

The double advantage of high parental education for offspring's educational achievement: The role of parenting practices

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ABSTRACT

Background: Parental education is one of the best predictors of child school achievement. Higher parental education is not only associated with higher child intelligence, but additionally children from highly educated parents perform better in school due to other family related factors. This study evaluates the relation between parental education, child non-verbal intelligence and parenting practices with child school achievement.

Methods: Longitudinal data from a large population-based, multi-ethnic cohort of children in the Netherlands (63% Dutch origin) followed from birth to age 12 years (3,547 children; 52.3% girls) was analysed. School achievement was measured at the end of primary school (twelve years of age) with a national Dutch academic test score. The non-verbal intelligence of the child was measured at age 6 years. Parental education was assessed at age 3 years. Maternal and paternal parenting measures were assessed in early and mid-childhood.

Results: Child intelligence partially mediated (B indirect effect= 1.55 95% CI [1.30, 1.79] $p<0.001$) of the association between parental education and child school achievement. Additionally, mother and father family routines in and mid-childhood partially mediated (B indirect effect= 0.08 95% CI [0.04, 0.14] $p<0.01$) the association between parental education and child school achievement. We did not find a mediated effect of corporal punishment in the association between parental education and child school achievement.

Conclusion: Higher parental education was associated with better school achievement through two mechanisms, a higher intelligence in the child and independently through parenting practices which contribute to better performance.

INTRODUCTION

Parental education is a consistent predictor of offspring school achievement, physical health, mental health, cognitive abilities, school achievement and final offspring academic attainment.^{1,2} School achievement is an important developmental outcome, is a predictor of the final academic attainment, socioeconomic status throughout life³ and health.⁴ One of the most important child characteristic contributing to school achievement is child intelligence.⁵

Parental education is associated with school achievement by mechanisms related to child intelligence² and by mechanisms independent of child intelligence. Parents with a higher intelligence will have children with higher intelligence,⁶ due to a high genetic heritability of intelligence. The heritability of intelligence in childhood is only around 20%, but increases to about 70% in adolescence and up to 80% in adulthood.⁷ Additionally, the family environment has lasting consequences on the development of a child's intelligence, as indicated by adopted children having a higher intelligence than non-adopted biological siblings and non-adopted peers.⁸ Somewhat surprisingly, few studies have attempted to quantify the effect of the association between parental education and child school achievement through child intelligence.

Independent of child intelligence, parents with a high education are more able than lower educated parents to provide social and material resources promoting a higher school achievement in the offspring, through their involvement with school activities.⁹ Higher educated parents also tend to live in higher quality neighbourhoods,¹⁰ are more likely to provide cognitive enriched environments to their children¹¹ and tend to express expectations that children complete higher education.¹² Parental education is known to be related to parenting practices. Parenting practices like parental involvement in childhood have been associated with better school achievement¹³ and less behavioural and emotional problems.¹⁴ It has been shown that higher parental education is associated with more consistent family routines.¹⁵ Family routines are associated with less anxiety, depressive symptoms¹⁶ and less behavioural problems in children.¹⁷ The association of family routines with school achievement has hardly been studied. In contrast to family routines, corporal punishment¹⁸ and harsh discipline tend to occur more amongst parents with a lower education.¹⁹ Corporal punishment in childhood has been associated with the presence of internalizing and externalizing problems, low self-esteem, a negative parent-child relationship and lower cognitive abilities in children.²⁰ In addition, harsh discipline, which includes the use of harsh verbal discipline or mild physical punishment,¹⁹ often precedes emotional and behavioral problems in children²¹ as well as a lower academic attainment.²²

In the present study, we aimed to investigate mechanisms that differentially underlie the association of parental education with children's school achievement. Specifically, we focus on quantifying the mediated effect of child intelligence and parenting practices in the association of parental education and child school achievement.

METHOD

Participants

Participants were drawn from the Generation R Study, a population-based prospective birth cohort that enrolled 9,778 women living in Rotterdam with an expected delivery date between April 2002 and January 2006. The study has been described extensively elsewhere.²³ This study has been approved by the Medical Ethical Committee of the Erasmus Medical Centre, and written informed consent was obtained from all participants parents. The eligible population for the present study consisted of the 7,393 children who participated in the school period (see flow chart, Supplementary Figure 1). Information on school achievement was obtained in 3,547 children, either by accessing the national database ($n = 2,655$) or the mother report when there was no link to the database ($n = 892$). Reasons for missing data on school achievement were: no consent to link the child's data to the national database; the test was not used at the school of the child; the linkage was not successful, or there was no mother report available. For the analyses, we included only children who had information on school achievement and parental education. Of the 3,547 children, 3,477 children had available data for maternal education and 3,218 for paternal education.

Maternal and Paternal Education

Information on their own educational attainment was provided by the mother and by the father during pregnancy, at child age three, and at age five years. Education was scored as: primary education not completed; primary education completed; up to three years of secondary school; intermediate vocational training; higher vocational training, or university degree. For the present analysis, we used the items from the three-year assessment.

Offspring School Achievement

The school achievement of the child was based on a test created by the Central Institute for Test Development (in Dutch: Centraal Instituut voor Test Ontwikkeling, CITO), the CITO score. In the Netherlands, is compulsory to administer an academic test in the final grade of primary school, to guide the appropriate choice for secondary education (i.e., pre-vocational secondary education, higher general secondary education and pre-university level). Of the different available academic tests, the CITO test is the most

frequently used. The test evaluates school achievement at the end of primary education, when children are 11-12 years old, by assessing language (e.g. In which sentence there is a word spelled incorrectly? This is the eighthst long jumper.) and mathematics skills (e.g. $7.7 + 3.07 = 10.14$; 10.77; 10.707; or 11.40). The standardized test score ranges between 500 and 550, with higher scores pointing at a higher school achievement. For 1,295 children, we had information on the school achievement score both by linkage through the national database and the mother report. The correlation between these two assessment types was .97. Of these combined reports, 79.5% of the mothers reported the correct school achievement score. This comparison suggests that mothers reliably report on their children's CITO score. Therefore, for children with a maternal report only we used this score to replace the missing value of the CITO test.

Offspring Intelligence

We measured children's intelligence at two time points. A non-verbal IQ was determined when children were age six using the Dutch Snijders-Oomen non-verbal intelligence test.^{24,25} The subsets of the non-verbal IQ test used in Generation R are Mosaics and Categories. We chose a validated Dutch instrument and specifically investigated non-verbal IQ, because our sample is multi-ethnic, and bilingualism is common; a valid assessment of verbal IQ before school age was therefore not feasible. Additionally, this assessment focuses on fluid intelligence²⁵, which allowed us to distinguish between intelligence characteristics that are more innate and less amenable to learning. At age 13 the WISC-V, a full intelligence scale was assessed, it comprises of Vocabulary, Matrix Reasoning, Digit Span and Coding scales.²⁶ To do this analysis we assume the IQ before 12 years is the same as the IQ assessment at 13 years.

Parenting Practices

We selected maternal and paternal parenting measures assessed in different childhood periods. Early Childhood: Harsh discipline was assessed with a Dutch adapted version of the Parent-Child Conflict Tactics Scale.¹⁹ Mothers and fathers completed this measure at child age three years. The harsh discipline scale is a validated self-report measure consisting of six items (e.g., "I shouted or screamed angrily at him/her"). Parents were asked to rate their use of this discipline practice in the last two weeks on a six-point scale ranging from never to five times or more (0 to 5). The six items were summed if there were no missing values, higher scores indicate more harsh discipline. In the current study, internal consistencies (Cronbach's alpha) were 0.63 for the mother rated scale and 0.57 for the father rated scale.

Family routines were reflected in a composite score derived from seven items about domains of family regularity reported by mothers when children were between two and four years old as described previously.¹⁷ The measure included two items on bedtime

routines (e.g. 'Do you have a set pattern or ritual with your child at bedtime?') at age two years. At age four, the measure included two items on family meal locations (e.g. 'How often do you have breakfast/evening meal around the table together with your child/children?') and three items on meal frequency (i.e. 'how often does your child eat breakfast/lunch/evening meals?'). A Confirmatory Factor Analysis was employed to combine these items into a single construct. The model fit was acceptable with a root mean square error of approximation = .05 and the comparative fit index and the Tucker–Lewis index being 0.94).

Middle Childhood: Corporal punishment was assessed with two questions from the Alabama Parenting Questionnaire.²⁷ The mothers completed this questionnaire when the children were eight years old. The questions were "Do you slap your child when he/she does something wrong?" and "Do you spank your child with your hand when he/she has done something wrong?". Mothers were asked how often this discipline type is used in the house, on a five-point scale ranging from never to often (0 to 4). The items were summed if there were no missing values, higher scores indicate the use of more corporal punishment. The internal consistency (Cronbach's alpha) was 0.67.

Family routines was measured with a subscale from the Stability of Activities in the Family Environment (SAFE) questionnaire.²⁸ Both mothers and fathers completed this measure when children were nine years of age. The scale is a validated self-report measure consisting of six questions (e.g., "How regular is your child's homework routine after school"). Parents were asked to rate the regularity of the activities in the family during the last six months on a four-point scale. The items were summed up allowing for 25% missing data. Higher scores mean more regularity in the family routines. In the current study, the internal consistencies (Cronbach's alpha) were 0.63 for the mother rated scale and 0.65 for the father rated scale.

Covariates

The following possibly confounding factors were included. Maternal age was assessed at enrolment. Maternal national origin was categorized as Dutch, other Western and non-Western, based on their parents' country of birth. A parent was categorized as Dutch origin if both her/his parents were born in the Netherlands, the Western category was created if either reported European or American Western origin, and the non-Western category included Surinamese, Dutch Antillean, Turkish, and all African descent amongst other origins. Mother's IQ was estimated at child age six years, with the set I from the Raven's Advanced Progressive Matrices Test²⁹ which is a nonverbal ability test used to assess fluid intelligence.

Statistical modelling

Missing values on the parenting practices, the covariates, and IQ of the children were imputed using chained equations with mice package³⁰ in R 3.5.3.³¹ Twenty imputed data sets were created. Additionally, we imputed parental education at age three years, carrying the information from the pregnancy assessment forward or the information from the five-year assessment backwards. We did not impute the school achievement score data. We performed an attrition analysis comparing the 3,547 included children to the 3,846 children with missing information. We also examined the correlation between the parenting practices with the Pearson's correlation coefficient.

We performed mediation analysis using Lavaan package³² in R. We assessed the relationship of parental education, children's intelligence and parenting practices with school achievement in four models. In the models one to three we evaluated the mediated effect of child full IQ, family routines in mid-childhood, and corporal punishment in the relationship of parental education and the child school achievement with each mediator in a separate model (see Figure 1). In the fourth model, we evaluated all the mediation paths in a single model. Models were fitted in the last imputed dataset with a maximum likelihood estimation and the standard errors were bootstrapped 1,000 times, the confidence intervals were calculated with the percentile bootstrap method and the p values were corrected for multiple testing with Benjamini and Yekutieli control, that takes into account the dependency between measurements.³³ Unstandardized coefficients are presented.

Maternal and paternal education and the maternal and paternal scores of harsh discipline in early childhood and family routines in middle childhood each were combined with the mixed model approach³⁴ using the Linear and Nonlinear Mixed Effects Models ('nlme') package.³⁵ This approach yielded combined latent variables for parental education (N = 3,490) and parenting variables, which were used in all analysis.

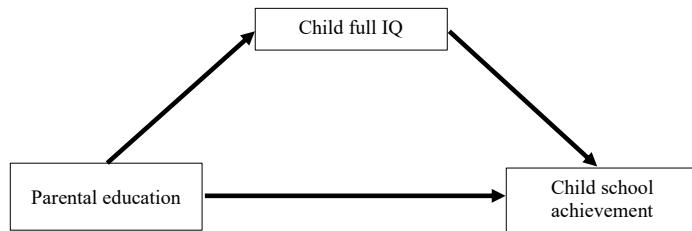
All the models were adjusted for age at enrolment and national origin of the mother and maternal IQ. Compared with the children not included in this analysis (n = 3,846), the included children (n = 3,547) had a higher non-verbal IQ (mean = 104.0, SD = 14.4) than children not included (mean = 98.2, SD = 15.1). The mothers and fathers included in the analysis were higher educated (31.3% university degree for the mothers and 37.3% for the fathers) (see Supplementary Table 1).

We performed two secondary analyses. In the first, we evaluated sequential mediation paths, going through the early childhood measure of each mediator and then through IQ and parenting practices in mid-childhood. In the second, we estimated the association between parenting practices and child full IQ, in the children with information

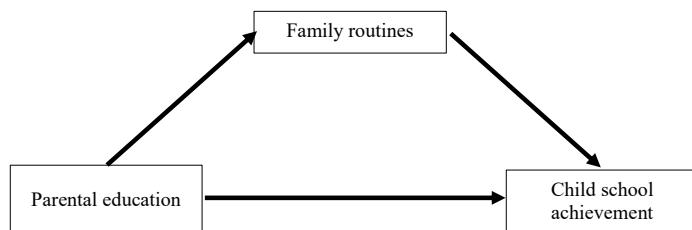
on school achievement and in all children regardless if they had information on school achievement to increase power in the analysis.

Figure 1. Mediation Models

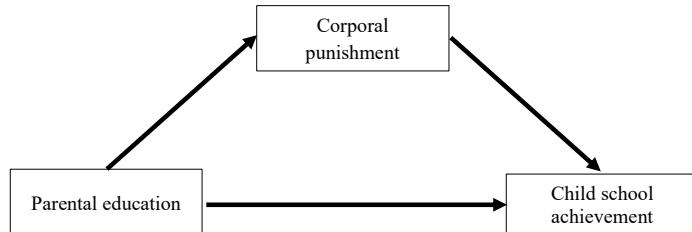
Model 1



Model 2



Model 3



Model 4

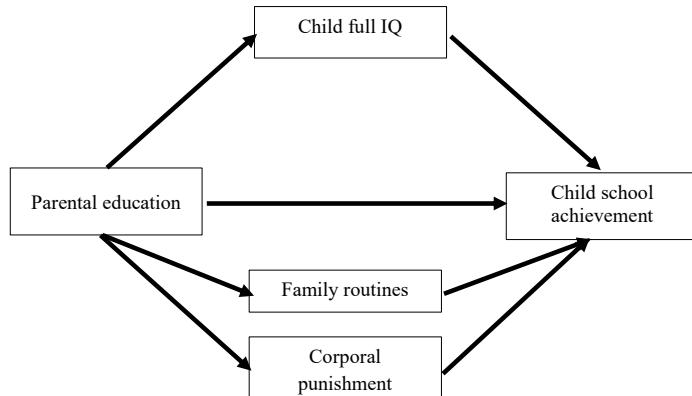


Table 1. Characteristics of the Study Population

Characteristics of the child	School achievement
Gender, boy, %	47.7
Age at academic test (in years), Mean (SD)	11.9 (.4)
School achievement test (score), Mean (SD)	538.4 (9.4)
Child non-verbal IQ (score), Mean (SD)	104.0 (14.4)
Child full IQ (score), Mean (SD)	104.6 (12.9)
Characteristics of the parents	
Mother's age at intake (in years), Mean (SD)	31.4 (4.7)
Mother IQ (score), Mean (SD)	98.3 (14.8)
Maternal education, %	
Secondary school only, less than 3 years	14.4
Secondary school only, more than 3 years and less	27.2
Higher vocational training	27.0
University degree	31.3
Paternal education, %	
Secondary school only, less than 3 years	16.3
Secondary school only, more than 3 years	24.3
Higher vocational training	22.0
University degree	37.3
National origin of the mother, %	
Dutch	63.0
Western	8.0
Non-Western	29.0
Parenting practices	
Harsh discipline mother age 3, Median (IQR)	2 (2)
Harsh discipline father age 3, Median (IQR)	2 (3)
Family routines mother age 4, Median (IQR)	0.1 (0.6)
Corporal punishment mother age 8, Median (IQR)	0 (1)
Regularity in routines mother age 9, Mean (SD)	18.4 (3.2)
Regularity in routines father age 9, Mean (SD)	17.8 (3.4)

Note. Total N= 3,547. Numbers denotes children included in one or more analyses.

SD= Standard deviation

IQR= Inter quartile range

RESULTS

The characteristics of the population are shown in Table 1. Of the participants, 47.7% were boys. The mean non-verbal IQ of the children was 104.0 (SD = 14.4) and of the mother 98.3 (SD = 14.8). The national origin of most mothers was Dutch, 63.0%. The correlations between the parenting practices are presented in Supplementary Table 2.

Table 2. Child full IQ and Parenting Practices in Mid-childhood as Mediators of the Association between Parental Education and Child School Achievement.

	Model 1			Model 2			Model 3			Model 4		
	β	95% CI	p	β	95% CI	p	β	95% CI	p	β	95% CI	p ^a
Indirect effect through full IQ	1.55	(1.30, 1.79)	<0.001							1.55	(1.30, 1.79)	<0.001
Indirect effect through family routines				0.11	(0.03, 0.18)	<0.01				0.08	(0.04, 0.14)	<0.01
Indirect effect through corporal punishment							0.04	(-0.01, 0.09)	0.06	0.01	(-0.02, 0.04)	1.00
Direct effect	2.56	(2.19, 2.97)	<0.001	4.03	(3.55, 4.46)	<0.001	4.06	(3.59, 4.52)	<0.001	2.47	(2.10, 2.88)	<0.001
Total effect	4.11	(3.65, 4.56)	<0.001	4.13	(3.68, 4.58)	<0.001	4.10	(3.69, 4.56)	<0.001	4.11	(3.65, 4.56)	<0.001

Note. N= 3490. Models are adjusted for child age and sex, maternal age, ethnicity, and non-verbal IQ of the mother.
^a p values are adjusted for multiple testing.

Family routines in early and mid-childhood were positively correlated (ranging from $r=0.19$ to 0.26). Similarly, harsh discipline in early childhood and corporal punishment in mid-childhood were correlated (ranging from $r=0.23$ to 0.33). Family routines in early and mid-childhood were negatively correlated with harsh discipline and corporal punishment (ranging from $r=-0.04$ to -0.14).

The outputs of the four mediation models are presented in Table 2. We describe model 4, as the results are similar to models 1 to 3. Child full IQ mediated 38% (B indirect effect= 1.55 95% CI [1.30 , 1.79] $p<0.001$) of the association between parental education and child school achievement. Additionally, regularity in the routines at ages four and nine years mediated 2% (B indirect effect= 0.08 95% CI [0.04 , 0.14] $p<0.01$) of the association between parental education and child school achievement. We did not find a statistically significant mediated effect of corporal punishment (B indirect effect= 0.01 95% CI [- 0.02 , 0.04] $p=1.0$) and child school achievement.

In the secondary analysis, sequential mediation paths were evaluated. We found that 30% of the mediated effect of mid-childhood full IQ in the association of parental education and child school achievement goes through non-verbal intelligence in early childhood. Additionally 40% of the mediated effect of regularity in the routines in mid-childhood goes through regularity in the routines in early childhood (see Supplementary Table 3). Finally, we contrasted the association of parenting practices with the child's full IQ both in the dataset of children with school achievement score and in the complete data set of children who participated in the school period (see Supplementary Table 4). Results very similar, harsh parenting and corporal punishment were negatively associated with IQ in both datasets.

DISCUSSION

In this study, using data from a population-based prospective birth cohort, we examined the association between parental education, children's intelligence, parenting practices in early and mid-childhood, and children's school achievement at age 12 years. Our study results are in line with the positive association of parental education with the child's intelligence and better school achievements. Additionally, we highlight two main findings. First, the child's intelligence partially mediates the association between parental education and the child's school achievement. Second, parental education is also related to offspring school achievement through parenting practices, family routines mediated the relation between parental education and the child's school achievement. In addition, we found that some effect of parenting practices may occur via child intelligence.

The positive association between parental education and offspring school achievement has been reported in numerous studies in over 50 years of research, across cultures and in countries with different levels of economic development.¹ We found that parental education was related to better school achievement of the child due the relation with offspring intelligence, the child's intelligence mediated 38% of the association of parental education and the child's school achievement. These analyses were controlled for maternal fluid intelligence to further minimize the impact of intellectual endowment from the mother and because intelligence is a highly heritable genetic trait.⁷ The association between parental education and child IQ reflects the role of environmental and genetic factors in the association of parental education with the child's intelligence in line with prior literature. For instance, intelligence is a highly heritable trait.⁷ Nonetheless, children adopted by parents with a higher socioeconomic status have a higher intelligence than the not adopted siblings and peers.⁸

In the present study, higher educated parents also were more likely than lower educated parents to provide more family routines and these routines partially mediated the association between parental education and child school achievement. Contrary to our hypothesis, there was no mediation by harsh discipline and corporal punishment in the relation between parental education and the child school achievement. This may be a result of the relatively low prevalence of harsh parenting and corporal punishment in the present study. Corporal punishment may not be very frequent in the Netherlands,³⁶ more so because of a ban of some of these practices, like beating. Nonetheless, we found that harsh discipline and corporal punishment were associated with lower intelligence, which is in line with previous literature.²⁰ Given the consistent association between IQ and school achievement, harsh parenting and corporal punishment cannot be ruled out as possible mediators of the relation of parental education and offspring school achievement.

These results should be viewed against the background of some limitations. First, we did not have a father report for two parenting practices measures as we found it more difficult to motivate fathers to complete frequently mailed questionnaires. Therefore, family routines in early childhood were only rated by the mother, as was corporal punishment in mid-childhood. Second, the mediated effect by parenting practices was not large, it was 2% of the total effect. Arguably, this is an important finding as school achievement is a complex outcome with numerous determinants and it points out to parenting practices as possible avenues for public health interventions. Parenting practices are a broad construct that encompasses multiple behaviours in a wide time span that are hard to assess comprehensively, for instance, 40% of the mediated effect of family routines in mid-childhood and school achievement goes through family routines in early childhood.

Third, school achievement data was only available in part of the sample. However, this selection was largely determined by the choice of schools for the specific test we linked.

This study has notable strengths, including the prospective nature of the data collection and the multiple ages at which parenting practices were collected minimizes recall bias from parental reports. The large number of children and the multi-ethnic composition of the sample improves the generalizability of the results. Further, both IQ and school achievement were objectively obtained in standardized settings.

These results illustrate that higher maternal and paternal education are important indicators of inequality in school achievement for two different reasons; firstly, through the positive effect on the child intelligence which mediates the child's school achievement, and secondly, by an additional effect on the child's performance in school, which is related to parenting practices. Importantly, implementing more routines, including morning, mealtime and bedtime routines, homework and school activities, household responsibilities and cultural activities, could improve the child's school achievement and may be a potential mechanism to narrow the gap between the children's school achievement of higher and lower educated parents and hence social inequality. This, however, remains speculative as our study is no intervention study demonstrating causality. Also, based on our findings, we carefully postulate that some aspects of routines are amenable to school and community interventions and can be addressed by educational institutions, for example with supervised homework routines at school. The findings should be replicated in a randomized trial to better account for unknown confounders that could explain these results. Additionally, the components of routines should be meticulously dissected to understand what components of the family routines hold the positive association found.

Key points

- Parental education is an important determinant of offspring education and is source of inequality through two different mechanisms. Children from highly educated parents are more intelligent and have a higher school achievement. Additionally, highly educated parents provide more regular routines at home and this regularity is associated to a higher school achievement.
- Promoting routines in the activities at home might be a way to decrease school achievement inequality.

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Supplementary Table 1. Attrition Analysis

	Included participants	Excluded participants
Characteristics of the child		
Gender, boy, %	47.7	52.1
Age at academic test (in years), Mean (SD)	11.9 (.4)	-
School achievement test (score), Mean (SD)	538.4 (9.4)	-
Child IQ (score) , Mean (SD)	104.0 (14.4)	98.2(15.1)
Characteristics of the parents:		
Mother's age at intake (in years), Mean (SD)	31.4 (4.7)	29.8 (5.3)
Mother IQ (score), Mean (SD)	98.3 (14.8)	93.4 (15.4)
Maternal education, %		
Secondary school only, less than 3 years	14.4	28.9
Secondary school only, more than 3 years and less	27.2	32.2
Higher vocational training	27.0	19.9
University degree	31.3	19.0
Paternal education, %		
Secondary school only, less than 3 years	16.3	26.7
Secondary school only, more than 3 years	24.3	28.4
Higher vocational training	22.0	20.2
University degree	37.3	24.7
National origin of the mother, %		
Dutch	63.0	48.1
Western	8.0	8.1
Non Western	29.0	43.8
Parenting practices		
Harsh discipline mother age 3, Median (IQR)	2 (2)	3 (2)
Harsh discipline father age 3, Median (IQR)	2 (3)	3 (2)
Family routines mother age 4, Median (IQR)	.1 (.6)	-.03 (.7)
Corporal punishment mother age 8, Median (IQR)	0 (1)	0 (1)
Regularity in routines mother age 9, Mean (SD)	18.4 (3.2)	17.9 (3.5)
Regularity in routines father age 9, Mean (SD)	17.8 (3.4)	17.5 (3.7)

Note. Total N included participants = 3,547, total N excluded participants = 3,846.

SD= Standard deviation.

IQR= Inter quartile range.

Supplementary Table 2. Correlation Coefficients Between Parenting Practices.

	1	2	3	4	5	6	7	8
Early childhood								
1. Harsh discipline mother rating	1	0.42	0.85	-0.14	0.33	-0.08	-0.07	-0.09
2. Harsh discipline father rating		1	0.83	-0.09	0.23	-0.04	-0.08	-0.07
3. Harsh discipline combined, mother and father rating			1	-0.14	0.33	-0.07	-0.09	-0.09
4. Family routines mother rating				1	-0.16	0.25	0.19	0.26
Middle childhood								
5. Corporal punishment mother rating					1	-0.12	-0.11	-0.14
6. Family routines mother rating						1	0.45	0.87
7. Family routines father rating							1	0.83
8. Family routines combined, mother and father rating								1

**Correlation is significant at the 0.01 level (2-tailed).

Supplementary Table 3. Child full IQ and parenting practices in early and mid-childhood as mediators of the association between parental education and child school achievement.

	Model 4		
	β	95% CI	p
Indirect effect through child non-verbal IQ and full IQ	0.30	(0.23, 0.38)	<0.001
Indirect effect through family routines in early and mid-childhood	0.02	(0.01, 0.04)	<0.01
Indirect effect through harsh parenting and corporal punishment	0.0005	(-0.004, 0.01)	0.80
Direct effect	2.31	(1.94, 2.72)	<0.001
Total effect	2.63	(2.26, 3.03)	<0.001

Note. N= 3,490. Models are adjusted for child age and sex, maternal age, ethnicity, and non-verbal IQ of the mother.

Supplementary Table 4. Associations of parenting practices and child full IQ in the dataset of children with school achievement measure and in the dataset of all the children who participated in the school period.

	Full IQ in children with school achievement data			Full IQ in all children		
	β	95% CI	p	β	95% CI	p
Early childhood						
Harsh discipline combined, mother and father rating	-0.56	(-1.10, -0.02)	0.04	-0.56	(-0.97, -0.15)	<0.01
Family routines mother rated	0.48	(-0.78, 1.74)	0.45	0.89	(-0.02, 1.80)	0.05
Middle childhood						
Corporal punishment mother rating	-0.75	(-1.23, -0.27)	<0.01	-0.77	(-1.12, -0.41)	<0.001
Family routines combined, mother and father rating	0.21	(-0.07, 0.49)	0.14	0.15	(-0.04, 0.35)	0.13

Note. N= 3,490 for the dataset of children with school achievement measure and 7,393 for the dataset of all the children who participated in the school period. Models are adjusted for child age and sex, maternal age, ethnicity, and non-verbal IQ of the mother.

Supplementary Figure 1. Flowchart of the study population