
The Effects of Parental Reading Socialization and Early School Involvement on Children's Academic Performance: A Panel Study of Primary School Pupils in the Netherlands

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This study examines the extent to which parental reading socialization and early school involvement account for performance differences between low-status and high-status children in successive primary school grades. It investigates not only the direct effects of these parental practices on children's academic performance, but also the indirect effects, that is, controlling for the children's *prior* performance. It furthermore examines the influence of parental reading socialization and early school involvement on the longer term development of scholastic performance. Panel data are employed from four waves of the Dutch primary education cohort study, starting in 1996–1997. Using multilevel (repeated measurement) models, we find that parental reading socialization and parental school involvement both explain part of the association between social background and academic performance in successive primary school years. The positive, mainly indirect, impact of these factors, however, is stronger for children's language performance than for arithmetic achievement. Finally, children socialized in reading retain or even expand their advantage in language performance over children who lack early reading socialization. The positive impact of parental school involvement fades as primary school progresses.

Introduction

Prior empirical studies on educational inequality have consistently found social background differences in children's academic performance. Children from high socio-economic backgrounds generally perform better at school than those from lower socio-economic

milieus (e.g. Boudon, 1974; Alwin and Thornton, 1984; Sammons, 1995; Erikson and Jonsson, 1996). This performance advantage of high-status over low-status children, also known as the 'primary effect of social background' (Boudon, 1974), exists already at the start of children's schooling, and it remains or even increases as the educational career progresses

(Walberg and Tsai, 1983; Stanovich, 1986; Sammons, 1995; Luyten, Cremers-Van Wees and Bosker, 2003). Because academic performance is a key factor in children's school success, social background differences are a large contributor to the existing social inequality in educational transitions and final educational attainment (Boudon, 1974; Jackson, Erikson, Goldthorpe and Yaish, 2007; Erikson, 2007; Kloosterman *et al.*, 2009).

To better understand the favourable starting position of high-status children over low-status children, we examine the role of early parental reading socialization and school involvement and the impact of these factors on children's academic performance during the entire course of primary school education. Researchers from various disciplines agree that there are large differences in the examples parents set and in the child-upbringing activities of families from different socio-economic backgrounds. High-status parents are more competent in, and capable of, positively affecting the academic performance of their offspring, as they have more beneficial cultural resources at their disposal than low-status parents (DiMaggio, 1982; De Graaf, 1986; Kalmijn and Kraaykamp, 1996). In addition, parents from higher socio-economic backgrounds exhibit more interest and involvement in their children's general development and schooling, which benefits their children's school career (Lareau, 1987; Astone and McLanahan, 1991; Ho Sui-Chu and Willms, 1996; Bianchi and Robinson, 1997; McNeal, Jr, 1999; Fan and Chen, 2001). The unequal inter-generational transmission of advantageous cultural resources and the differing levels of parental involvement likely produce early disparities in academic performance among children from different socio-economic backgrounds. Therefore, our first research question reads: *To what extent do parental reading socialization and early school involvement explain social inequality in children's academic performance over the course of primary school?*

We are particularly interested in whether the effects of parental reading socialization and school involvement on children's academic performance last throughout primary school. Although the positive relationship between such parental practices and children's academic performance has received considerable attention, scant research has examined how long these effects last using a longitudinal study design. A relevant exception is the study of Melhuish and colleagues (2008). The current study uses panel data and a multilevel methodology to scrutinize the effects of parental reading socialization and parental school involvement on children's academic performance level

and children's progress in successive primary school years.

Children are particularly receptive to socialization experiences early in life (Alwin and Thornton, 1984; Bus, Van IJzendoorn and Pellegrini, 1995; Leseman and De Jong, 1998; Kraaykamp, 2003; Dumais, 2005). Indeed, early childhood is a critical period for the development of skills that constitute the foundation for higher academic achievement. Early parental practices could therefore effectively determine children's academic performance even in later years of schooling. The effect of parental activities on children's academic performance could be direct, but might also be indirect, through the impact of children's prior performance level on future achievement. In order to examine the longevity of the effect of parental reading socialization and school involvement on children's academic performance during primary school and to unravel the direct and indirect effects of these practices, we formulate our second research question: *To what extent do parental reading socialization and early school involvement affect children's academic performance over the course of primary school, directly as well as indirectly, through prior demonstrated academic performance?*

Previous research on school performance development indicates that the effect of social background on children's academic performance is already present at the start of the educational career, and it remains influential as schooling progresses. Children from high socio-economic backgrounds have a relatively high starting level, but also make more rapid academic progress than their lower socio-economic counterparts (Sammons, 1995; Luyten, Cremers-Van Wees and Bosker, 2003). The current study seeks insight into the process of social reproduction by examining the relationship between parental reading socialization and school involvement and children's academic progress. Young children who are advantaged in terms of parental resources might gain increasingly more academic success than children who lack these beneficial parental assets at an early age. This process, also known as the *reproduction effect* or *Matthew Effect*, might be responsible for the existing social inequality in performance development throughout primary school. Reflecting this line of reasoning, our final research question reads: *To what extent do parental reading socialization and early school involvement affect the development of children's academic performance over the course of primary school?*

By longitudinally examining parents' influence on children's academic performance, we extend scientific knowledge of the impact of parental practices

on children's performance level *and* progress. We employ panel data from four waves of the Dutch primary education cohort study (PRIMA), starting in 1996–1997. Our study, moreover, advances research on the determinants of academic performance in two other respects. First, it focusses on primary school pupils. Up to now, most research on the relationship between parental reading socialization and involvement and children's academic performance has involved secondary school pupils. Consequently, little is known about the influence of such parental practices on children's early academic success (Schlee, Mullis and Shriner, 2009). This is remarkable considering that social inequality in academic performance is most prominent in primary school, leading to social differentiation later in the educational career. Secondly, we integrate aspects of social stratification research and developmental research. In social stratification research, explanations for the relationship between social background and children's academic success generally refer to the importance of parental cultural resources (DiMaggio, 1982; De Graaf, 1986; Kalmijn and Kraaykamp, 1996; De Graaf, De Graaf and Kraaykamp, 2000). In child-development studies, however, the significance of parental involvement for children's schooling is an important and recurring topic (e.g. Astone and McLanahan, 1991; Shumow and Miller, 2001; Sénéchal and LeFevre, 2002). Only a limited number of studies employs parental school involvement to account for the association between social background and academic performance (c.f. Fehrmann, Keith and Reimers, 1987; Ho Sui-Chu and Willms, 1996; Flouri and Buchanan, 2004). The current study combines stratification and developmental research by simultaneously analysing parental reading socialization and school-related involvement.

Theoretical Framework

Parental Reading Socialization and Children's Academic Performance

Within social stratification research, the cultural reproduction proposition of Bourdieu (1984; Bourdieu and Passeron, [1977] 1990) has led to a branch of empirical studies that considers the extent to which parental cultural resources account for the intergenerational transmission of educational inequality (DiMaggio, 1982; De Graaf, 1986; Kalmijn and Kraaykamp, 1996; De Graaf, De Graaf and Kraaykamp, 2000). According to Bourdieu, parents' socialization

practices familiarize children with family-specific linguistic and cultural skills that endure throughout their lives (Bourdieu and Passeron, [1977] 1990). High-status children learn to value formal culture and are apt to partake in highbrow activities such as museum attendance and reading, while low-status children are less acquainted with these types of cultural activities. As the possession of highbrow linguistic and cultural skills is highly valued and rewarded in schools, the children of culturally competent high-status parents tend to perform better at school and obtain a higher educational level than their low-status peers.

Cultural reproduction research traditionally measures parental cultural resources by participation in highbrow cultural activities, such as going to museums and the theatre. More recently however, researchers have shown that this more status-related aspect of cultural capital is less relevant to children's school success than a more cognitive component of parental cultural resources, that is, parental reading practices (De Graaf, 1986; De Graaf, De Graaf and Kraaykamp, 2000; Sullivan, 2001). Parental reading practices are positively associated with children's cognitive development, problem-solving skills, cultural knowledge, reading proficiency, and linguistic ability, all of which are highly relevant in a child's school success (Bus, Van IJzendoorn and Pellegrini, 1995; Leseman and De Jong, 1998; Notten, Kraaykamp and Ultee, 2008). This is especially true with regard to language-related proficiency. Therefore, this study focusses on parental reading practices instead of parental attendance at cultural events.

Previous research acknowledges that parental reading socialization manifests in two manners (Kraaykamp, 2001, 2003; Notten and Kraaykamp, 2009). First, parents nurture and socialize their children by setting an example. Children are known to imitate their parents' behaviour, including when it comes to reading preferences and interests (Bandura and Walters, 1963; Lareau, 2003), thereby expanding their linguistic capital. Secondly, parents may intentionally foster their children's reading skill and proficiency by direct instruction, such as reading aloud to their children or discussing books with their offspring. We expect that, over the entire course of primary school, an early familiarity with reading, by means of parental reading example and parental reading guidance, positively affects children's academic performance (*H1*) and that social background differences in early parental reading socialization explain part of the social inequality in children's academic performance (*H2*).

Parental School Involvement and Children's Academic Performance

Parental involvement (i.e. social capital) is generally recognized as exerting a beneficial influence on children's school success (Desforges and Abouchaar, 2003). Parents' involvement in their children's education, as reflected in the degree of parent-teacher contact (McNeal, Jr, 2001; Englund, *et al.*, 2004), parental participation in school activities (Fan and Chen, 2001), and parent-child discussion about school-related matters (Fan and Chen, 2001; McNeal, Jr., 2001), gives pupils an educational advantage over pupils whose parents are less involved. Intensive parental school involvement might lead children to recognize the importance of education; it might also make them feel more at home at school and stimulate them to excel in academics. In addition, teachers might view children of supportive parents as themselves being more cooperative and school minded.

To give their offspring the best possible start in life, we hypothesize that high-status parents invest more in school-related activities than low-status parents. Previous research showed that higher educated parents spend more time with their children in general (Zick, Bryant and Österbacka, 2001; Sayer, Gauthier and Furstenberg, Jr, 2004). Furthermore, high-status parents are more intensively involved in their children's schooling than less advantaged parents (Bianchi and Robinson, 1997; Zick *et al.*, 2001; Lareau, 2003). These favourable social conditions may result in high socio-economic children being more successful in school than children from low socio-economic backgrounds (e.g. Lareau, 1987; Ho Sui-Chu and Willms, 1996; Fan and Chen, 2001; Shumow and Miller, 2001). Given these considerations, we expect that, over the entire course of primary school, parental school-related involvement in early childhood positively affects children's academic performance (H3), and that social background differences in parental involvement explain part of the social inequality in children's academic performance (H4).

Although most studies on parental involvement show that having involved parents positively affects children's schooling (e.g. McNeal, Jr, 1999, 2001; Fan and Chen, 2001; Englund *et al.*, 2004; Flouri and Buchanan, 2004; Schlee, Mullis and Shriner, 2009), some studies find the opposite, namely, that children's scholastic performance is poorer when parents are intensively involved (Milne *et al.*, 1986; Baker and Stevenson, 1986; Ho Sui-Chu and Willms, 1996). This seemingly counterintuitive finding is likely attributable to parents' tendency to become more involved if their

children encounter difficulties at school, by which parental involvement becomes the outcome rather than the cause of academic performance. Because this study looks at parental involvement at the start of primary education, before problems could emerge, such reversed causality is less likely to be an issue here.

Parental Practices and Children's Performance Track Records

The proposition that family characteristics early in a child's life strongly impact later cognitive development and academic success has found empirical support (Alwin and Thornton, 1984; Bourdieu, 1997; De Graaf, De Graaf and Kraaykamp, 2000; Sénéchal and LeFevre, 2002; Englund *et al.*, 2004). Early parental reading socialization and school involvement may directly improve the academic performance of their offspring in later grades. We expect, however, that part of the positive influence on children's academic performance throughout primary school is indirect, mediated by children's demonstrated prior performance level (H5). Parents' early reading and school-related social investments permit their young children to perform relatively well in early school tasks, preparing them to manage more difficult tasks and challenges as primary school progresses.

Children who are advantaged in terms of early socialization experiences, as such, have less difficulty acquiring ever more complex skills and knowledge in subsequent grades compared to their less advantaged counterparts. Performance track records, therefore, are likely to differ between advantaged and disadvantaged groups of children. The literature on performance development provides two models on social inequality in performance development (Stanovich, 1986; Luyten, Cremers-Van Wees and Bosker, 2003; Van der Slik, Driessen and De Bot, 2006). The first model is the so-called *transmission model*, which assumes that social background differences in academic performance, favouring children from high socio-economic backgrounds, are retained as the educational career progresses. The second, the so-called *reproduction* or *Matthew Effect* model, presumes, in contrast to the transmission model, that the initial educational advantage of high-status children over low-status children increases throughout schooling. Most studies on performance development support the latter model (Sammons, 1995; Luyten, Cremers-Van Wees and Bosker, 2003). We propose that the same mechanisms can be applied to derive expectations about the relationship between parental reading socialization and school involvement and children's academic

performance development. If parental reading socialization and school involvement enhance a child's development and learning ability, the influence of these practices on children's academic performance might be retained or even increase as the level of schooling increases. Children who are brought up in a poor reading environment or have less involved parents at a young age are predetermined to lag behind those socialized in resourceful families during the entire period of primary schooling (the transmission model). Or they might even fall farther behind in performance level as they increasingly lack the drive and skills to cope with more complex school tasks (the reproduction model). Following the results of prior research in favour of the reproduction or Matthew Effect model, we expect that the rate of increase in academic performance level to be faster for children who are advantaged in terms of parental reading socialization and school involvement than for children from disadvantaged backgrounds (*H6*).

Data and Measurements

Data

Our analyses are based on the Dutch cohort study primary education (PRIMA), a study that is repeated every 2 years to establish the cognitive and social skills of Dutch primary school pupils. The same pupils are followed over the course of their primary school, lasting 8 years in the Netherlands (age range: 5–12). Our study employs data obtained from survey questionnaires administered to parents and teachers as well as pupils' scores on language and arithmetic performance tests. We investigate, in particular, academic performance during primary school of pupils who were in grade 2 (age range: 5–6) in the 1996/1997 school year.

For 11,916 second-grade pupils from 587 primary schools, we have information on the family's social characteristics and resources. Pupils' language ($N=11,051$) and arithmetic performance ($N=10,885$) were assessed in grades 2, 4, 6, and 8, respectively, in the school years 1996/1997, 1998/1999, 2000/2001, and 2002/2003. As in most longitudinal research, we deal with panel attrition, in this instance most notably at the school level but also at the individual level. Between each time point, 70 per cent of schools continued participation in the study. Taking school attrition into account, we lose only ~20 per cent of the pupils at each subsequent measurement occasion at the individual level. Schools with pupils whose parents were generally relatively low educated were more likely

to drop out of the study. At the individual level, an important reason for attrition was pupils' repeating a grade, and these children tended to have a low educational background. As a consequence, children from high socio-economic backgrounds (i.e. those with culturally competent and socially involved parents) are overrepresented in our sample. This probably leads to an underestimation of the effects of parental reading socialization and school involvement in and throughout primary school.

Measurements

We measure *pupils' academic performance* by both a language and an arithmetic performance score. Test scores were obtained from the Concepts and Ordering Test developed by the Dutch National Institute for Educational Measurement (CITO). The PRIMA research initiators calibrated the items of the language and arithmetic tests in order to be able to compare test scores between pupils from different grades (Vierke, 1995; Driessen, *et al.*, 1998). We subsequently standardized the language and arithmetic performance scores using Z-scores ($\times 100$). It thus became easier to compare the impact of our independent variables on the two performance scores.

Social background is measured by *parental education*, reflecting the highest level of education achieved between the father and mother. The initial educational categories were converted into an interval variable based on the number of years required to complete a particular level of education: lower education (LO) = 6; lower secondary education (LBO or MAVO) = 10; higher secondary education (HAVO, VWO, or MBO) = 12; and higher education (HBO or university) = 16. We centred this variable at its mean (11.02) to facilitate interpretation. For all parental background features as well as the parental involvement and reading activities, it counts that they were measured at the beginning of children's primary schooling (grade 2 in primary school, children's age range: 5–6).

Parental reading socialization is measured by the parental reading example as well as by parental reading guidance. Both the father and the mother reported the number of hours they spent reading books, newspapers, and magazines (per week), when their child started primary school. To construct a scale for *parental reading example*, the average score on these reading variables was calculated (Cronbach's $\alpha=0.71$) and converted into Z-scores. We measure *parental reading guidance* by the reading instruction parents give their 5–6-year-old children. Parents reported how often they looked at picture books with their child as

well as how often they read aloud to their child. The answer categories were (i) less than once a week, (ii) 1–2 times a week, (iii) 3–5 times a week, and (iv) (almost) daily. A scale was created taking average scores (Cronbach's $\alpha=0.77$) and standardized using Z-scores.

Parental involvement is measured by averaging four items referring to parental involvement in education-related activities, both at home and at school. First of all, parents were asked to indicate the frequency with which they spoke with their young children about school-related matters. The four answer categories were (i) less than once a week, (ii) 1–2 times a week, (iii) 3–5 times a week, and (iv) (almost) daily. Parents also reported the frequency with which they attended school meetings, such as a parents' evening, a general information meeting, or a parent–teacher conference. Answer categories were (i) (almost) never, (ii) sometimes, (iii) often, and (iv) (almost) always. Then, the teacher was asked whether the school had good contact with the pupil's parents and whether the parents were actively involved in school. Answer categories were (i) definitely no, (ii) no, (iii) neither yes nor no, (iv) yes, and (v) definitely yes. The average of these four items represents our measure of parental involvement (Cronbach's $\alpha=0.63$). Again, we standardized this measure using Z-scores.¹ Note that we assume both parental school involvement and reading socialization to be virtually stable during the primary school years.²

We employ several controls in our analyses. To take into account the financial resources of parents, we include the logarithm of *parental income*, measured when the child entered second grade, and centre it at its mean (8.50). Furthermore, in our models we control for *gender* (0 = boy; 1 = girl) and *ethnicity* (0 = native Dutch; 1 = non-Western immigrant background).

To deal with missing values, we employ a multiple imputation procedure in STATA (Rubin, 1987, 1996; Allison, 2000). This procedure yields multiple data-sets in which each missing value is replaced with a random imputation, based on the observed values of all variables included in this procedure. Analyses were performed on each data-set separately, after which the results were combined. Most missing values were found with respect to fathers' hours of magazine reading (15 per cent). Rubin (1987) states that, in cases with a lot of missing information, more imputations are needed to obtain estimates with a relatively high efficiency. Considering the percentage of missing values in our data-set, we decided to construct five multiple-imputed data-sets. After performing the

multiple-imputation procedure, we removed the cases with initially missing values on our dependent variables, that is, language and arithmetic performance, as proposed by Von Hippel (2007). As a result, we start with 11,051 second-grade pupils whose language test score is known and 10,885 second-grade pupils for whom we know the arithmetic test score. Table 1 displays the descriptive statistics of both the dependent and independent variables. To examine children's language performance in different grades simultaneously (i.e. repeated performance measurements), we constructed a *pupil-grade* file. A similar file was created for the children's arithmetic performance.

Modelling Strategy

We estimate the effect of parental education, parental reading socialization, and parental school involvement on children's academic performance during primary school. First, we do this separately for grades 2, 4, 6, and 8. We apply hierarchical multilevel models with pupils at level 1 and schools at level 2. Here, our sample consists of pupils with complete information on all four measurement occasions, respectively, 1,994 pupils for language performance and 1,714 pupils for arithmetic performance. To assess both the direct and the indirect effects of parental socialization practices on academic performance later in the primary school career, we control for pupils' prior scholastic performance.

We then test more formally for differences in academic development between pupils within primary schools by applying hierarchical linear models for repeated measures at fixed occasions (hierarchical growth-curve models). An important advantage of these models is their ability to deal with incomplete data structures. Hence, our analysis of pupils' academic development is able to use the full sample, that is, 11,051 pupils for language performance and 10,885 pupils for arithmetic performance. The data have a three-level structure: measurement occasions nested within pupils nested within schools.

Results

The Effects of Parental Reading Socialization and School Involvement in Successive Grades

Table 2 presents the models in which pupils' language scores are regressed on parental education, parental reading socialization, and parental school involvement,

Table 1 Descriptive statistics of dependent and independent variables

	N	Minimum	Maximum	Mean	SD
Dependent variables					
Language score—grade 2	11,051	−246.45	94.36	−76.25	53.32
Language score—grade 4	5,414	−213.90	193.39	39.54	59.48
Language score—grade 6	3,262	−147.57	277.24	97.47	51.84
Language score—grade 8	1,994	8.50	376.11	155.75	53.91
Language score—total	21,721	−246.45	376.11	0.00	100.00
Arithmetic score—grade 2	10,885	−238.80	147.29	−82.43	48.13
Arithmetic score—grade 4	5,196	−28.69	126.41	53.20	28.41
Arithmetic score—grade 6	2,880	32.00	211.83	116.05	21.66
Arithmetic score—grade 8	1,714	108.43	236.55	167.18	19.10
Arithmetic score—total	20,675	−238.80	236.55	0.00	100.00
Independent variables					
Parental education	11,916	−5.02	4.98	0.00	2.88
Parental income	11,916	−1.60	0.89	−0.06	0.37
Gender	11,916	0.00	1.00	0.49	0.50
Ethnicity	11,916	0.00	1.00	0.22	0.42
Parental reading socialization					
Reading example	11,916	−1.68	4.11	0.00	1.00
Reading instruction	11,916	−2.24	1.00	0.00	1.00
Parental involvement					
	11,916	−5.12	1.46	0.00	1.00

per grade. The variance components, indicating variance between schools (level 2) and between pupils (level 1) show that in each grade most variation in language performance is found between pupils, although a significant proportion of variation is left at the school level. Model 1a shows the total effect of parental education on language performance in grade 2. Apparently, already at the start of primary school, children with highly educated parents score higher on language proficiency than children with less educated parents ($b=2.99$). With regard to the subsequent primary school grades (models 2a, 3a and 4a), we find a similar scale of (total) effects of parental education on language performance.

Next, we add parental reading socialization and parental involvement to our models. Models 1b and 2b show that in the first years of primary school, parental reading instruction and, even more so, school-related involvement positively affect children's language achievement. Later on in primary school, as shown in models 3b and 4b, the parental reading example exerts a positive effect, while parental reading instruction and parental involvement lose (part of) their statistical significance. Apparently, children become more able to learn from their parents' reading habits indirectly (by imitation) as they become more experienced themselves. In general, and in line with hypotheses 1 and 3, we can conclude that parental

reading socialization and early parental school involvement positively affect children's language performance. In addition, the models demonstrate that overall parental practices mediate between 16 and 18 per cent of the association between parental education and children's language performance.³ This is in line with our expectation in hypotheses 2 and 4.

To unravel the direct and indirect effects of parental socialization practices, we include children's prior language proficiency in the models. Taking into account prior language performance (Models 2c, 3c, and 4c) results in a substantial decrease in the effects of parental reading socialization, parental involvement and parental education, indicating indirect effects. Direct effects of parental socialization practices still persist in the earlier grades, but fade as children's primary schooling progresses.

We performed similar analyses for children's arithmetic performance to learn whether parental reading socialization and school involvement affect language and arithmetic performance in the same way. Table 3 presents the results. Again, more variance is found among pupils, although a significant proportion of the variance in arithmetic proficiency occurs at the school level. In all grades, children with more highly educated parents are more successful in arithmetic than children with lower educated parents (Models 1a, 2a, and 3a). Thus, social inequality in primary school exists in both

Table 2 Multilevel models of language performance on parental education and parental practices, per grade^a

	Grade 2 (N = 1,994)				Grade 4 (N = 1,994)				Grade 6 (N = 1,994)				Grade 8 (N = 1,994)							
	Model 1a		Model 1b		Model 2a		Model 2b		Model 3a		Model 3b		Model 3c		Model 4a		Model 4b		Model 4c	
	b	se	b	se	b	se	b	se	b	se	b	se	b	se	b	se	b	se	b	se
Intercept	-64.58**	2.13	-66.30**	2.18	46.32**	2.36	44.55**	2.37	95.49**	1.94	94.38**	1.97	92.60**	1.83	157.33**	1.95	156.36**	2.00	158.08**	1.66
Parental education (centred)	2.99**	0.43	2.46**	0.45	3.87**	0.49	3.23**	0.51	4.58**	0.44	3.83**	0.46	2.75**	0.44	4.31**	0.47	3.64**	0.50	1.25**	0.41
Parental reading socialization																				
Reading example (0-1)			0.32	1.18			0.56	1.31			4.14**	1.22	3.96**	1.12			3.50**	1.29	0.94	1.04
Reading instruction (0-1)			2.15	1.19			4.05**	1.33			3.05*	1.23	1.62	1.15			3.26*	1.34	1.33	1.08
Parental involvement (0-1)			5.10**	1.36			4.80**	1.55			2.60	1.38	1.02	1.29			2.03	1.51	0.48	1.24
Prior language performance																				
Language grade 2 (centred)																			0.33**	0.02
Level-two (i.e. school) variance	17.76**	1.63	17.98**	1.63	19.01**	1.81	18.49**	1.79	12.59**	1.60	12.44**	1.59	11.57**	1.44	10.18**	1.94	10.09**	1.95	9.02**	1.46
Level-one (i.e. pupil) variance	44.63**	0.75	44.36**	0.74	50.39**	0.84	50.14**	0.84	45.99**	0.77	45.64**	0.76	42.41**	0.71	49.78**	0.83	49.52**	0.83	40.45**	0.67
Deviance (-LL)	-10477.57		-10462.56		-10713.16		-10695.71		-10502.11		-10482.03		-10338.87		-10640.80		-10625.22		-10231.07	

Source: PRIMA.

^aAll models include controls for gender, ethnicity and parental income (effects not shown).

**P < 0.01; *P < 0.05.

Table 3 Multilevel models of arithmetic performance on parental education and parental practices, per grade^a

	Grade 2 (N = 1,714)				Grade 4 (N = 1,714)				Model 2c			
	Model 1a		Model 1b		Model 2a		Model 2b		b	se		
	b	se	b	se	b	se	b	se	b	se		
Intercept	-64.38**	2.34	-65.54**	2.37	64.14**	1.18	64.00**	1.20	59.56	1.14		
Parental education (centred)	2.31**	0.40	1.86**	0.41	1.73**	0.24	1.62**	0.26	1.13	0.23		
Parental reading socialization												
Reading example (0-1)			1.73	1.08			1.35*	0.67	0.91	0.62		
Reading instruction (0-1)			1.01	1.11			-0.84	0.67	-1.13	0.61		
Parental involvement (0-1)			3.74**	1.25			0.72	0.75	-0.19	0.68		
Prior arithmetic performance												
Arithmetic grade 2 (centred)									0.26**	0.01		
Level-two (i.e. school) variance	23.11**	1.71	23.29**	1.71	9.52**	0.90	9.56**	0.90	9.48**	0.85		
Level-one (i.e. pupil) variance	37.41**	0.68	37.22**	0.68	22.98**	0.42	22.95**	0.42	20.58**	0.37		
Deviance (-LL)	-8755.21		-8743.65		-7875.88		-7871.26		-7699.05			
	Grade 6 (N = 1,714)				Grade 8 (N = 1,714)				Model 4c			
	Model 3a		Model 3b		Model 3c		Model 4a		Model 4b		b	se
	b	se	b	se	b	se	b	se	b	se	b	se
Intercept	119.01**	0.93	118.82**	0.95	112.65**	0.76	169.39**	0.87	169.17**	0.89	167.39**	0.65
Parental education (centred)	1.70**	0.19	1.62**	0.20	0.72**	0.15	1.67**	0.18	1.58**	0.19	0.44**	0.12
Parental reading socialization												
Reading example (0-1)			0.47	0.53	0.15	0.49			0.34	0.48	0.01	0.30
Reading instruction (0-1)			-0.12	0.54	0.34	0.39			0.27	0.51	0.38	0.32
Parental involvement (0-1)			0.67	0.61	0.30	0.44			0.68	0.56	0.15	0.35
Prior arithmetic performance												
Arithmetic grade 4 (centred)					0.56**	0.01						
Arithmetic grade 6 (centred)											0.71**	0.01
Level-two (i.e. school) variance	7.26**	0.73	7.27**	0.73	6.47**	0.55	7.13**	0.67	7.11**	0.67	6.35**	0.48
Level-one (i.e. pupil) variance	18.57**	0.34	18.58**	0.34	13.33**	0.24	16.86**	0.31	16.86**	0.31	10.31**	0.19
Deviance (-LL)	-7506.83		-7504.76		-6964.44		-7349.16		-7346.84		-6555.85	

Source: PRIMA.

^aAll models include controls for gender, ethnicity, and parental income (effects not shown).

**P < 0.01; *P < 0.05.

children's language performance and arithmetic test scores.

Adding indicators of parental reading socialization and parental school involvement to our models (1b, 2b, and 3b), we may conclude that these factors are poor determinants of arithmetic achievement, except for the effect of parental involvement in grade 2. In this early grade, children with involved parents have a clearly higher arithmetic score than children with less involved parents ($b=3.74$). In general, however, in contrast to our expectations, neither parental reading socialization nor parental involvement exert any great influence on children's arithmetic proficiency during primary school. Whereas in grade 2 about 20 per cent of the social background difference in arithmetic achievement is explained by parental practices, in the other grades, these practices contribute just slightly to explain social inequality in arithmetic (about 5 per cent), contradicting hypotheses 2 and 4. Apparently, social inequality in arithmetic performance is less transmitted or influenced by parental reading socialization and school involvement than language proficiency. Finally, we take into account children's prior arithmetic achievement level (Models 2c, 3c, and 4c). It turns out that the effect of parental reading example, as observed in grade 4, is completely indirect.

Parental Reading Socialization and School Involvement and Children's Performance Track Records

The previous section unravelled the direct and indirect effects of parental reading socialization and school involvement on children's school success, per grade. We now have more insight into the actual relation between parental practices and children's performance, but we have yet to answer our question of whether children's academic progress—or growth—during primary school is *significantly* affected by parents' early reading and school-related social investments. For this we make use of a repeated measures multilevel model with fixed measurement occasions (i.e. in grades 2, 4, 6, and 8).

In preliminary analyses, we started with a compound symmetry model (random-intercept model) with, as its fixed part, four dummies for the measurement occasions which allow the means to vary freely over time. The compound symmetry model assumes that the variances of each measurement occasion are equal and that all covariances between the different measurement occasions are equal as well. This model turned out to be too restrictive. We then allowed the rates of increase in performance scores to have a random, individually

dependent component by including a random effect of time. This proved to be an adequate but still parsimonious description of the dependence between the four measurement occasions.

Table 4 presents hierarchical linear models for repeated measures of language and arithmetic performance. We first examine the role of parental practices for the development of language performance in primary school. Looking at the variance components at the bottom of this table, we see that most variance is situated at the lowest level, that is, between measurement occasions, and the least variance is at the highest level, that is, between schools. The inclusion of a random slope of time, set randomly over pupils, introduces two new components, both significant. The slope or *time* variance at the pupil level shows that the progress in language performance differs significantly between the pupils. In addition, the intercept-slope or *pupil-time* covariance indicates that the differentiation in language performance among pupils increases through the primary school years, or stated differently, the language performance gap widens.

As a first step to assess the role of parental education, parental reading socialization, and parental school involvement on language development in primary school, we consider the effects of these determinants on children's language proficiency. First, the fixed grade measures in model 1a show that throughout primary school, average language scores increased, indicating children's progress in language proficiency as we would expect in successive school years. Furthermore, as found earlier, parental education positively affects language performance, as does being socialized in a beneficial reading environment and having involved parents at an early age.

To examine the effect of parental education on the rate of progress in children's language performance, we introduce the interaction effect of parental education with grade (model 1b). Here we find that, during primary school, the total (direct and indirect) effect of parental education on children's language performance increases from 2.79 in grade 2 to 4.17 ($2.79 + (3 \times 0.46)$) in grade 8. This indicates that the initial advantage of children with highly educated parents over children with lower educated parents grows as primary school progresses.

In model 1c we add interactions of grade with the indicators of parental reading socialization and parental school involvement. In line with the findings mentioned above, parents' early reading example turns out to have no significant impact on children's language performance in the early school years. In subsequent grades, however, the effect of this aspect of

Table 4 Hierarchical linear models for repeated measures of language and arithmetic performance^{a,b}

	Language (N = 11,051)						Arithmetic (N = 10,885)					
	Model 1a		Model 1b		Model 1c		Model 2a		Model 2b		Model 2c	
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>
Grade												
Grade 2 (Time 0)	-61.88**	1.35	-61.75**	1.35	-61.78**	1.35	-62.83**	1.11	-63.57**	1.10	-64.13**	1.09
Grade 4 (Time 1)	47.22**	1.36	47.32**	1.36	47.35**	1.36	65.45**	1.06	64.78**	1.04	64.37**	1.03
Grade 6 (Time 2)	99.27**	1.44	99.22**	1.44	99.38**	1.44	123.71**	1.02	123.29**	1.00	123.15**	0.99
Grade 8 (Time 3)	158.18**	1.59	158.17**	1.59	158.55**	1.59	174.60**	1.04	174.22**	1.03	174.39**	1.01
Parental education (centred)	3.02**	0.17	2.79**	0.18	2.80**	0.18	2.04**	0.12	3.19**	0.15	2.75**	0.16
Parental reading socialization												
Reading example (0-1)	0.89*	0.46	0.89*	0.46	0.35	0.50	0.31	0.33	0.29	0.33	0.40	0.45
Reading instruction (0-1)	2.53**	0.44	2.53**	0.44	2.35**	0.47	0.45	0.31	0.44	0.31	1.31**	0.43
Parental involvement (0-1)	5.47**	0.48	5.48**	0.48	6.05**	0.51	3.12**	0.35	3.10**	0.34	6.17**	0.45
Interactions												
Parental education * grade			0.46**	0.12	0.45**	0.14			-0.88**	0.08	-0.53**	0.08
Reading example * grade					1.10**	0.40					-0.08	0.23
Reading instruction * grade					0.37	0.39					-0.68**	0.24
Parental involvement * grade					-1.21**	0.41					-2.46**	0.24
Level-three (i.e. school) variance	218.36**	20.69	219.12**	20.75	218.17**	20.69	189.15**	16.84	177.04**	16.05	170.24**	15.55
Level-two (i.e. pupil) variation												
Intercept variance (pupil)	510.73**	34.32	512.49**	34.28	511.51**	34.28	1157.46**	23.61	1152.47**	23.49	1146.28**	23.29
Slope variance (time)	46.98**	12.64	47.46**	12.64	45.01**	12.60	161.86**	7.07	157.18**	6.90	151.58**	6.71
Intercept-slope covariance (pupil-time)	64.59**	17.79	64.43**	17.77	65.47**	17.73	-411.55**	11.62	-406.31**	11.45	-400.11**	11.23
Level-one (i.e. occasion) variance												
Residual variance	1604.53	26.39	1601.63	26.35	1602.86	26.36	421.88	7.56	421.53	7.52	421.52**	7.49
Deviance (-LL)	-114440.34		-114434.29		-114425.73		-100665.21		-100596.30		-100522.26	

^aAll models include dummies for the years in which pupils discontinued their participation in the research project (effects not shown). These dummies show that poorly performing pupils are more likely to withdraw from the research project. Estimating the models without these dummies does not affect the results.

^bAll models include controls for gender, ethnicity, and parental income (effects not shown).

**P < 0.01; *P < 0.05.

parental reading socialization becomes significantly greater, indicating a Matthew Effect. This supports hypothesis 6. In grade 8, the effect of parental reading example on children's language achievement is $3.65 (0.35 + (3 \times 1.10))$. The early reading instruction children receive from their parents is conducive for their language performance in grade 2 ($b = 2.35$), but this advantage remains static during the primary school years, as indicated by the insignificant interaction of reading instruction with grade. Although the developmental impact of early parental reading example and parental reading instruction is not unequivocal, the findings point to a lasting advantage for children socialized in a beneficial reading environment over children who lack beneficial reading socialization. Early parental involvement is profitable for children's language performance at the start of primary school ($b = 6.05$), but surprisingly, it becomes less relevant as primary education progresses. Finally, the effects of parental reading example and parental involvement throughout the primary school years are unable to explain social inequality in academic progress; the interaction effect of parental education with grade is virtually the same in Model 1b ($b = 0.46$) and Model 1c ($b = 0.45$). We therefore conclude that parental educational level retains its prominent position in the social reproduction process.

The second part of Table 4 relates to changes during primary school in the effect of parental education and the influence of parental reading socialization and parental school involvement on children's arithmetic progress. Most of the variance is at the pupil level (see the variance components at the bottom of the table). The slope or *time* variance at the pupil level indicates that children differ significantly in their arithmetic development during the primary school years. Unlike language development, however, for which we established that throughout primary school differences increased among pupils, the intercept-slope or *pupil-time* covariance shows that the arithmetic scores of pupils become more alike as primary school progresses.

Model 2a presents the effects of parental education, reading socialization, and school involvement on children's arithmetic proficiency. Again, as may be expected, the fixed grade measures show that the average arithmetic score increases over the course of primary school. Further, as found earlier, parental education has a positive influence on children's arithmetic achievement. With respect to parental reading socialization and school involvement, we find that only early parental involvement improves children's early arithmetic performance.

Including the interaction term between parental education and grade in model 2b reveals that, in contrast to our expectation, the difference in arithmetic performance between children with highly and low-educated parents diminishes over the course of primary school. The effect of parental education decreased from 3.19 in grade 2 to 0.55 ($3.19 - (3 \times 0.88)$) in grade 8, indicating a vanishing arithmetic gap between children from different socio-economic backgrounds. Results are similar for early parental reading instruction and parental school involvement; their role in predicting children's arithmetic achievement diminishes as primary school progresses. Apparently, during the primary school years, the benefits of early parental reading instruction and parental involvement decrease, enabling children from less resourceful and involved parents to make up some of their disadvantage in arithmetic performance, as they seem to make more rapid progress than children from advantaged backgrounds. Therefore, regarding arithmetic performance, hypothesis 6 finds no corroboration. Finally, comparing Model 2b with Model 2c regarding arithmetic performance, we find that the diminishing effect of parental education throughout primary school is largely attributable to the fading effect of early parental involvement and parental reading instruction (about 40 per cent).

Conclusion and Discussion

The academic advantage of children from high socio-economic backgrounds over children from low socio-economic backgrounds is well established in educational inequality research (e.g. Alwin and Thornton, 1984; Boudon, 1974; Erikson and Jonsson, 1996; Sammons, 1995). As social inequality in academic performance level manifests at the start of children's schooling, and is the forerunner of educational inequalities later in the educational career (Boudon, 1974), it is of interest to scrutinize the relationship between social background and children's academic performance in the primary school years. The present study investigated the extent to which parental reading socialization, that is, parental reading example and instruction, and parental school involvement at the start of a child's educational career, explain social background differences in children's academic performance in successive primary school grades. More innovatively, we examined the extent to which these parental practices affect children's academic performance directly as well as indirectly, controlling for children's prior academic performance.

We also looked at the extent to which they affect the pace of development of children's performance as primary school progresses. We performed multilevel (repeated measures) analyses based on four waves of the Dutch cohort study primary education (PRIMA), with our first cohort starting grade 2 in 1996/1997. We used language and arithmetic standardized test scores as indicators for children's academic performance.

In accordance with prior research, we found a strong positive relationship between parental education and children's language and arithmetic performance in successive primary school grades. Parental reading socialization and school-related involvement explain part of this social inequality, particularly with respect to children's language achievement. We demonstrated that both parental reading socialization and parental school involvement positively affect children's language performance, while for children's early arithmetic success only parental school involvement is beneficial. The limited value of parental reading socialization for children's arithmetic performance may be explained by the fact that mathematics are learned almost exclusively at school (Ozturk and Singh, 2006), while linguistic skills are more affected by the home environment. Although parental practices do exert a significant direct effect on children's language performance in most primary school grades, we found that the influence of these practices runs largely via children's prior language performance.

With regard to children's developmental progress in school, our findings corroborate previous research in showing a growing gap in language proficiency between children with highly educated parents and children with low-educated parents, indicating a reproduction or Matthew Effect (Luyten, Cremers-Van Wees and Bosker, 2003; Van der Slik, Driessen and De Bot, 2006). Interestingly, however, we found an opposite result for children's arithmetic performance. Children with highly educated parents and those with low-educated parents become more alike in their arithmetic performance in subsequent primary school years.

Examining the effects of parental reading socialization and school involvement on children's language progress over the course of primary school showed positive effects of parental reading example and parental reading instruction. Parental reading example is most relevant for a child's language achievement in later grades, again pointing to a reproduction or Matthew effect. In all likelihood, children in a later phase of schooling are better able to use and benefit from their parents' reading example. Parental reading instruction is beneficial for language performance at

the start of children's primary schooling, and this positive effect remains as primary school continues, indicating a transmission effect. Overall, from the start of primary school, children socialized in reading are advantaged in terms of language performance. However, the effect of actual parental reading guidance on children's arithmetic development diminishes in subsequent grades. A possible explanation for this puzzling finding might be that, in the first grades of primary school, language skills are more of a prerequisite for arithmetic tasks than in subsequent grades.

For children's language and arithmetic performance, parental school involvement has a clear positive influence at the start of primary school, but its impact diminishes in subsequent primary school years. Apparently, children disadvantaged by less involved parents catch up some of their initial arrears in language and arithmetic achievement. Perhaps having involved parents at an early age is difficult to translate into a persistent educational advantage in later primary school grades, since parental involvement is not directly related to children's learning language and arithmetic skills (unlike parental reading socialization).

This study found parental reading socialization and school involvement to be highly influential when it comes to acquiring and improving language skills, but they are remarkably less effective when it comes to advancing arithmetic skills. Children from disadvantaged backgrounds succeed in making up their lost ground in arithmetic, indicating that less advantaged children make quicker arithmetic progress than their advantaged counterparts. Perhaps the arithmetic curriculum offered in primary schools poses less of a challenge to children from advantaged backgrounds as they tend to master the arithmetic skills (e.g. counting, multiplication, subtraction, addition) relatively easily and early in their primary school career, by which, as a result, their arithmetic progress is rather limited thereafter. This notion does not apply to the language curriculum; it still pays to practice spelling, reading, and writing skills, even for talented pupils with a good grasp of the general principles and rules.

This research suggests that policy-makers and educators aiming to eliminate social disparities in primary school learning should direct their efforts mainly towards reducing the language-achievement gap. They should be aware that high-status parents are able to offer their children a persistent advantage in primary school when it comes to language-related proficiency. To narrow the language-achievement gap, primary schools could pay greater attention to improving the

language skills and competencies of low-status children, particularly in the first years of school.

Notes

1. In addition to avoiding causality errors, our measure of parental involvement, by including the perceptions of teachers as well as of the parents, also counteracts the bias that could result from parents providing socially desirable responses.
2. Parents' (an adult person's) preferences and values are known to be relatively stable in adult life (Inglehart, 1990, 1997). However, even if there are life-course effects in values and preferences, given the short period children are in primary school (8 years), we expect them to be small. We, however, acknowledge that when a child performs worse at school, some parents might intensify their reading socialization or involvement. If this reverse causality occurs, the relationship between parental practices and children's school achievement becomes weaker, but especially so for high socio-economic families, since parental practices are highly stratified (Lareau, 2003). This in turn implies that we have conservative tests for our hypotheses.
3. Parental school involvement and the indicators of reading socialization explain 17.7 per cent ($1 - ((2.46/2.99))$) of the relationship between parental education and children's language performance in grade 2. In grade 4, this is 16.5 per cent ($1 - (3.23/3.87)$). In grade 6, this is 16.4 per cent ($1 - (3.83/4.58)$), and in grade 8, this is 15.5 per cent ($1 - (3.64/4.31)$).

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