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Poverty, family resources and children's early educational attainment: the mediating role of parenting

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This study uses longitudinal data from the UK Millennium Cohort Study to show the extent to which episodic and more persistent poverty in early childhood and the lack of other family resources disadvantage children at the start of their school careers in terms of whether they have achieved the target indicator of 'good level of achievement' on the Foundation Stage Profile. Positive parenting is shown to be an important contributor to school achievement that matters for children, regardless of poverty experience or family disadvantage. It is also shown to be an important mediator in redressing the effects of poverty and disadvantage.

Introduction

It is well established that children who experience poverty are more likely than their more advantaged peers to experience lower levels of educational attainment (Smith *et al.*, 1997; Shonkoff & Phillips, 2000a; Bradshaw, 2002; Strelitz & Lister, 2008) and there is evidence that poverty during early childhood and persistent poverty may be particularly deleterious (Duncan *et al.*, 1994; Korenman *et al.*, 1995; Alhusen *et al.*, 2005; Najman *et al.*, 2009). Many families in poverty, as well as lacking income, have other characteristics associated with poorer child outcomes. For example, the educational attainment and employment status of the parents tends to be lower (Adelman *et al.*, 2003; Magadi & Middleton, 2007) and early parenthood and lone parenthood are more common (Kiernan *et al.*, 1998; Joshi *et al.*, 1999; Hobcraft & Kiernan, 2001). Poverty is also more prevalent in some ethnic minority groups (Platt, 2009) and more prominent in some geographical areas (Bradshaw, 2005). Nevertheless, many children living in disadvantaged circumstances do well and the ways children are parented may be part of the explanation for this. Parenting has certainly been

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shown to be a key factor in children's development. An extensive research literature, including reviews by Shonkoff and Phillips (2000b), Demo and Cox (2000), Desforges and Abouchaar (2003) and Gutman *et al.* (2009), shows that cognitive stimulation and promotion of play and learning, security and warmth in relationships, sensitivity in interaction and responses to children's needs, ample physical nurturance, establishment of appropriate boundaries and standards of conduct and the maintenance of positive discipline are among the aspects of parenting which can enhance children's well being.

In this study we use longitudinal data from the UK Millennium Cohort Study (Dex & Joshi, 2005) to examine the extent to which episodic and more persistent poverty in early childhood and the lack of other family resources disadvantage children at the start of their school careers in terms of whether they have achieved the target indicator of 'good level of achievement' on the Foundation Stage Profile (HM Government, 2009a). We also assess the extent to which positive parenting behaviours and attitudes relate to school performance. But our key aim is to assess the extent to which positive parenting mediates the effects of poverty and disadvantage.

The Millennium Cohort Study

We use data from the first three waves of the Millennium Cohort Study (MCS) and our focus is on children born in England as our outcome measure, which comes from the Foundation Stage Profile, is only available for children in English state schools. The first sweep of the MCS in England was carried out during 2001–2002 and includes information on 11,533 families and 11,695 children aged between 9 and 11 months. Children born between September 2000 and August 2001 were included, representing those who would begin attending primary school in 2005.

The families were followed up when the child was aged three and five years with achieved response rates of 78 and 79% of the target sample, respectively. Detailed information on the sampling strategy and response rates for the surveys can be found in Hansen (2008). Full details on the survey, its origins, objectives, sampling and content of the surveys are contained in the documentation attached to the data deposited with the UK Data Archive at Essex University. The sample design allowed for over-representation of families living in areas with high rates of child poverty or high proportions of ethnic minorities, which increased the power of the study to describe effects for these groups of families. The study is weighted to take account of the initial sampling design as well as non-response in the recruitment of the original sample and sample attrition over the follow up period to age five (Plewis, 2007; Ketente, 2008).

Our sample for the analysis reported in this paper includes 5462 children whose mothers were interviewed at the initial survey, for whom there was an educational assessment at age five and for whom information on family income was reported at each of the initial and follow up surveys. Only one child from twin or triplet births was included.

Definition of good achievement

Children's attainment was assessed via the Foundation Stage Profile (FSP), which is an assessment of children's developmental achievement over the first year of primary school, assessing the Early Learning Goals for the children between ages four and five (Qualifications and Curriculum Authority, 2003, 2008). The assessment was completed by the child's teacher for six areas of learning: personal, social and emotional development; communication, language and literacy; mathematical development; knowledge and understanding of the world; creative development; and physical development. The assessment includes continued observation over the year period and the assessments are routinely moderated. These data are collected for children in English state schools by the Department for Children, Schools and Families. The MCS survey data were linked to FSP assessments made over the academic year from 2005 to 2006, with a success rate of 95% for the cohort children attending state schools in England (Hansen & Jones, 2008). The FSP aims to provide a rounded picture of a child's progress and development within their usual educational setting and is deemed to be appropriate for children of all abilities and children for whom English is an additional language (Qualifications and Curriculum Authority, 2003, 2008). This assessment may be preferable to survey assessments, which are usually made under test conditions and which may be less appropriate for children of very low ability or for children with limited fluency in English. This instrument also has some drawbacks. For example, it does not discriminate amongst above average ability children and some of the scales, such as those measuring emotional well being, have not been well validated (Merrell *et al.*, 2007). There are also concerns about whether the child's social class, gender and ethnicity might affect the teacher's scoring (Gillborn, 2006).

Our indicator of good level of achievement is the one used by local authorities and nationally, National Indicator 72 (HM Government, 2009a). This is defined as working securely across all of the sub-scales in communication, language and literacy and personal, social and emotional development, that is scoring at least six (out of a maximum of nine) points on each of the sub-scales. Communication, language and literacy includes assessments of language for communicating and thinking; linking sounds and letters; reading; and writing. Personal, social and emotional development includes assessments of dispositions and attitudes; social development; and emotional development. In addition, to attain a good level of achievement children have to score at least 78 points out of the potential maximum of 117 across the total FSP assessment. Within our study sample this outcome was achieved by 50% of the children: 58% of girls and 43% of boys.

Definition of poverty

The family income of the household was reported at each survey. These income data were adjusted for the number and ages of the people in the family home using the equivalence scales produced by the Organisation for Economic Co-operation and

Development. Families whose equivalised income was 60% below the UK median, before housing costs, were considered to be in poverty (Ketende & Joshi, 2008). On this basis, 61% of children were not living in poverty at any of the surveys and 14% of the children had been living in poverty at all three of the surveys, which we refer to as persistent poverty. The remainder of the children had experienced periods both in and not in poverty, which we refer to as episodic poverty, differentiating between 13% of the children who had experienced episodic poverty but were not in poverty at the five-year survey and 12% of the children who had experienced episodic poverty including living in poverty at the five-year survey. These figures only include families with a full income history and are likely to underestimate the total level of poverty in the population because family income data were less frequently reported amongst the more disadvantaged families in the study (Ketende & Joshi, 2008). However, large enough groups of families were maintained to permit comparisons to be made across families with different experiences of poverty. Amongst the children who had not lived in poverty at any of the three surveys, 60% had good achievement, compared with 40% of the children who had experienced episodic poverty, and 26% of the children who had lived in persistent poverty (see Table 1).

Definition and derivation of an index of family resources

Income only reflects one aspect of family resources that might affect children's achievement. We also looked more broadly at family resources using a composite index that took into account a number of often co-occurring circumstances that may disadvantage children. We included measures that captured the socioeconomic resources and demographic situation of the families including: income poverty, mother's education, family employment, housing tenure, quality of the local area for bringing up children, mother's age at the birth of her first child, family structure, number of children in the household, child's birth order, child's ethnic origin and the language spoken in the home. These measures come from information reported by the main respondent (in the main, the mother) and are shown in Appendix 1. On an individual basis all these factors were associated with children's level of achievement.

We used the individual measures of family resources to derive a composite index, which ordered families according to how likely it was that their child would attain the good level of achievement outcome. In order to determine the relative contribution of each measure within this index we fitted a multivariate logistic regression model,[1] which simultaneously related all of the measures to the good level of achievement outcome. This model is detailed in Appendix 1, where adjusted odds ratios (ORs) and 95% confidence intervals are presented. The model included controls for the child's gender and age and missing information on any measure was explicitly coded and included as a dummy variable. The Wald test was used to assess the statistical significance of each measure. Having fitted the logistic regression model, the predict function in Stata (Stata Corporation, 2007) was used to calculate the family resources index. This gave a score with higher values reflecting levels of family resources, which were more favourable for children's achievement. The measure was grouped into

Table 1.   Poverty, family resources and early school achievement amongst children in England in the Millennium Cohort Study

	Sample (%)	Good level of achievement (%)
Poverty history		
None	61.4	60.0
Episodic (not poor at 5)	12.9	40.6
Episodic (poor at 5)	12.2	39.6
Persistent poverty	13.6	25.9
Family resources index score		
Highest (quintile 1)	19.7	69.0
Quintile 2	20.3	63.8
Quintile 3	20.0	53.3
Quintile 4	20.0	42.4
Lowest (quintile 5)	20.0	23.7
Total sample	100.0	50.4

Notes: Unweighted sample size 5462 children; all comparisons statistically significant $p < 0.001$, tested using the Chi-squared test.

quintiles. Amongst children with family resources scores in the highest quintile, 69% had good achievement; in the second, third and fourth quintiles 64, 53 and 42% of children had good achievement; and in the lowest quintile only 24% of children had good achievement (see Table 1).

Definition and derivation of an index of parenting

A composite index of parenting was also created, which took into account many aspects of the care and investment that parents make in their child's development. Parents were asked about activities they undertook to promote their child's reading and learning, their relationship and interactions with the child, aspects of the child's family organisation and nutrition and positive and negative disciplinary practices. In addition, at the three-year survey the interviewer observed the interactions between the parent and the child during a cognitive assessment task. This included observation of positive interactions such as praising the child and answering the child's questions, as well negative interactions in the form of slapping or spanking, scolding or physically restraining the child. The parenting measures are shown in Appendix 2.

A parenting index was created using information derived from a logistic regression model in which good achievement was related to the parenting measures. For each of the parenting measures the most positive category was usually the most frequent in the population and was used as the baseline category for calculating the ORs. The estimates can be interpreted as poorer achievement where positive behaviours are infrequent or absent. Again the model included controls for the child's gender and age and missing information on any measure was explicitly coded and included as a dummy variable. A Wald test was used to assess the statistical significance of each

measure and measures that did not contribute significantly were removed from the model by backwards selection, excluding any measures with a p-value larger than 0.1.

The estimated coefficients were used to calculate a parenting index, which ordered families according to how likely it was that their child would have good achievement. Again we used the predict function in Stata (Stata Corporation, 2007) to provide a measure in which higher scores reflected parenting behaviours that were more favourable for children's achievement. To aid our descriptive analysis the measure was then grouped into three categories low, mid and high, each representing a third of the families. Using this categorisation, we found that amongst the children with high parenting index scores, 70% had a good level of achievement, compared to 51% of children with the mid-level parenting index scores and 31% of children with low parenting index scores.

Interrelations between parenting, poverty, family resources and children's achievement

In this section we examine how the grouped summary index of parenting relates to type of poverty and the index of family resources and how children's achievement is related to parenting and resources.

From Table 2 we see that 44% of children who had not experienced poverty had high parenting scores, however, only 11% of children who had lived in persistent poverty had received this level of parenting. Furthermore, 66% of the children who had lived in persistent poverty also had low parenting scores, reflecting the extent to

Table 2.   Poverty, family resources and parenting amongst families of children in England in the Millennium Cohort Study

	Sample	Parenting index score		
	%	Low	Mid	High
Total sample (%)		33.3	33.3	33.3
Poverty history				
None	61.4	20.5	36.0	43.5
Episodic (not poor at 5)	12.9	45.6	33.1	21.4
Episodic (poor at 5)	12.2	48.7	31.4	19.9
Persistent poverty	13.6	66.3	23.1	10.6
Family resources index score				
Highest (quintile 1)	19.7	9.4	30.5	60.2
Quintile 2	20.3	16.2	36.9	47.0
Quintile 3	20.0	27.6	40.7	31.7
Quintile 4	20.0	44.1	37.0	18.9
Lowest (quintile 5)	20.0	69.3	21.6	9.1

Notes: Unweighted sample size 5462 children; all comparisons statistically significant $p < 0.001$, tested using the Chi-squared test.

Table 3. Poverty, family resources, parenting and early school achievement amongst children in England in the Millennium Cohort Study

| | Good level of achievement | | | |
| | Parenting index score | | | |
	Low	Mid	High	Total
Poverty history				
None	42.3	55.0	72.5	60.0
Episodic (not poor at 5)	28.3	45.9	58.6	40.6
Episodic (poor at 5)	25.7	48.5	59.6	39.6
Persistent poverty	18.6	32.3	57.6	25.9
Family resources index score				
Highest (quintile 1)	42.0	62.4	76.6	69.0
Quintile 2	49.2	57.6	73.6	63.8
Quintile 3	40.7	52.9	64.6	53.3
Quintile 4	32.2	45.8	59.7	42.4
Lowest (quintile 5)	19.4	28.9	43.8	23.7
Total population	30.5	51.0	69.7	50.4

Notes: Unweighted sample size 5462 children; all comparisons statistically significant $p < 0.001$, tested using the Chi-squared test.

which these two aspects of disadvantage often co-occur. Similar trends were seen with respect to family resources and parenting. Amongst the children with the highest level of family resources, 60% had high parenting scores, compared with only 9% of children with the lowest level of family resources, and 69% of children with the lowest family resources also had low parenting scores.

With respect to the children's achievement, we see from Table 3 that the poorest achievement was seen amongst children who had lived in persistent poverty and experienced the lowest level of parenting; only 19% of these children had good achievement. For children who had lived in persistent poverty but with high parenting scores, achievement was substantially higher at 58%. For children who had not experienced poverty and had high parenting scores, achievement was, as would be expected, the highest at 73%. It would appear from these simple analyses that positive parenting may redress the effects of poverty. We also see similar patterns for positive parenting and levels of family resources. We proceed to test this more rigorously in the next sections.

Multivariate analysis

Models of children's achievement, poverty, family resources and parenting

Logistic regression was used to estimate the odds that children with different poverty, family resource and parenting experiences in early childhood would have a good level of achievement in their first year at school.

Table 4 shows the odds ratios (ORs) for the individual factors and combinations of factors. In Model 1 the focus is on poverty and parenting and Model 2 on family resources and parenting. For these analyses the parenting index was included as a continuous measure so as to retain more of the available information. The OR of 2.39 for parenting shown in the first column provides an estimate of the relative increase in odds of good achievement associated with a one standard deviation increase in the parenting index. The ORs of 0.41 and 0.38 for the children who experienced episodic poverty reflect lower odds of good achievement compared to children who did not experience poverty and the OR of 0.20 reflects lower odds again when the poverty was persistent. A striking gradient in the odds of good achievement according to level of family resources is also seen, with an OR of 0.11 comparing children in the least advantaged quintile to those in the highest. All estimates include controls for month and year of birth and gender of the child. These controls are included as the children have birthdays at different times of the academic year, which can affect attainment, and boys and girls differed in their performance on the assessment indicator.

Model 1 includes the children's poverty history and the parenting index. The ORs for poverty in this model may be interpreted as the association between poverty and children's achievement having taken into account differences in parenting. We see that the inclusion of parenting improves the odds of children in different poverty categories attaining a good level of achievement, but poverty and the persistence of poverty still matter. The odds of a child having good achievement if they have experienced episodic poverty are lower than those with no recorded experience of poverty, but the odds are similar for whether the poverty was in the past or was more current (ORs: 0.58 and 0.56, respectively) and it is clear that children who have experienced persistent poverty have the lowest odds of having a good level of achievement (OR: 0.40).

Turning to Model 2, which includes the family resources indicator and the parenting index, we see that the introduction of the parenting index improves the odds that children will be doing better at school but the gradient across the quintiles, particularly the lower quintiles, persists (ORs: 0.46 for the 4th quintile and 0.24 for the lowest). We also note that the difference in achievement between children in the upper two quintiles is no longer significant once parenting has been taken into account (OR: 0.85).

In sum, these analyses show that poverty and parenting and family resources and parenting have independent effects on the odds of children achieving well in school but family resources and parenting are also interrelated as judged by the reduction in the odds for the parenting indicator when family poverty and resources are taken into account. When these latter factors were included in the models the OR for the parenting index was attenuated, but slightly more so by the family resources index than by the poverty classification (ORs: 1.86 and 2.08, respectively).

Does the impact of parenting on children's achievement vary with level of disadvantage?

We were also interested in whether parenting had a different impact on children when they have had different experiences of poverty or family resources. In Table 5 we

Table 4. Poverty, family resources, parenting and early school achievement amongst children in England in the Millennium Cohort Study—logistic regression analysis

		Good level of achievement					
		Individual factors		Model 1		Model 2	
		OR[1]	95% CI[1]	OR[2]	95% CI[2]	OR[3]	95% CI[3]
Parenting index score	Standardised score[4]	2.39	(2.20, 2.60)	2.08	(1.90, 2.27)	1.86	(1.70, 2.04)
Poverty history	None	1.00		1.00			
	Episodic (not poor at 5)	0.41	(0.34, 0.49)	0.58	(0.48, 0.71)		
	Episodic (poor at 5)	0.38	(0.31, 0.47)	0.56	(0.46, 0.69)		
	Persistent poverty	0.20	(0.16, 0.24)	0.40	(0.31, 0.50)		
Family resource index score	Highest (quintile 1)	1.00				1.00	
	Quintile 2	0.74[a]	(0.61, 0.91)			0.85[b]	(0.69, 1.03)
	Quintile 3	0.47	(0.38, 0.58)			0.62	(0.50, 0.76)
	Quintile 4	0.28	(0.23, 0.35)			0.46	(0.37, 0.57)
	Lowest (quintile 5)	0.11	(0.09, 0.14)			0.24	(0.19, 0.31)

Notes: Unweighted sample size 5462 children; [1] Odds ratio (OR) for attaining good level of achievement and 95% Confidence intervals (CIs) estimated for each factor separately; [2] OR and 95% CIs estimated including parenting index and poverty; [3] OR and 95% CIs estimated including parenting index and family resources; [4] Parenting index score standardised to mean 0, standard deviation 1, OR reflects difference per standard deviation increase in parenting index; All estimates adjusted for child's age and gender; [a] $p = 0.004$; [b] $p = 0.104$; all other ORs $p < 0.001$ tested using the Wald test.

show the effects of parenting amongst children in each of these groups. When estimates of the effects of parenting were made separately for children who had experienced each type of poverty history, similar effects were found for all of the groups (ORs around 2) and these effects were all significant ($p < 0.001$).

To explore whether parenting had a different impact on children when they had had different experiences of poverty we used an interaction test. The p-value from the test, 0.72, did not provide significant evidence of differential effects. Similar findings pertained for parenting and the level of family resources. This suggests that the potential benefits of positive parenting are evident for children regardless of their socioeconomic circumstances.

Parenting as a mediator of disadvantage

Our multivariate analysis showed that quality of parenting received by the child was an important factor in how well they were doing at school and that positive parenting improved the odds of children living in more disadvantaged circumstances doing better. But how much does positive parenting matter, or to put it another way, to what extent does positive parenting mediate the effects of disadvantage?

To formally estimate this we divided the total effects of poverty and family resources into two components. Firstly, the component that might be explained by the parenting measures and secondly the component that was maintained having

Table 5.   Association between parenting and early school achievement according to poverty and family resources

	Good level of achievement	
	OR[1]	95% CI[1]
Parenting index estimates by poverty history		
None	2.13	(1.90, 2.38)
Episodic (not poor at 5)	1.92	(1.60, 2.31)
Episodic (poor at 5)	2.14	(1.75, 2.62)
Persistent poverty	2.03	(1.70, 2.42)
Test for interaction between parenting and poverty	$p = 0.722$	
Parenting index estimates by family resources index		
Highest (quintile 1)	2.27	(1.79, 2.87)
Quintile 2	1.92	(1.61, 2.29)
Quintile 3	1.81	(1.50, 2.18)
Quintile 4	1.77	(1.49, 2.11)
Lowest (quintile 5)	1.76	(1.53, 2.03)
Test for interaction between parenting and family resources	$p = 0.414$	

Notes: Unweighted sample size 5462 children; [1] Odds ratio (OR) for attaining good level of achievement and 95% confidence interval (CI) estimated for parenting index score standardised to mean 0, standard deviation 1, OR reflects difference per standard deviation increase in parenting index; all estimates adjusted for child's age and gender; all ORs $p < 0.001$ tested using the Wald test.

taken account of parenting. The first component is the indirect effect and estimates how much of poverty or level of family resources act through differences in parenting and the second component estimates how much of the effect of poverty or family resources may be direct or due to unobserved variables that are not included in our models. To operationalise this we used a method devised by Erikson *et al.* (2005), which decomposes the effects from logistic regression models in this way and which has been implemented in Stata by Buis (forthcoming) as the *ldecomp* program.

The results from this analysis are presented in Table 6, which shows that within the confines of our model half of the effect of poverty on children's achievement may be explained by parenting and around 40% of the effect of family resources may be explained by parenting. Moreover the effects were broadly similar across the separate poverty categories and family resources quintiles.

Summary and conclusion

Many studies have shown that poverty and lack of family resources are far from beneficial for child wellbeing and this study shows this continues to be case for a recent cohort of English children. Children from poor families and those with lower levels of family resources are doing less well than their more advantaged peers in their first year of school as assessed by their performance on the Foundation Stage Profile. It was clear from our analyses that poverty mattered, but persistent poverty was even more detrimental for children's attainment. Moreover, even those children whose families had moved out of poverty were not faring well. This may be due to these families having just moved above the poverty threshold but still experiencing relative hardship (see Berthoud *et al.* [2004] for a discussion of this issue) or that legacies of poverty continue to be influential. A broader perspective using a family resource

Table 6. Mediation of the association between poverty, family resources and children's early school achievement by parenting

	% of effect mediated by parenting[1]
Poverty history	
None	
Episodic (not poor at 5)	51.6
Episodic (poor at 5)	49.8
Persistent poverty	50.3
Family resource index score	
Highest (quintile 1)	
Quintile 2	45.9
Quintile 3	38.1
Quintile 4	44.0
Lowest (quintile 5)	40.5

Notes: Unweighted sample size 5462 children; [1] % age of poverty/family resources effect (log OR) estimated to act indirectly through parenting using Stata ldecomp program.

index created from a range of socioeconomic background factors showed that there was a distinct gradient in children's achievement with level of family resources. Thus, it is not just being in and out of poverty that matters for children's attainment but also the distribution of resources across families.

The parenting index derived from a wide range of parenting measures was also a very important factor in relation to children's attainment and the extent of positive parenting tended to be lower in poorer families and in those with fewer resources. But it was also clear from our analyses that children from poor families and those with lower levels of family resources who experienced more positive parenting were more likely to be doing well in school, and the differences were quite marked. It was also clear that more positive parenting matters at all levels of resources. Moreover, there was little evidence from our analysis that quality of parenting had a more positive or negative effect depending on poverty experience or level of family resources. This latter finding chimes with that from an analysis of the Avon Longitudinal Study of Parents and Children data by Gutman and Feinstein (2008), which showed that children whose mothers provided a stimulating environment had better social and motor development and this was invariant with socioeconomic circumstances.

The parenting index included reports by the mother and observation by the survey interviewers of parent–child interaction and covered a wide range of behaviours, activities and attitudes including: promotion of reading and learning; relationships and interactions with the child; aspects of family organisation, care and nutrition; and disciplinary practices, all of which were associated with the child's level of achievement. All of these measures were associated with poverty experience and level of family resources when they were examined on an individual basis. This suggests that when families are disadvantaged disruption to parenting is not specific to any particular parenting behaviour but may impact negatively across many different aspects of parenting.

We also posed the question as to how much parenting mediated the effects of disadvantage. This is a pertinent question as both poverty reduction and improving parenting are high on the policy agenda, which has as a core aim the improvement of child well being (Coghlan *et al.*, 2009; HM Government, 2009b). Our decompositional analysis suggested that about one-half of the effects of child poverty and 40% of resource disadvantage may be accounted for by the quality of parenting the child has received in early childhood and the size of the effects were broadly similar across the poverty groups and level of family resources. These are not insubstantial proportions, but a substantial part of the gaps still remain to be explained.

We cannot imply that the mediating effect of parenting is necessarily causal as our analyses are based on observational data and other factors that we have not included in our models may also be important or may be driving the parenting behaviours. Such factors may well include the mental well being of the parents and the social support that they receive from other relatives and the community. Our findings show that parenting is a key mediator of poverty and disadvantage in relation to children's achievement in their first year at school and are in line with, and extend on, similar findings in relation to these children's cognitive development at age three

(Kiernan & Huerta, 2008) and are in accord with analyses of children's achievement at age seven using Entry Assessments at ages four or five and Key Stage 1 assessment data for the children included in the ALSPAC study who were born in 1991–1992, a decade before the MCS children (Burgess *et al.*, 2006). However, we have not thrown light on the mechanisms and processes by which poverty and disadvantage hinder positive parenting, which would aid our understanding of why some children fare less well. So, for example, is it lack of income or capabilities that reduces the chances of some parents engaging in cognitively enhancing activities or does poverty lead to family stresses that inhibit positive parenting or are both working together? The difficulties of bringing up children when resources are limited have been clearly described in Ghate and Hazel's (2004) study of *Parenting in poor environments* and strategies that improve parenting behaviours may provide the leverage for children to develop and achieve well in circumstances where this may not usually be expected (see Desforges and Abouchaar [2003] for a review and Melhuish *et al.* [2008] and Siraj-Blatchford [2009] for exemplars) and our findings lend further support to such an approach.

Acknowledgements

Note

1. Logistic regression attempts to predict the outcome of a binary variable using one or a number of predictor variables. In this paper the outcome is whether or not children attained the good level of achievement target. Odds ratios are estimated that compare the odds for children in each category of the predictor variable to the odds for the reference group, for example, comparing the odds of good achievement amongst children who had experienced episodic poverty to those who had never experienced poverty. In the multivariate analysis a number of predictor variables are included simultaneously and thus the ORs for each variable are adjusted to take account of the other variables in the model.

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Appendix 1. Family resources and early school achievement amongst children in England in the Millennium Cohort Study

		Sample	Good level of achievement			
		%	%	OR[1]	95% CI[1]	P (Wald)
Poverty history (9-month, 3-year, 5-year surveys)	None	61.4	60.0	1.00		
	Episodic (not poor at 5)	12.9	40.6	0.69**	(0.56, 0.85)	
	Episodic (poor at 5)	12.2	39.6	0.71**	(0.56, 0.88)	
	Persistent poverty	13.6	25.9	0.67*	(0.49, 0.91)	0.002
Maternal education level (9-month survey)	NVQ level 4/5	34.7	64.1	1.00		
	NVQ level 3	14.0	50.6	0.75**	(0.62, 0.90)	
	NVQ level 2	31.8	48.2	0.73**	(0.61, 0.87)	
	NVQ level 1	10.5	35.0	0.51***	(0.42, 0.63)	
	No qualifications	9.2	23.7	0.40****	(0.30, 0.53)	0.000
Parental employment history (either or both parents) (9-month, 3-year, 5-year surveys)	Employment at all surveys	78.9	56.7	1.00		
	Employment at 5 years	7.5	34.7	0.98	(0.74, 1.30)	
	Employment earlier survey	6.4	33.2	0.87	(0.63, 1.21)	
	No employment any survey	7.3	20.5	0.51**	(0.35, 0.75)	0.004
Housing tenure (5-year survey)	Owner occupier	69.1	57.9	1.00		
	Rent privately	7.3	38.0	0.71*	(0.54, 0.94)	
	Rent from LA/HA	21.3	31.0	0.81†	(0.66, 1.00)	
	Other	2.4	44.1	1.01	(0.65, 1.55)	0.043
Good area to bring up children (5-year survey)	Excellent	31.3	58.9	1.00		
	Good	42.0	51.7	0.81*	(0.68, 0.96)	
	Average	20.8	40.7	0.71**	(0.58, 0.87)	
	Poor or very poor	5.9	30.3	0.67*	(0.47, 0.94)	0.007
Age of mother at first birth (9-month survey)	30 and above	26.9	64.0	1.00		
	25–29	31.4	56.0	0.84†	(0.70, 1.02)	
	20–24	24.5	41.5	0.69**	(0.55, 0.85)	
	13–19	17.1	32.1	0.70*	(0.53, 0.92)	0.005

Appendix 1.   (Continued)

	Sample	Good level of achievement			P
	%	%	OR[1]	95% CI[1]	(Wald)
Family structure at age 5 and history					
(9-month, 3-year, 5-year surveys) Married	60.0	57.5	1.00		
Cohabiting	11.6	51.1	1.02	(0.83, 1.25)	
Previously separated	6.0	38.0	0.80	(0.60, 1.07)	
Lone parent	17.3	36.2	0.89	(0.71, 1.11)	
Step family	5.1	28.3	0.49***	(0.34, 0.72)	0.008
Number of children in the household 1 child	16.0	51.0	1.00		
(5-year survey) 2 children	51.0	54.0	1.07	(0.89, 1.29)	
3 children	22.9	48.5	1.03	(0.82, 1.30)	
4+ children	10.1	35.6	0.92	(0.69, 1.22)	0.506
Cohort child is mother's first born First born	42.3	55.4	1.00		
(9-month survey) Later born	57.7	46.9	0.79***	(0.70, 0.90)	0.001
Child's ethnicity White	89.6	51.2	1.00		
(9-month survey) Mixed	3.4	52.0	1.47*	(1.07, 2.03)	
Indian	1.4	50.7	0.99	(0.56, 1.76)	
Pakistani or Bangladeshi	2.6	31.1	0.82	(0.44, 1.54)	
Black or Black British	2.1	39.5	0.85	(0.55, 1.32)	
Other ethnic group	1.0	42.1	0.99	(0.54, 1.80)	0.248
Language spoken in the home English only	92.8	51.1	1.00		
(9-month survey) English and other language	5.8	43.1	0.96	(0.61, 1.51)	
Other language only	1.4	34.4	0.81	(0.40, 1.63)	0.828

Notes: Unweighted sample size 5462 children; [1] Odds ratio (OR) and 95% confidence interval (CI) from model including all characteristics and controls for child's age and gender; † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, tested using the Wald test.

Appendix 2.   Parenting behaviours and early school achievement amongst children in England in the Millennium Cohort Study

		Sample	Good level of achievement			
		%	%	OR[1]	95% CI[1]	P (Wald)
Reading and learning						
How often read to the child	Every day	61.2	57.1	1.00		
(3-year survey)	Several times per week	19.7	45.3	0.80*	(0.66, 0.95)	
	Once or twice per week	13.7	37.0	0.77**	(0.63, 0.93)	
	Once or twice per month	2.4	29.0	0.58*	(0.37, 0.92)	
	Less often/not at all	2.9	25.6	0.65*	(0.44, 0.96)	0.002
Home learning activities[a]	15–16 highest	18.9	59.3	1.00		
(3-year survey)	13–14	25.6	52.9	0.85	(0.70, 1.04)	
	10–12	35.7	49.5	0.80*	(0.67, 0.95)	
	7–9	15.1	40.6	0.66***	(0.53, 0.82)	
	0–6 least	4.8	39.7	0.83	(0.60, 1.14)	0.006
Child taken to library	Regularly	34.9	59.9	1.00		
(3-year survey)	Special occasions	9.2	52.3	0.81†	(0.63, 1.03)	
	Not at all	55.8	44.2	0.73***	(0.64, 0.83)	0.000
Child helped with reading	Every day	56.7	54.2	1.00		
(5-year survey)	Several times per week	32.8	49.3	0.87	(0.74, 1.03)	
	Once or twice per week	9.3	35.4	0.67***	(0.54, 0.83)	
	Once or twice per month	0.4	26.3	0.53	(0.20, 1.41)	
	Not at all	0.8	15.8	0.29**	(0.13, 0.68)	0.000
Attended parents' evening	Yes	92.8	52.1	1.00		
(5-year survey)	No	7.2	28.4	0.48***	(0.37, 0.64)	0.000
Relationships						
PIANTA warmth score[b]	35 highest warmth	49.8	56.9	1.00		
(3-year survey)	33–34	30.0	51.3	0.89	(0.78, 1.03)	
	30–32	15.3	45.9	0.80*	(0.66, 0.96)	
	7–29 low warmth	4.9	34.8	0.74	(0.51, 1.07)	0.062
Positive home observation[c]	6 behaviours	70.2	54.8	1.00		
(3-year survey)	5	23.6	46.8	0.83*	(0.71, 0.97)	
	3–4	4.7	33.6	0.55***	(0.40, 0.76)	
	0–2	1.4	16.2	0.29**	(0.15, 0.59)	0.000

Appendix 2. (Continued)

		Sample	Good level of achievement			P
		%	%	OR[1]	95% CI[1]	(Wald)
Visited other children	Yes	93.4	51.2	1.00		
(3-year survey)	No	6.6	39.0	0.77*	(0.60, 0.98)	0.032
Close to child	Extremely	70.4	52.6	1.00		
(5-year survey)	Very	26.2	48.7	0.93	(0.81, 1.06)	0.025
	Fairly/not very	3.4	32.9	0.64**	(0.46, 0.89)	
Friends with other parents	Yes	89.8	51.7	1.00		
(5-year survey)	No	10.2	38.9	0.72**	(0.58, 0.88)	0.002
Physical care and nutrition						
Period breast fed	6 months or more	24.6	59.0	1.00		
(9-month survey)	3–6 months	18.6	57.7	1.01	(0.84, 1.23)	
	Up to 3 months	29.2	49.5	0.78**	(0.65, 0.94)	0.000
	Not at all	27.6	38.8	0.58***	(0.47, 0.72)	
Child has regular bed times	Always	42.0	55.2	1.00		
(3-year survey)	Usually	39.0	50.9	0.90	(0.78, 1.04)	
	Sometimes	12.2	39.9	0.74**	(0.61, 0.90)	0.010
	Never or almost never	6.9	36.8	0.76*	(0.58, 0.99)	
Child has regular meal times	Always	60.4	51.3	1.00		
(5-year survey)	Usually	33.2	53.0	1.29***	(1.14, 1.48)	
	Sometimes	4.2	31.7	0.86	(0.64, 1.16)	0.000
	Never or almost never	2.1	23.3	0.56*	(0.34, 0.91)	
Portions of fruit per day	3 or more	55.3	56.3	1.00		
(5-year survey)	2	26.9	46.6	0.83**	(0.72, 0.95)	
	1	14.1	39.6	0.78*	(0.64, 0.95)	0.002
	None	3.7	32.2	0.63**	(0.46, 0.87)	
Positive and negative discipline						
Negative home observation[c]	0 behaviours	91.7	52.1	1.00		
(3-year survey)	1	6.3	37.3	0.77†	(0.59, 1.01)	0.016
	2 or 3	2.0	27.5	0.51*	(0.27, 0.94)	

Appendix 2.   (Continued)

	Sample	Good level of achievement			
	%	%	OR[1]	95% CI[1]	P (Wald)
Tell child off if naughty (3-year survey)					
Regularly	51.8	55.3	1.00		
Frequently (daily)	38.1	48.2	0.85*	(0.74, 0.97)	
Rarely or never	10.1	43.0	0.72**	(0.57, 0.92)	0.005
Ensure requests carried out (5-year survey)					
All of the time	53.6	54.1	1.00		
More than half the time	30.9	50.0	0.84*	(0.72, 0.98)	
About half the time	9.3	41.8	0.81†	(0.65, 1.02)	
Less than half the time	4.7	41.1	0.80	(0.58, 1.10)	
Never/almost never	1.6	51.0	1.06	(0.65, 1.71)	0.100
Reason with child if naughty (5-year survey)					
Regularly	72.1	52.5	1.00		
Frequently (daily)	19.6	50.4	0.86†	(0.73, 1.01)	
Rarely or never	8.3	40.2	0.78*	(0.61, 0.99)	0.032
Shout at child if naughty (5-year survey)					
Regularly	68.6	53.3	1.00		
Frequently (daily)	5.0	39.6	0.85	(0.62, 1.18)	
Rarely or never	26.4	47.2	0.74***	(0.64, 0.85)	0.000

Notes: Unweighted sample size 5462 children; [1] Odds ratio and 95% CI from model including all parenting behaviours and controls for child's sex age and gender; † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, tested using the Wald test; in addition the following factors were considered in the model but did not contribute significantly once adjustment for the factors included was made, (Wald test $p > 0.1$). PIANTA conflict score [b] at age 5; [a] regular mealtimes at age 3, regular bedtimes at age 3, and smacking the child when naughty at age 3 and at age 5; [a] Each of the activities: learning the alphabet; learning about numbers or counting; learning songs, poems or nursery rhymes; and painting or drawing; were scored as 1 for occasionally or less than once a week; 2 for 1–2 times a week; 3 for 3–6 times a week; or 4 for 7 times a week/constantly. These were summed and grouped as 15–16 (highest); 13–14; 10–12; 7–9; or 0–6; [b] items describing warmth in the relationship were selected by factor analysis of the PIANTA parent child relationship scale (Pianta 1995): I share an affectionate, warm relationship with the child; the child will seek comfort from me; the child values his/her relationship with me; when I praise the child, he/she beams with pride; the child spontaneously shares information about himself/herself; it is easy to be in tune with what the child is feeling; and the child shares his/her feelings and experiences with me. Each item was scored as 1 definitely does not apply; 2 not really; 3 neutral; 4 applies sometimes; or 5 definitely applies. Scores were summed and grouped as 35 (highest warmth); 33–34; 30–32; or 7–29, similarly items describing conflict in the relationship: the child and I always seem to be struggling with each other; the child easily becomes angry with me; the child remains angry or is resistant after being disciplined; dealing with the child drains my energy; when the child wakes up in a bad mood, I know we're in for a long and difficult day; the child's feelings towards me can be unpredictable or can change suddenly; and the child is sneaky or manipulative with me; were summed and grouped as 7–15 (lowest conflict); 16–20; 21–26; or 27–35; [c] each of the following were counted as positive behaviours in the home observation: voice positive when speaking to the child; converses at least twice with child; answers child's questions verbally; praises child spontaneously; caresses or kisses child; and introduces interviewer to the child. Each of the following were counted as negative: scolded the child more than once; used physical restraint on the child; and slapped or spanked the child.