	2000–3999	1209(18.9%)	740(18.6%)	203(19.5%)	266(19.4%)		
	4000–5999	713(11.2%)	407(10.2%)	132(12.7%)	175(12.7%)		
	≥ 6000	955(14.9%)	499(12.5%)	162(15.6%)	294(21.4%)		

Notes Income, Average monthly family income; Mortgage, Monthly payments on the family mortgage; Number, Number of children; Stage, The child's stage of learning; MCEE, Monthly Cost of extra-curricular education.The total score of EFA ≥ 98, Extremely anxious;. The total score of EFA<90,Normal; 90 ≤ The total score of EFA<98,More anxious.

Table 2 Correlation matrix between *PAE* and demographic information variables

	1	2	3	4	5	6	7	8	9
1.*PEA*	1								
2.Age	-0.003	1							
3.Gender	0.005	-0.227**	1						
4.Education	-0.055*	-0.58**	-0.059**	1					
5.Income	-0.056**	-0.106**	0.031*	0.454**	1				
6.Mortgage	-0.007	0.117**	-0.017	-0.182**	0.320**	1			
7.Number	0.013	0.055**	-0.024	-0.274**	-0.124**	-0.030	1		
8.Stage	-0.012	0.404**	-0.060**	-0.197**	-0.156**	0.123**	0.016	1	
9.MCEE	0.120**	-0.086**	0.030*	0.168**	0.181**	-0.123**	-0.052**	-0.093**	1

Notes * and ** indicates $P<0.05$ and $P<0.01$, respectively.

Table 3 Prediction of *PAE*

Prediction	Step 1		Step 2		Step 3	
	β/Coef	*SE*	*β/Coef*	*SE*	*β/Coef*	*SE*
PEA						
Age	−0.034	0.051				
Gender	−1.002	0.483				
Education	−2.120***	0.286	−2.073***	0.284	−1.973***	0.273
Income	−2.000***	0.349	−0.2.029***	0.015	−1.996***	0.348
Mortgage	−0.272*	0.114	−0.275*	0.114	−0.283***	0.113
Number	0.0234	0.400	0.214	0.339		
Stage	−0.564	0.400	−0.620	0.368		
MCEE	1.494***	0.131	1.490***	0.131	1.502***	0.130
Adjust R^2	0.035		0.035		0.035	
F	30.367***		39.749***		58.847***	

Notes *, **, and *** indicates $P<0.05$, $P<0.01$ and $P<0.001$, respectively.

hypotheses 4. Monthly cost of educational inputs is negatively correlated with age, monthly household mortgage payments, number of children, and the child's stage of learning, and positively correlated with gender, education level, and average monthly household income. Monthly household mortgage payments are positively correlated with age, and average monthly household income, and negatively correlated with education level. Average monthly household income is positively correlated with gender and education level, and negatively correlated with age. The results partially confirmed hypothesis 2 and 5. The correlation study provides a basis for exploring the factors influencing *PEA*.

Factors influencing parents' perceptions of educational anxiety

Based on the results of the analysis in Table 2, we selected variables, directly and indirectly, related to parental educational anxiety and conducted a stepwise multiple regression analysis, and the results are shown in Table 3.

The results of multiple regression analysis showed that education level, average monthly household income, monthly household mortgage payment, and monthly cost of educational inputs were direct influences on *PEA*, while age, gender, the child's stage of learning, and the number of children may be indirect influences on *PEA*.

Interactive moderating effect between influencing factors

On this basis, we used two-step interactive multiple regressions to examine the moderating effects of education on monthly household mortgage payments and parents' educational anxiety [31], the moderating effects of monthly costs of educational inputs on parents' educational anxiety and fertility intentions, and the moderating effects of the effectiveness of the current "double reduction" policy on fertility intentions and parents' educational anxiety [27], respectively. The results are shown in the following series of figures (Figs. 1, 2 and 3).

Parents with high monthly household mortgage payments have lower levels of educational anxiety than those with low monthly payments. Educational attainment has a significant moderating effect on monthly household mortgage payments and *PEA*, with higher educational attainment associated with lower levels of *PEA* among parents with lower monthly mortgage payments (Fig. 1).

The monthly cost of educational inputs is moderate, the public's acceptance level is high, the willingness of reproduction is becoming acceptable by pepole, and the *PEA* is not high; High willingness of reproduction; increased *PEA*, and high monthly cost of educational inputs reduce fertility intention, but it is not statistically significant (Fig. 2).

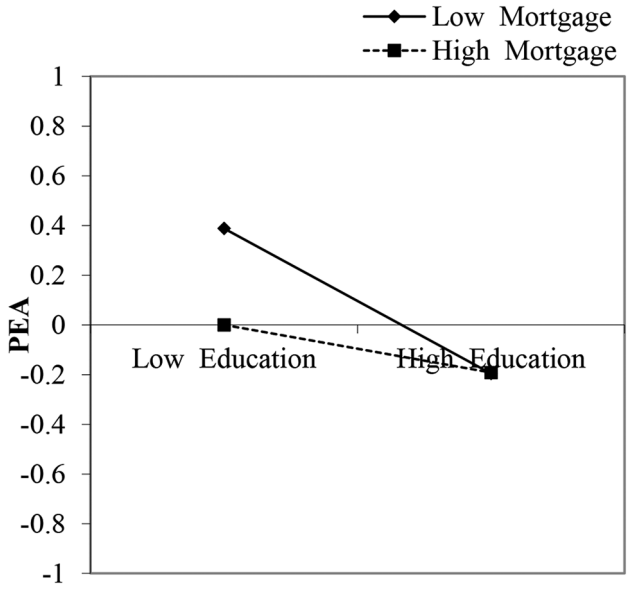

Fig. 1 Interaction between educational attainment and *PAE* as a function of monthly household mortgage payments (The figure was generated from standardized coefficients)

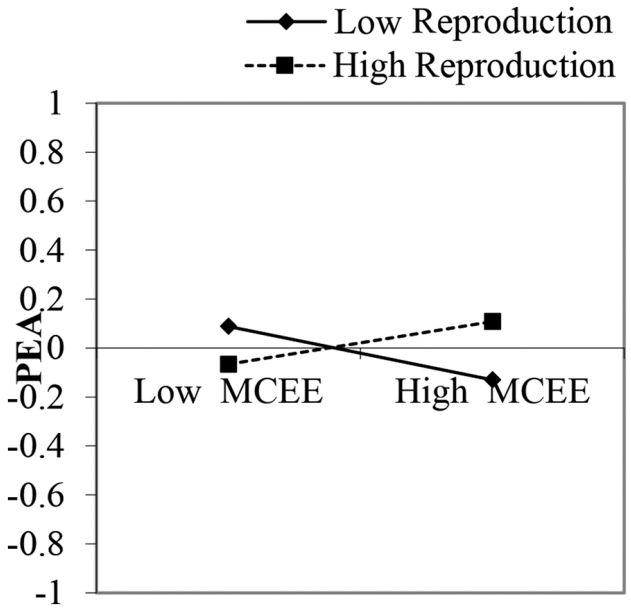

Fig. 2 Interaction of the monthly cost of educational inputs on the regulation of *PEA* and fertility intention (The figure was generated from standardized coefficients)

The effectiveness of the current "double reduction" policy has slightly alleviated parents' educational anxiety, but it is not statistically significant. The effectiveness of the current "double reduction" policy does not have a significant moderating effect on fertility intention and parental education anxiety (Fig. 3).

We further investigated and obtained the correlation parameters of the moderating effect between the relevant factors as shown in Table 4.

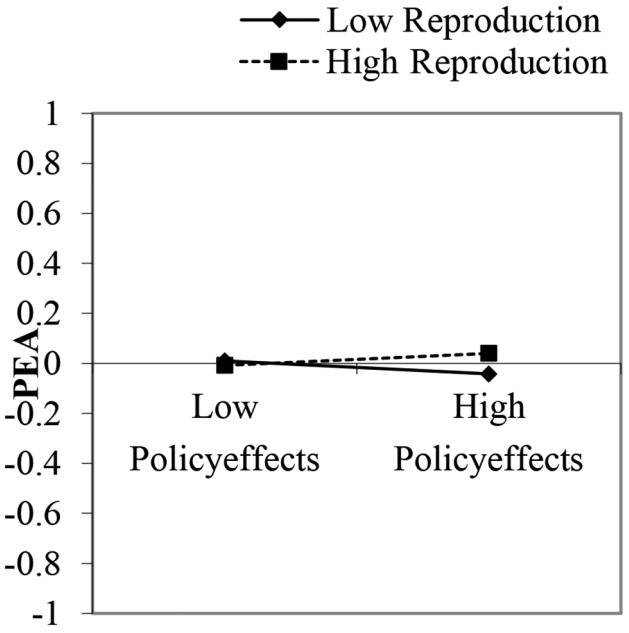

Fig. 3 Interaction of the effectiveness of the current "double reduction" policy on fertility intention and *PEA*(The figure was generated from standardized coefficients)

Table 4 Moderating effect between related factors

Dependent	Independent	Moderator variable	Interaction coefficient	SE	*R* square change
PEA	Mortgage	Education	0.176*	0.086	0.013***
PEA	Reproduction	MCEE	0.259	0.233	0.013***
PEA	Reproduction	Policyeffects	0.015	0.705	0.001*

Notes *, ** and *** indicates $P<0.05$, $P<0.01$ and $P<0.001$, respectively. Education, parents' education level; Reproduction, parents' "willingness to have more children"; Policyeffects, current Effectiveness of the "double reduction" policy

Table 4 provides further evidence of the moderating effect of educational attainment on monthly household mortgage payments. The above research results confirm hypothesis 6 and refute hypotheses 7 and 8.

Discussion

The results of the study found that there were statistically significant differences in parents' perceptions of educational anxiety with respect to educational attainment, average monthly household income, the child's stage of learning, and monthly household educational input costs. One reason may be that the higher the level of education, the greater the likelihood that parents' educational abilities will be enhanced in a timely manner and the easier it is to alleviate educational anxiety. The second reason may be because the average family income determines the economic level of household affordability, which in turn creates a difference in purchasing power, which is directly related to the family's purchase of a home and the

family's monthly investment in education, and directly or indirectly has an impact on parents' education anxiety. It is understandable that the child's stage of learning will directly affect the distribution of mental and material resources of the family, which affects *PEA*.

The results of the correlation study showed that perceptions of *PEA* were negatively correlated with parental educational attainment and monthly household income, and positively correlated with monthly cost of household education inputs. There was no significant correlation with parental age, gender, monthly household mortgage payments, number of children, and the child's stage of learning. One of the reasons for this may be that most parents of primary and secondary school students are around 30 years old, they are in a period of career development and have a higher awareness of the need for social development skills, which in turn raises the demands on their children's upbringing, while at the same time, their income is generally at a low to medium level and they have a relatively high level of education, resulting in an imbalance that exacerbates the educational anxiety of parents. The second reason may be that parents have a higher level of education, while most of their children are in primary school and a few are in junior secondary school, the incongruity of the transition from primary school to junior secondary school and the influence of the subjects amplify parents' worries. The possible reason for the positive correlation between *PEA* and monthly cost of household education inputs, the greater the financial and time-sharing pressure on the family, and the more likely it is that parents will suffer from mental stress, which in turn leads to *PEA*; these factors are directly related to parents' psychological needs, and also directly affects students' learning attitudes and academic performance, which is a key factor directly determining *PEA* [32]. The monthly cost of family education investment relates to the structure of family consumption and affects the quality of life of parents, which in turn affects *PEA*, which is consistent with the findings of Zhou's study [33]. There is no significant correlation between *PEA* and gender, which is contradictory to Gabriel's findings [18]. The possible reasons for this are the uneven gender representation in the data and the insufficient amount of data, although other possible reasons cannot be ruled out.

The correlation study further reveals that parents' monthly education investment fees are negatively correlated with age, monthly household mortgage payments, the number of children, and the child's stage of learning; and positively correlated with gender, education level, average monthly household income. One of the possible reasons is that the higher the child's school stage, the relatively older the parents are, and the older the parents, the more rational the education investment is; younger parents are influenced by the current "irrational educational competition" environment in China, and that the monthly investment in education is understandably higher; the lower the number of children, the greater the education investment, which may be attributed to the increase in the cost of living, which has shared the total economic income of the family. On the other hand, it may be the result of elite education and personalized cultivation. Female parents are more impulsive in economic consumption than male parents, and parents with higher education levels and higher monthly household income have relatively more disposable income, and it is understandable that they have higher monthly education input fees. Household disposable income has a positive effect on monthly household mortgage payments. The greater the monthly investment in family education, the less disposable income the family will have, and the pressure on parents to pay financially will increase, subsequently creating *PEA* [24]. It is understandable that parents are more satisfied with the quality of after-school services as they are older, have a more rational view of consumption, and are more tolerant and understanding of others. Of course, other possible reasons cannot be excluded.

The results of regression analysis showed that education level, average monthly household income, monthly household mortgage payment, and monthly cost of educational inputs were direct influences on *PEA*, while age, gender, the child's stage of learning, and the number of children may be indirect influences on *PEA*. The average monthly household income, education level, monthly household mortgage payment and the monthly cost of educational inputs are directly related to the level of *PEA*, suggesting that educators and schools should pay attention to the development of *PEA* in the primary school level. This suggests that the government and society should actively promote economic development, raise household economic income and improve the level of financial availability of families to ensure that each family has the financial capacity to invest in education properly.

Interactive multiple regression analysis revealed that the level of education had a significant moderating effect on the monthly household mortgage payments and *PEA*, with higher educational attainment associated with lower levels of *PEA* among parents with lower monthly mortgage payments. This suggests that the government attaches importance to education and provides salary commensurate with the level of education, and at the very least, the contribution of talents cannot be ignored, so as to reduce additional depression and anxiety. The study further found that the high willingness of reproduction; increased *PEA*, and high monthly cost of educational inputs reduce fertility intention. At the same time, this study found that the effectiveness of the current "double reduction" policy has little effect on the

regulation of fertility intention and *PEA*. We reminded the education administration to actively introduce supporting measures for "double reduction", especially to lay stress on the enforcement and implementation effect of the policy in order to reduce *PEA*.

Conclusion

Education level, average monthly household income, monthly household mortgage payment, and monthly cost of educational inputs were direct influencing factor of *PEA*. Educational attainment has a significant moderating effect on monthly household mortgage payments and *PEA*. Schools, the government and society should pay attention to the direct influence of *PEA*, reasonably divide the work, effectively cooperate, and actively introduce and implement relevant policies (e.g., integrating marriage, childbirth, parenting and education, improving financial, tax, insurance, education, housing and employment policies and actively implementing them, continuously optimizing service provision, and creating a friendly social atmosphere, including encouraging enterprises and institutions to facilitate the work of employees who need to take their children to and from school, take care of sick or home-bound children, etc.), so as to contribute wisdom and strength to eradicate *PEA*.

Strengths and limitations

This study uses the latest measurement tools to measure the level of *PEA* of primary and secondary school students, in order to provide theoretical support for the improvement of the physical and mental health of primary and secondary school students and their parents. The fact that the moderating effects of some variables were not presented better may be a shortcoming of this study, and it is expected to further control the potential interfering factors to improve the quality of the study.

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Author contributions
LPZ and JJS designed this study. LPZ, YQZ, YC and JJS collected data. LPZ, YQZ and JJS extracted and analyzed data. LPZ, YQZ and JJS provided guidance for statistical analysis and provided financial support. LPZ and JJS wrote the manuscript. LPZ, YQZ, YC and JJS reviewed the manuscript.

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Data availability
The data used to support the findings of this study are included within the article.

Declarations

Ethics approval and consent to participate
All experimental protocols were approved by the ethics committee of Anhui Medical University (No.82240245). All methods were carried out in accordance with relevant guidelines and regulations. Confirming that informed consent was obtained from all subjects and/or their legal guardian(s).

Competing interests
The authors declare no competing interests.

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