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Cultural capital as a predictor of school success: evidence and gender differences in Chinese middle schools

Hui Jin[1,5], Shi Jiao[2,5]✉, Xu Ma[3] & Yunan Xia[4]

Cultural capital is vital for equitable educational development. This paper studies the effect of family cultural capital on the performance of middle school students with regard to gender, using a multiple linear regression model. Participants from four representative middle schools, totalling 1036 students, were selected during the online learning period. The study found that institutionalised and objectified cultural capital had a pronounced positive effect on students' school outcomes, but cultural capital that was embodied had both positive and negative effects. Significant differences in the effects of cultural capital on school success were found between male and female students. The educational level of a mother has a significant impact on the school attainment of female students in Chinese, English, math and overall achievement, whereas a father's education level has a significant effect on male students' English achievement and overall achievement. The results of the study showed that cultural capital contributed to the academic success of middle school students in different ways. The results presented above contribute to a better comprehension of the mechanisms of the influence of cultural capital on the school performance of middle school students, which has important implications for students' educational equity. This study recommends improving the mechanism of collaborative education among schools, families and society, by paying attention to vulnerable groups that lack cultural capital, improving the methods of educational evaluation and providing tailor-made education for all types of students.

[1] Faculty of Education, Beijing Normal University, 100875 Beijing, China. [2] Institute of Curriculum and Textbook Research, Ministry of Education, 100029 Beijing, China. [3] College of Economics, Minzu University of China, 100081 Beijing, China. [4] Institute of Ancient History, Chinese Academy of Social Sciences, 100101 Beijing, China. [5] These authors contributed equally: Hui Jin, Shi Jiao. ✉email: jiaoshi@muc.edu.cn

Introduction

The provision of quality and equal educational opportunities is a fundamental aspect of educational success and a better life in the future. While there has been considerable progress in school enrolment, significant challenges remain in ensuring that students receive quality and equitable education (Portela et al. 2013; Xu et al. 2023). Cultural capital is widely acknowledged as a significant indicator of educational equity and a pivotal element of inclusive educational development. Cultural capital can be conceptualised as a form of capital, a scarce and limited resource that can facilitate educational success through a range of avenues (Bourdieu and Passeron, 1990). Cultural capital is a significant factor in academic achievement, an effective route to personal advancement, and has a strong intergenerational transmission effect on students (Bourdieu, 2018b). The unequal appropriation of parental cultural capital may result in disparities in academic performance among students from different socio-economic backgrounds (Bourdieu, 2018a). Education can serve as a powerful instrument to prevent the intergenerational transmission of inequality.

It is of paramount importance to identify strategies that can be employed to prevent the transmission of educational inequality from one generation to another and to promote the inclusive development of education. Such an approach is essential for the construction of a robust education system and nation. Researchers have been attempting to address the issue of cultural capital formation for an extended period (Castro et al. 2015; Guo et al. 2023). However, the relationship between cultural capital and academic achievement remains unresolved (DiMaggio, 1982). There is no shortage of research on institutionalised and objectified cultural capital, while studies on embodied cultural capital are rare (Jin et al. 2022). Studies on the effects of parental educational attainment and household book collection on their children's school attainment are numerous, while studies on the effects of highbrow cultural activities on school attainment are not well known (Tan, 2020). Although past research has answered some of the general questions about the connection between school performance and cultural capital (Isopahkala-Bouret et al. 2023; Wang and Wu, 2023), we still need to answer how the various levels of cultural capital affect school accomplishment. Additionally, research on gender differences and cultural capital among younger students requires further attention.

Theoretical framework and review of the literature

Theory of cultural capital. This study employs Bourdieu's theory of cultural capital as its theoretical framework. Cultural capital, a significant theory in the study of educational equity, is typically employed to examine the role of cultural capital in academic achievement. Bourdieu conceptualises cultural capital as a form of capital that can become a resource of power, enabling groups to maintain a dominant position and obtain necessary resources (Bourdieu, 1973). Bourdieu divides cultural capital into three levels: the first is the institutionalised state, the second is the objectified state and the third is the embodied state (Bourdieu, 1990). Institutionalised state is mainly reflected in academic levels, such as education levels of parents. The cultural capital of parents can be defined as a conventional, permanent and legally secure source of cultural value. The objectified state is associated with cultural artefacts or commodities, such as books, writings, paintings, etc., which are materially transferable and relatively hidden. The embodied state is often reflected in persistent dispositions, both physical and mental, such as visiting museums, concerts and other elegant cultural activities (Bourdieu, 2018b). Cultural capital, like external wealth, can be transformed into an internal component of a person and a habit, but it cannot be transferred through gifts, purchases or exchanges. The acquisition of capitalisation depends to varying degrees on time, society and social class, without any deliberate indoctrination, and is therefore quite unconscious (Bourdieu, 1990).

The theory of cultural reproduction suggests that families from the upper classes are more likely to achieve academic success and have a greater chance of obtaining cultural resources than others (Bourdieu and Passeron, 1990). Cultural capital, as a scarce resource, can be transferred from parents to children and has the characteristic of intergenerational transmission. Therefore, cultural capital can bring intergenerational welfare to children and promote educational success (Bourdieu, 2011). DiMaggio believes that cultural capital stands for a kind of elite culture that can promote students to gain academic advantages in the system of school education (DiMaggio, 2019a). DiMaggio holds that active participation in highbrow culture can be a practical and useful strategy for students with lower status who long for upward mobility (DiMaggio, 2019b). Compared to Bourdieu, DiMaggio pays more attention to cultural mobility patterns, emphasising that vulnerable groups can flow upwards by actively acquiring highbrow culture, thereby breaking the traditional intergenerational effects of the past. DiMaggio places more emphasis on the mode of cultural flow, which is an important complement to cultural reproduction theory (DiMaggio, 1982).

Cultural capital and school accomplishment. There is an abundance of study on the composition of cultural capital. However, there is a paucity of research on the measurement of the impact of cultural capital on education (Jæger and Møllegaard, 2017). Despite the fact that Bourdieu proposed a number of indicators of cultural capital in his empirical work (Bourdieu, 1973), no common core standard of cultural capital has yet been devised (Sieben and Lechner, 2019). Research on the impact of cultural capital on education tends to focus on the interpretation of institutionalised and objectified cultural capital, often neglecting embodied cultural capital.

Previous findings have demonstrated that cultural capital has a positive influence on educational attainment (Imbulana Arachchi and Managi, 2023; Kingston, 2001). Cultural capital, a limited and hidden resource, has the potential to be transmitted intergenerationally from parents to their offspring (Jæger and Karlson, 2018). Recent research has indicated that there is a relationship between parental cultural capital and the acquisition of academic skills (Gaddis, 2013; C. Y. Tan et al. 2019). This phenomenon has been found to contribute to the improvement of academic performance in school settings (Jæger, 2011). The uneven distribution of cultural capital can lead to educational inequality, as observed from a macro perspective (Breinholt and Jæger, 2020). The educational level of parents is generally recognised as an important indicator for assessing children's academic performance (Igarashi and Saito, 2014). The reading habits of parents can predict their children's school accomplishments, and reading can benefit children from disadvantaged backgrounds (Castro et al., 2015). The impact of pupils' embodied cultural capital on their school accomplishments can be anticipated (Tan, 2020). The availability of highbrow cultural materials has become a limited commodity that plays an increasingly important role in students' knowledge acquisition and academic performance (Jæger, 2011). Tan and Fang (2023) found that family cultural capital has a significant positive correlation with adolescents' educational aspirations and academic efforts.

It is recognised that many elements of cultural capital appear to play a critical role in student's academic performance (Dufur et al. 2013). Previous studies have shown that cultural capital has

a significant impact on how students learn and perform; however, there is a lack of knowledge regarding the specific mechanisms through which cultural capital influences student academic achievement (Roksa and Potter, 2011). Additional research is needed to address the question of the impact of cultural capital on students' academic achievement. Numerous scholarly investigations have been conducted on the cultural capital of university student cohorts (Jack, 2016; Matos, 2023; Tan et al., 2019), however, research specifically focusing on the cultural capital of middle school students remains relatively scarce. There has been no shortage of regional comparative studies in the past (Bourdieu, 1973; Jin et al., 2022), but there is still a lack of examination of gender differences (Adedeji et al. 2023). The impact of cultural capital on students' academic achievement is closely linked to the perpetuation of cultural norms, the achievement of educational goals, and the promotion of equitable educational opportunities in the context of long-term learning (Jæger, 2011). Therefore, there is a need for an in-depth study of the impact of cultural capital on school accomplishment.

Moreover, how does cultural capital influence students' school success? Although a great deal of evidence has demonstrated the significant impact of cultural capital on students' academic success and achievement, few studies have explored the underlying mechanisms between cultural capital and academic success. Few studies have attempted to examine how cultural capital is related to academic achievement. Consequently, this study will improve our understanding of the inherent mechanisms by which cultural capital affects school attainment.

Research questions and hypotheses

This study employs the theoretical framework of cultural capital to investigate the relationship between each of the three levels of cultural capital and students' academic achievement. By elucidating the intrinsic mechanisms through which cultural capital affects academic achievement, the study contributes to the understanding of the complex relationship between cultural capital and academic achievement. The study proposes two research questions and five hypotheses.

RQ1: What is the effect of cultural capital on students' academic achievement in middle schools?

H1. The institutionalised state of students has a positive impact on their academic attainment.

H2. The objectified state of students has a significant impact on their academic attainment.

H3. The embodied state of students has a significant impact on their academic attainment.

RQ2: What is the effect of gender-differentiated family cultural capital on students' academic achievement?

H4. For male students, family cultural capital has a significant positive impact on their academic attainment.

H5. Female students' educational attainment is significantly influenced by the cultural capital of their families.

Methods

Data. In selecting schools and students in China, meticulous measures were implemented. The 1100 questionnaires were distributed in a 1:3 ratio to four sample middle schools in Beijing. The four sample schools selected for the study are located at the same level of economic and social development in Beijing, with the same level of teaching, scale of operation and social influence. Furthermore, the rankings of the sampled schools are located at the average level of Beijing. Therefore, the samples are representative. Beijing serves as the capital of China as well as the country's political, economic, educational and cultural centre. With regard to the relationship between children's cultural capital and academic achievement, the samples are, therefore, reasonably representative. A total of 491 boys (47.4%) and 545 girls (52.6%) were recruited from a total of 1036 seventh-to ninth-grade participants. A paper-based questionnaire was administered to a single class within fifteen minutes. The sampled students were informed that their answers would be taken for research purposes only, which enabled them to respond honestly.

The study provides comprehensive data on a range of significant topics, including the institutionalised, embodied and objectified state. The questionnaire primarily collected basic information, including family background and school performance data on middle school students. This included data on the educational level of their fathers and mothers, household book collections, individual talents and participation in highbrow cultural activities.

Variables

Dependent variables. Students' academic accomplishment was the primary dependent variable of the research and a significant indicator of future school success for students. According to the *Implementation Opinions on Further Promoting the Reform of High School Entrance Examination and Enrolment* (Commission, 2023), the middle school examination in Beijing is divided into three types: score-based examination, grade-based examination and qualification-based assessment. Combined with the needs of this study, the three subjects of Chinese, mathematics and English are embodied in scores, and all of them are 100 points, which is a more unified standard and more convenient for statistics and analysis in the study. So, this study compiled the final grades of middle school students in three subjects—Chinese, English and mathematics—and made the test grades standardised with school grade variables spanning from 0 to 100 score. Dependent variables are cumulative grades and grades in three major subjects.

Independent variables. The independent variable in this study was family cultural capital. The categories were based on Bourdieu's theory of cultural capital and included institutionalised, embodied and objectified states. For specific information and statistical results on variables, please refer to Tables 1 and 2.

Controls. Five control variables were employed in the analysis. In this study, the first control variable was students' grades (1 represents grade seven, 2 represents grade eight, 3 represents grade nine); the second was gender (1 represents male, 2 represents female); China has gradually relaxed its family planning policy over the past few years, allowing couples to have up to three children. The number of children in a household is represented by a numerical value, with 1 indicating one child, 2 indicating two children, 3 indicating three children and 4 indicating four or more children. The fourth control represents the household income, with 1 indicating very low income and 5 indicating very high income. The final control represents the area.

Analysis. This article focuses on the causal relationship between variables and the specific dependence between variables. In comparison to other methods, regression analysis can estimate the change in the dependent variable through the change in the independent variable, thus achieving the purpose of in-depth analysis of the dependence between variables. Given that the article involves more than two independent variables and one dependent variable, it is more appropriate to choose the multiple linear regression model as the main statistical method in this study. In the present investigation, a multiple linear regression model was constructed with family cultural capital serving as the independent variable and academic performance of the students

Table 1 Descriptive information ($N = 1036$).

Variables	Factors	The variable name	Description
Dependent	School attainment	Scores of Chinese, English, Math and overall	Cumulative score
Independent	Institutionalised	Education attainment of father	1 = elementary school and below, 2 = middle school, 3 = high school, 4 = vocational university, 5 = bachelor, 6 = master, 7 = doctor
		Education attainment of mother	1 = elementary school and below, 2 = middle school, 3 = high school, 4 = vocational university, 5 = bachelor, 6 = master, 7 = doctor
	Objectified	Household book collection	1 = 0–10 volumes, 2 = 11–20 volumes, 3 = 21–50 volumes, 4 = 51–100 volumes, 5 = 101–200 volumes, 6 = 201–300 volumes, 7 = 301 or more volumes
		Household English book collection	
	Embodied	Individual talent	1 = no distinct skill, 2 = 1 skill, 3 = 2 skills, 4 = 3 skills, 5 = 4 skills, 6 = 5skills, 7 = 6 skills/more
		Visiting galleries or museums	1 = never, 2 = one in 1–2 years, 3 = one per year, 4 = one in 3–6 months, 5 = one in 1–2 months, 6 = monthly, 7 = weekly or more
		Attending science museums	
		Attending concerts or plays	
		In-town travel	
		Out-of-town travel	
		Overseas travel	
Control	-	Grade	1 = G7, 2 = G8, 3 = G9
		Gender	1 = boy, 2 = girl
		Children's number	1 = 1 kid, 2 = 2 kids, 3 = 3 kids, 4 = 4 or more kids
		Household income	1 = very low, 2 = slightly low, 3 = moderate, 4 = slightly high, 5 = very high
		Area	1 = A, 2 = B, 3 = C, 4 = D

Table 2 Statistical results for the variables($N = 1036$).

Variables	*M*	*SD*	Minimum	Maximum
Grade	1.62	0.692	1	3
Gender	1.53	0.500	1	2
Children's number in the household	1.42	0.579	1	4
Household income	3.83	0.808	1	5
Area	3.34	1.929	1	4
Education attainment of father	4.43	1.231	1	7
Education attainment of mother	4.46	1.208	1	7
Household book collection	5.23	1.687	1	7
Household English book collection	2.93	1.604	1	7
Individual talent	3.85	1.671	1	7
Visiting galleries or museums	3.43	1.393	1	7
Attending science museums	3.08	1.312	1	7
Attending concerts or plays	2.76	1.429	1	7
In-town travel	4.69	1.622	1	7
Out-of-town travel	3.33	1.229	1	7
Overseas travel	2.08	1.109	1	7
Score of Chinese	81.523	9.753	34.00	100.00
Score of English	83.137	12.577	11.00	100.00
Score of Math	78.657	15.452	5.00	100.00
Overall score	242.185	34.798	52.00	300.00

serving as the dependent variable. The following constituted the model:

$$Y = \beta_0 + \beta_1 Z_a + \beta_2 Z_b + \beta_3 Z_c + \sum_{k=1}^{1} \lambda_1 Z_1 + \mu$$

The above equation Y stands for students' academic accomplishment, containing the scores of Chinese, English, math and the overall score; Z_a refers to the institutionalised state; Z_b represents the objectified state; Z_c refers to the embodied state; Z_1 reflects the controls; μ represents the model's random error.

Results

The correlation between children's cultural capital and their school accomplishment. Considering the composition of family cultural capital, this paper tested the correlations of each element in institutionalised, objectified and embodied cultural capital with the total scores of Chinese, English, mathematics and the three subjects, respectively, so as to establish the degree of correlation between variables and facilitate subsequent regression analysis.

The method of determining the correlation analysis. In this study, the achievement variables are interval variables and the other independent variables are mainly ordinal variables, it is no longer appropriate to use Pearson simple correlation, Kendall's tua-b rank correlation, or Spearman correlation in analysing the correlation between fixed-range variables and fixed-order variables, and it is more appropriate to use the correlation ratio to test the correlation degree here.

The correlation ratio, also known as the Eta squared coefficient, is used to calculate or estimate the mean value of the dependent variable, relying on the value of each independent variable as the independent variable and a fixed distance variable as the dependent variable. One of the calculation variables of the correlation ratio is a fixed-order variable, which means that the Eta squared coefficient value cannot be negative and falls within the range of [0, 1]. If the Eta squared coefficient value reaches 0, it indicates no correlation between the variables. Conversely, if the Eta squared coefficient value is 1, it indicates a complete correlation between the variables. The coefficient signifies the proportion of errors that can be attributed to the variables.

The one-way analysis of variance (ANOVA) analysis. Since the samples in this paper are random samples, the F-test in one-way analysis of variance (ANOVA) can determine the feasibility of inferring the correlation results to the overall. In the one-way ANOVA, the significance level of the *F*-test is 0.01 or 0.05, revealing if the initial hypothesis of the one-way ANOVA "each category's mean value in the total is equal" holds, the *F*-values probability is 0.01 or 0.05, which is a small probability event, so the original hypothesis should be rejected, indicating that the mean values of each category in the aggregate are not equal, the

Table 3 Results of One-way ANOVA ($N = 1036$).

Variables	Overall Score	Chinese	English	Math
Education attainment of father	7.974** $p = 0.000$	5.021** $p = 0.000$	10.448** $p = 0.000$	4.087** $p = 0.000$
Education attainment of mother	7.488** $p = 0.000$	5.939** $p = 0.000$	9.127** $p = 0.000$	3.999** $p = 0.001$
Household book collection	8.446** $p = 0.000$	7.138** $p = 0.000$	14.095** $p = 0.000$	5.238** $p = 0.000$
Household English book collection	4.855** $p = 0.000$	2.405* $p = 0.026$	10.286** $p = 0.000$	2.235* $p = 0.038$
Individual talent	0.912 $p = 0.485$	2.479* $p = 0.022$	1.224 $p = 0.291$	0.960 $p = 0.451$
Visiting galleries or museums	5.847** $p = 0.000$	4.982** $p = 0.000$	5.533** $p = 0.000$	4.460** $p = 0.000$
Attending science museums	4.286** $p = 0.000$	3.260** $p = 0.004$	3.902** $p = 0.001$	3.862** $p = 0.001$
Attending concerts or plays	4.954** $p = 0.000$	6.510** $p = 0.000$	4.078** $p = 0.000$	2.308* $p = 0.032$
In-town travel	4.328** $p = 0.000$	4.639** $p = 0.000$	4.141** $p = 0.000$	2.352* $p = 0.029$
Out-of-town travel	2.260* $p = 0.036$	0.997 $p = 0.426$	2.463* $p = 0.023$	2.202* $p = 0.041$
Overseas travel	2.958** $p = 0.007$	1.530 $p = 0.165$	3.357** $p = 0.003$	0.729 $p = 0.626$

*$p < 0.05$, **$p < 0.01$;
The two data columns in the table are the *F*-statistic and the statistical significance (p values).

Table 4 Correlation analysis between students' cultural capital and school accomplishment ($N = 1036$).

Variables	Overall Score	Chinese	English	Math
Education attainment of father	0.044	0.028	0.057	0.023
Education attainment of mother	0.042	0.033	0.051	0.023
Household book collection	0.047	0.040	0.076	0.030
Household English book collection	0.028	0.014	0.057	0.013
Individual talent	0.005	0.014	0.007	0.006
Visiting galleries or museums	0.033	0.028	0.031	0.025
Attending science museums	0.024	0.019	0.022	0.022
Attending concerts or plays	0.028	0.037	0.023	0.013
In-town travel	0.025	0.026	0.024	0.014
Out-of-town travel	0.013	0.006	0.014	0.013
Overseas travel	0.017	0.009	0.019	0.004

The data in the table are Eta squared coefficients.

independent variable is significantly different from a dependent variable, and there is a correlation between the variables in the aggregate. As can be seen from Table 3, all variables were significantly correlated with Chinese scores, English scores, math scores and total scores, apart from personal talent, which was not substantially correlated with English, math and total scores; frequency of out-of-town trips, which was not significantly correlated with Chinese scores; and frequency of international trips, which was not significantly correlated with Chinese scores and math scores.

The analysis correlation test results. The degree of correlation between each element of the institutionalised state, embodied state and objectified state, respectively, and the total scores of Chinese, English, mathematics and the three subjects requires reference to the correlation ratio or Eta squared coefficient. The correlation between variables is weaker when the value of eta squared is closer to zero. From Table 4, it can be found that the Eta squared values of personal talent and English score, math score and total grade are 0.007, 0.006, and 0.005, individually, suggesting the weakest variable correlation, which is not considered in the analysis of English, math and total score. In addition, the Eta squared values of frequency of international travel and Chinese and math scores were 0.009 and 0.004, respectively, indicating a weak correlation between the variables, which were not considered in the analysis.

Estimated results of family cultural capital on student school accomplishment. On the basis of the above model, the impact of different types of family cultural capital on the school attainment of middle school students was estimated, and the outcomes of the estimation are demonstrated in Table 5.

The institutionalised state had distinct degrees of impact on the school accomplishment of middle school students. The educational attainment of the student's father had a significant positive impact on both their English performance and overall score. However, there was no significant effect on their Chinese and mathematics grades. Specifically, the coefficients of the father's education level on middle school students' English scores and total scores were 0.969 ($p < 0.05$) and 2.385 ($p < 0.1$), respectively. In addition, the educational attainment of the student's mother had a substantially positive effect on both Chinese and overall grades, while the effects on English and mathematics grades were not substantial. Specifically, the coefficients of the effect of education attainment of mothers on Chinese scores and total scores of middle school students were 0.940 ($p < 0.01$) and 2.868 ($p < 0.05$), respectively. From the above estimation results, it can be found that both parents' education has a substantial effect on the overall grades, and the father's education has a positive effect on middle school students' English grades while the educational attainment of the mother has a positive impact on Chinese scores, indicating that institutionalised cultural capital plays a key in students' overall scores, English scores and Chinese scores, and high level of parental education plays a significant role in developing the grades.

The objectified state had a substantial impact on the school's accomplishments. Household book collections had a substantially positive effect on their Chinese, English, math and total grades. Specifically, the regression coefficients of household book collection on children's Chinese, English,

Table 5 Effects of family cultural capital on pupils' school attainment.

Variables	Overall Score	Chinese	English	Math
Grade	0.824 (0.016) $p = 0.601$	2.126*** (0.151) $p = 0.000$	−1.692*** (−0.093) $p = 0.003$	−0.492 (−0.022) $p = 0.488$
Gender	3.784* (0.054) $p = 0.078$	2.705*** (0.139) $p = 0.000$	2.288*** (0.091) $p = 0.003$	−1.557 (−0.050) $p = 0.107$
Children's number	−0.092 (−0.002) $p = 0.960$	0.188 (0.011) $p = 0.709$	−0.569 (−0.026) $p = 0.378$	0.319 (0.012) $p = 0.697$
Household income	−1.205 (−0.028) $p = 0.370$	−0.884** (−0.073) $p = 0.018$	−0.191 (−0.012) $p = 0.688$	−0.278 (−0.015) $p = 0.646$
Area	1.184** (0.066) $p = 0.041$	−0.219 (−0.043) $p = 0.172$	0.362* (0.056) $p = 0.078$	1.065*** (0.133) $p = 0.000$
Education attainment of father	2.385* (0.084) $p = 0.057$	0.189 (0.024) $p = 0.586$	0.969** (0.095) $p = 0.029$	0.753 (0.060) $p = 0.182$
Education attainment of mother	2.868** (0.100) $p = 0.026$	0.940*** (0.116) $p = 0.008$	0.688 (0.066) $p = 0.132$	0.909 (0.071) $p = 0.116$
Household book collection	2.701*** (0.131) $p = 0.000$	0.856*** (0.148) $p = 0.000$	1.217*** (0.163) $p = 0.000$	1.172*** (0.128) $p = 0.000$
Household English book collection	0.582 (0.027) $p = 0.464$	−0.211 (−0.035) $p = 0.339$	0.638** 0.081 $p = 0.024$	−0.111 (−0.012) $p = 0.754$
Attending concerts or plays	0.891 (0.037) $p = 0.357$	0.520* (0.076) $p = 0.051$	−0.083 (−0.009) $p = 0.809$	4.728E-5 (0.000) $p = 1.000$
Overseas travel	−2.049* (−0.065) $p = 0.059$	/	−0.349 (−0.031) $p = 0.364$	/
R^2	0.089	0.110	0.123	0.063
Adjusted R^2	0.076	0.097	0.111	0.050
ΔR^2	0.085	0.067	0.099	0.051
F	6.644	8.428	9.574	4.884
ΔF	9.476	7.675	11.535	6.125

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$;
The symbol '/' indicates that both variables are not regressed due to a weak correlation between the dependent and independent variables.
The table above shows the coefficient, standardised coefficient and their statistical significance in the data columns. The same information is presented below.

math and total grades were 0.856 ($p < 0.01$), 1.217 ($p < 0.01$), 1.172 ($p < 0.01$) and 2.701 ($p < 0.01$) in order. In addition, family English book collection has a positive effect on middle school students' English scores; with an effect coefficient of 0.638 ($p < 0.05$).

The embodied state showed a substantially positive impact on their school accomplishment. The frequency of attending concerts presented a positive effect on their Chinese grades, while the frequency of international trips had a substantially negative impact on their overall grades. Specifically, the coefficient of the frequency of attending concerts on children's Chinese grades was 0.520 ($p < 0.1$); the coefficient of the frequency of outbound trips on middle school students' total scores was −2.049 ($p < 0.1$).

Estimated effects of family cultural capital on the school performance of children from different genders. On the basis of the above model, how gender-differentiated family cultural capital affects their academic accomplishment was estimated, and the estimated results are shown in Table 6.

Amongst the institutionalised state, the father's level of education demonstrated a considerable impact on the English scores and total grades of boys, while the mother's level of education revealed a significant impact on the scores of girls across all subjects. Concretely, the coefficients of father's education on male students' English and total grades were 1.459 ($p < 0.05$) and 4.301 ($p < 0.05$), individually. The coefficients of mother's education on female students' Chinese, English, mathematics and total scores were 1.417 ($p < 0.01$), 1.843 ($p < 0.01$), 2.197 ($p < 0.01$) and 5.351 ($p < 0.01$).

Among the objectified state, the quantity of family books had a considerable positive effect on the English, Chinese, mathematics and overall scores of middle school students of different genders. The quantity of family English books has a considerable positive impact on the English scores of male students. Specifically, the coefficients of the effect of family book collection on boys' Chinese, English, math, and total grades were 1.028 ($p < 0.01$), 1.751 ($p < 0.01$), 1.208 ($p < 0.05$) and 2.930 ($p < 0.05$), respectively. The coefficients of the effect of household book collection on female students' Chinese, English, math and total scores were 0.707 ($p < 0.01$), 0.854 ($p < 0.01$), 1.212 ($p < 0.01$) and 2.670 ($p < 0.01$), respectively. In addition, the coefficient of influence of family English book collection on male students' English scores was 0.748 ($p < 0.1$).

Among the embodied state, the frequency of attending science museum activities had a substantially positive effect on female students' math and total grades. However, this had no substantial impact on male students' grades. Conversely, the frequency of attending concerts had a positive impact on male students' Chinese grades. However, this had no substantial impact on female students' performance. Finally, the frequency of overseas travel had a negative impact on male students' total grades. However, this had no substantial effect on female students' grades. Concretely, the regression coefficients of the science museum activity frequency on girls' math and total grades were 2.618 ($p < 0.01$) and 4.285 ($p < 0.01$), respectively. The regression coefficient between the frequency of concert visits and the Chinese grades of male students was 0.863 ($p < 0.1$). The regression coefficient between the frequency of travelling abroad and the total grades of male students was −2.049 ($p < 0.1$).

Discussion

The effect on children's school attainment

Table 6 The impact of family cultural capital on school performance from different genders.

	Males ($N = 491$)				Females ($N = 545$)			
Variables	**Overall Score**	**Chinese**	**English**	**Math**	**Overall Score**	**Chinese**	**English**	**Math**
Grade	1.557 (0.028)	2.702*** (0.169)	−2.051** (−0.102)	−0.741 (−0.031)	0.177 (0.004)	1.600*** (0.135)	−1.368** (−0.085)	−0.264 (−0.013)
	$p = 0.550$	$p = 0.000$	$p = 0.025$	$p = 0.509$	$p = 0.925$	$p = 0.002$	$p = 0.043$	$p = 0.768$
Household income	−5.650** (0.117)	−1.679*** (−0.123)	−1.799** (−0.104)	−0.763 (−0.037)	2.192 (0.058)	−0.291 (−0.029)	1.045* (0.076)	0.057 (0.003)
	$p = 0.014$	$p = 0.009$	$p = 0.025$	$p = 0.439$	$p = 0.162$	$p = 0.501$	$p = 0.064$	$p = 0.939$
Area	0.743 (0.038)	−0.275 (−0.049)	0.171 (0.024)	0.840** (0.101)	1.453** (0.089)	−0.183 (−0.042)	0.465* (0.078)	1.240*** (0.162)
	$p = 0.431$	$p = 0.295$	$p = 0.605$	$p = 0.038$	$p = 0.039$	$p = 0.345$	$p = 0.066$	$p = 0.000$
Education attainment of father	4.301** (0.142)	0.674 (0.078)	1.459** (0.134)	0.124 (0.095)	1.032 (0.040)	−0.233 (−0.033)	0.596 (0.063)	0.393 (0.032)
	$p = 0.033$	$p = 0.231$	$p = 0.039$	$p = 0.163$	$p = 0.501$	$p = 0.580$	$p = 0.281$	$p = 0.590$
Education attainment of mother	0.037 (0.001)	0.465 (0.052)	−0.654 (−0.058)	−0.505 (−0.038)	5.351*** (0.205)	1.417*** (0.202)	1.843*** (0.194)	2.197*** (0.179)
	$p = 0.986$	$p = 0.429$	$p = 0.376$	$p = 0.577$	$p = 0.001$	$p = 0.001$	$p = 0.001$	$p = 0.003$
Household book collection	2.930** (0.129)	1.028*** (0.159)	1.751*** (0.215)	1.208** (0.125)	2.670*** (0.145)	0.707*** (0.143)	0.854*** (0.128)	1.212*** (0.140)
	$p = 0.020$	$p = 0.004$	$p = 0.000$	$p = 0.026$	$p = 0.002$	$p = 0.003$	$p = 0.006$	$p = 0.003$
Household English book collection	0.130 (0.049)	−0.286 (−0.043)	0.748* 0.090	0.115 (0.012)	0.110 (0.006)	−0.100 (−0.019)	0.557 (0.077)	−0.309 (−0.033)
	$p = 0.369$	$p = 0.418$	$p = 0.090$	$p = 0.832$	$p = 0.911$	$p = 0.714$	$p = 0.118$	$p = 0.511$
Attending science museums	−1.893 (−0.070)	−0.463 (−0.060)	−0.785 (−0.081)	−0.884 (−0.077)	4.285*** (0.166)	0.538 (0.077)	0.818 (0.087)	2.618*** (0.215)
	$p = 0.349$	$p = 0.411$	$p = 0.267$	$p = 0.309$	$p = 0.007$	$p = 0.222$	$p = 0.155$	$p = 0.001$
Attending concerts or plays	1.758 (0.067)	0.863* (0.116)	−0.004 (0.000)	0.500 (0.045)	0.148 (0.007)	0.211 (0.035)	−0.238 (−0.029)	−0.388 (−0.037)
	$p = 0.279$	$p = 0.054$	$p = 0.995$	$p = 0.465$	$p = 0.897$	$p = 0.503$	$p = 0.561$	$p = 0.470$
Overseas travel	−2.049* (−0.065)	/	0.060 (0.005)	/	−1.279 (−0.044)	/	−0.535 (−0.051)	/
	$p = 0.059$		$p = 0.924$		$p = 0.323$		$p = 0.251$	
R^2	0.076	0.103	0.116	0.040	0.145	0.104	0.166	0.120
Adjusted R^2	0.049	0.077	0.090	0.013	0.123	0.080	0.144	0.098
ΔR^2	0.073	0.069	0.100	0.034	0.132	0.085	0.136	0.106
F	2.816	3.907	4.454	1.510	6.439	4.380	7.538	7.137
ΔF	3.771	3.661	5.389	1.859	8.158	5.034	8.624	5.552

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$;
The table above presents the coefficient, the standardized coefficient, and their statistical significance in the data columns.

Students' institutionalised state demonstrated a significant effect on their academic attainment positively. This paper found that the institutionalised state had different degrees of influence on the academic accomplishment of children. In the institutionalised state, both educational attainment of parents had a substantial impact on children's overall accomplishment positively. This study validates the results of Jin et al. (2022) that high parental educational attainment can contribute to school success by providing the resources needed for children's performance in school.

The influence of a father's educational attainment on his children's English performance in school is a significant factor. This suggests that the higher the educational attainment of the father, the better the English performance of the children. English courses are offered in China's higher education programmes, and obtaining postgraduate degrees, such as master's and doctoral degrees, requires taking a more rigorous English proficiency exam. Therefore, fathers with high academic qualifications play an intergenerational role in enhancing their children's English proficiency. The level of education attained by mothers has a significant effect on the performance of Chinese students. This suggests that the higher the mother's academic qualifications, the better the children's Chinese performance at school. Women tend to study more liberal arts majors, and their mothers have played a significant role in the enlightenment of traditional culture, which is the foundation of Chinese learning. (Dumais, 2002). Therefore, it can be concluded that the higher the mother's education, the better the children's Chinese school outcomes.

Objectified state had a substantial impact on middle school students' school attainment. In the objectified state, family book collections had a significant impact on Chinese, English, mathematics and total scores. The study echoed the study of Kloosterman et al. (2011). Contrary to the research of Jin et al. (2022), family book collections did not exerts an effect on children' school performance. This study demonstrates that family book collections still have an impact on middle school performance. The result shows that family book collections are very important for middle school students, and they are still an important objectified indicant of cultural capital.

The family collection of English books had a substantial effect on children's English grades. Past studies have revealed the impact of family collections of books written in the first language (Kraaykamp and Van Eijck, 2010), but the reason for considering the indicator of book collection written in the second language is that the region selected for this study is the capital city of China, Beijing, where international exchanges are becoming more frequent and many families have a number of English book collections, which will provide an important objectified state for middle school students to improve their English performance.

Students' embodied state had a substantial impact on their school attainment. The frequency of attending concerts had a substantial impact on middle children's Chinese accomplishments, validating the study of Corrigall et al. (2013). Participation in music learning and activities affects language achievement, which has a substantial impact on academic performance positively (Guhn et al. 2020). Musically trained individuals perform better on tests of language skills, including vocabulary, reading, spelling and phonics (Schellenberg, 2005). To encourage the academic achievement of Chinese through music education, it is important to emphasise the role that musical activities play in language learning.

It can be observed that international travel has a significantly detrimental impact on the academic performance of middle school students. In Beijing, a city with high economic and social development, it is not uncommon to travel abroad, and travelling abroad does not necessarily bring academic achievement. In response to the study of Jin et al. (2022), travelling abroad had a substantially negative impact on their accomplishment. Travelling overseas can be a unique experience; going abroad does not mean that one learns about a refined culture, and this experience cannot positively impact middle school students' school success. Therefore, careful consideration should be given to travelling abroad, what the purpose of the trip is, and what it can bring to the student.

Moreover, with busy parents working in China's big cities and many children's education being undertaken by grandparents, parental presence has, in turn, become a scarce resource. Tan and Fang (2023) suggests that such scarce resources as parental engagement and parent-child interaction are a form of family social capital.

The effect on male and female students' attainment

The effect of the institutionalised state on the school accomplishment of boys and girls. A mother's education level has a substantial effect on female students' attainment in Chinese, English, math and overall achievement. The study echoed the statement of Jin et al. (2022) that mothers' academic qualifications can provide the resources needed for their school success, thus exerting the intergenerational effect of institutionalised cultural capital. Therefore, the important role played by mothers' academic qualifications in the education of middle school girls should be emphasised.

Moreover, a father's education level has a substantial effect on male their English and overall attainment. The study mirrored the results of Erola et al. (2016) that a father's academic qualification can promote children's school success as a common intergenerational effect of institutionalised cultural capital. The significant effect of a father's educational qualification on boys' English achievement indicates that the higher the father's education level, the better the son's English performance in school. Thus, a highly educated father can provide some learning advantages for his son's English studies in middle school.

The effect of an objectified state on the academic accomplishment of students of different genders. Firstly, the family collections of books have a substantial impact on the Chinese, English, math and total grades of both boys and girls. The study validated the findings of Byun et al. (2012). This shows that, whether boys or girls, the family book collection is an important cultural capital indicator to promote school success.

Secondly, Family English book ownership greatly influences boys' English performance, supporting the results of Castro et al. (2015). Therefore, we should give full play to the role of family collections of English books so as to improve the English performance of male students in middle schools.

The embodied state's impact on the school attainment of boys and girls. Firstly, the frequency of science museum activities had a significant effect on female students' math and overall grades, which was different from the previous study (Jin et al. 2022), which found that visiting science and technology museums promoted the grades of high school boys, and this study took the participants of middle school students, which showed the opposite result. In general, boys have an advantage over girls in STEM subjects, and this study found that visiting science museums could promote female students' math achievement and overall achievement, so it is possible to promote the improvement of girls' academic achievement through participation in science museum activities.

Secondly, the frequency of attending concerts or plays had a significant effect on male students' Chinese performance, and this

study echoed the research of Yang et al. (2014) that boys who participated in music activities had higher academic performance in language than other students. This proves that participation in musical training and musical activities can promote language skills. Thus, the cultural capital of pupils may benefit their language performance through participation in challenging events like concerts or plays.

Thirdly, the frequency of overseas travel had a significantly negative impact on the overall results of male students, suggesting that travel abroad did not promote boys' academic success. We admit that travelling abroad can broaden horizons, expose one to different cultures, and accumulate rich international experiences, which can have many educational effects (Stone and Petrick, 2013). However, it is necessary to note that the benefits of middle school students' overseas travel may not be obtained in school performance. Instead, it may enhance the development of students' comprehensive abilities and core literacy in the future (Trower and Lehmann, 2017). Travelling abroad may bring different values to both in-class and out-of-class learning, and learning through travel may go beyond academic learning (Gmelch, 1997). Therefore, the educational impact of travelling abroad should not be judged solely on the basis of academic achievement. Of course, when choosing to travel abroad, one should carefully plan for the goals of the trip as well as the educational impact.

Conclusions

In conclusion, three categories of cultural capital have been shown to influence the academic achievement of middle school pupils in specific ways. Middle school students' academic success has been significantly impacted by the objectified and institutionalised states. The embodied state has both positive and negative consequences on middle school pupils' academic performance. There appears to be a notable discrepancy in the impact of cultural capital on academic achievement between male and female students.

Overall, this investigation makes three primary contributions: Firstly, this study offers empirical evidence from Chinese participants in support of research into the cultural capital of middle school students in the Asia-Pacific region. Secondly, it introduces cultural capital to the field of family education, thereby enriching the cultural capital theory's application scenarios and providing empirical research references for family education in the new era. Thirdly, this study demonstrates the continued relevance and criticality of cultural capital theory in contemporary times. The research findings indicate that there is a need to balance the impact of cultural capital on educational outcomes, improve the mechanism of coordinated education among schools, families and society and address the class gap hidden behind cultural capital. It is recommended that parents be encouraged to participate actively in their children's education and life, with a view to increasing the time they spend with their children in learning and communication and forming positive parent-child interactions. Moreover, it is proposed that focus be placed on disadvantaged groups with regard to cultural capital. In addition to pursuing their own educational advancement, parents can also expand their reading and take their children to more activities such as concerts or museums in order to promote diversified development. Besides, the evaluation system should be optimised. This could be achieved by adopting a diversified evaluation system, enhancing the focus on process evaluation, and paying attention to the all-round growth of students. Furthermore, teaching should be based on students' aptitude.

Limitations. The study on the cultural capital of the family has achieved its objectives, but there are some limitations. First, the study was conducted on a sample of more than one thousand middle school students from four middle schools in Beijing, and it is not yet possible to draw conclusions applicable to all middle school students in China. Future studies should increase the sample size and investigate the mechanism of family cultural capital on the school performance of pupils. This should be done by combining questionnaires and interviews based on the level of socio-economic and cultural development of the societies concerned, and taking into account China's geographical divisions. Second, this study focuses on the theme of the effect of family cultural capital on students' school success without further exploring the underlying principles of influence. In future research, a more detailed analysis could be conducted on the underlying principles of the effect of family cultural capital on school success for students of different ages. Third, the subjects covered in this study were limited to Chinese, English and mathematics, and future research could examine the impact of cultural capital on a wider range of subjects. Furthermore, future research should consider urban-rural differences and the impact that social capital has on students. It should also focus on differences in teaching and learning conditions from the provincial level to the school level, consider the changes in cultural capital in the digital age, and focus on the impact of artificial intelligence development on cultural capital.

Data availability

The data collected and reported in this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical considerations.

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Author contributions

Conceptualisation, original draft preparation, investigation and data analysis: HJ and SJ; Methodology and software: HJ, SJ and XM; Validation and formal analysis: HJ and SJ; Resources, and data curation: HJ, XM and YX; Supervision, reviewing and editing: HJ, SJ and YX; Project administration and resource management: HJ and SJ. All authors have read and agreed to the published version of the paper.

Competing interests

The authors declare no competing interests.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. The study was approved by the Academic Committee of the Institute for Educational Theories of Beijing Normal University (BNUAC1101023).

Informed consent

At the beginning of the survey, participants were informed about the purpose of the study and their free rights to participate voluntarily. All respondents were provided informed consent prior to the investigation.

Additional information

Correspondence and requests for materials should be addressed to Shi Jiao.