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Influences on Children's Development and Progress in Key Stage 2: Social/behavioural outcomes in Year 5

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department for
children, schools and families

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Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11)

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Executive Summary

The Effective Pre-school and Primary Education Project 3-11 (EPPE 3-11) is a large scale longitudinal study of the influence of pre-school and primary school on children's cognitive and social/behavioural development. The study originally followed children from the start of pre-school (at age 3 years plus) through to primary school entry and then across Key Stage 1 (KS1). Over 3000 children and 141 pre-school centres were included in the first phase of the research. Children were tracked from age 3 years to the end of KS1 in primary school at age 7 years.

The follow-up phase of the research investigates the development of the same group of children across Key Stage 2 (KS2) of primary education (7 to 11 years). It consists of three "Tiers". Tier 1 involves the analysis of primary school academic effectiveness across all primary schools in England using value added approaches measuring pupil progress for three successive cohorts across KS2 in terms of National Assessment outcomes (Melhuish et al., 2006a; 2006b). Tier 2 focuses on the academic and social/behavioural progress of around 2,500 children in the original sample and uses the results from Tier 1 to provide measures of primary school academic effectiveness for the schools attended by EPPE 3-11 children. Tier 3 explores variations in teachers' classroom practices during Key Stage 2 by focusing on a sample of 125 schools and Year 5 classes drawn from the 850 plus primary schools that the EPPE children attended (see Sammons et al., 2006). This paper is part of the Tier 2 analysis of the project and investigates children's social/behavioural development in Year 5 of primary school (age 10). A separate paper reports the equivalent findings related to children's Reading and Mathematics attainment at this same age (Sammons et al; 2007).

Key Findings

1 Four main dimensions of children's social/behavioural development were identified based on teachers' assessments of individual children: 'Self-regulation', 'Hyperactivity' 'Pro-social' behaviour and 'Anti-social' behaviour. Overall the vast majority of children are rated positively (show good social behaviour) at age 10, but there is still variation and a small proportion (6.1%) are identified as showing behavioural problems. As with cognitive outcomes in Reading and Mathematics social behaviour is found to be affected by children's background characteristics and their pre-school and educational experiences.

2 Child, family and Home Learning Environment (HLE) factors remain important influences on children's social/behavioural development at age 10, especially on 'Hyperactivity' and 'Self-regulation'.

3 There is no longer an effect of pre-school centre-based child care (below 2 years) upon 'Anti-social' behaviour. By contrast, there remains a longer term positive effect of attending a pre-school in terms of 'Pro-social' behaviour.

4 Overall it appears that 'just' attending a pre-school is not sufficient to ensure better social/behavioural development in the longer term, except for 'Pro-social' behaviour. However, children who attend higher quality pre-schools show the most benefits in all aspects of social development. This supports earlier findings at both entry to primary school and in Year 1 that consistently indicate that higher pre-school quality has a positive impact on both cognitive and social/behavioural development.

5 In line with findings on cognitive development, pre-school quality still affects children's social behaviour at age 10. Similarly measures of pre-school effectiveness are also associated with better social development at age 10. Children who attended a more effective pre-school (one that was associated with better social/behavioural development before they started primary school) continued to show longer term benefits.

6 Children who had attended a more academically effective primary school showed reduced 'Anti-social' behaviour at age 10, although academic effectiveness did not show a significant association with other aspects of social behaviour.[1]

7 The influence of pre-schools and primary schools on children's social/behavioural outcomes are most clearly seen when the levels of pre-school quality and primary school academic effectiveness are analysed in combination.

8 Comparing different combinations of pre-school quality and primary school effectiveness reveals that medium and particularly high quality pre-school can help to protect the child against the disadvantage of attending a low academically effective primary school in terms of several social/behavioural outcomes including 'Hyperactivity', 'Self-regulation' and 'Pro-social' behaviour.

9 The combination of the Home Learning Environment (HLE) and pre-school quality is important. High HLE on its own is not enough. Children who had a high Early years HLE and went to a poor quality pre-school showed worse outcomes in Self-regulation at age 10 than those who had a high Early years HLE and went to a medium or high quality pre-school.

10 Children with low HLE are especially vulnerable, irrespective of pre-school quality, in terms of Self-regulation at age 10.

11 A child who has three of the following characteristics: a) experienced a good Home Learning Environment (HLE) in the early years, b) attended a high quality pre-school, c) and moved on to attend a highly academically effective primary school will tend to do better than a child with two, who will do better than a child with one or none of these characteristics. Hence, it is the combination of these three aspects, HLE, pre-school and primary school over time that is important for promoting positive longer term outcomes in children's social/behavioural development. The child who has a better Early years HLE, goes to a high quality, effective pre-school setting followed by a more academically effective primary school appears to have a combination of 'protective' experiences that are more likely to benefit social/behavioural development.

12 These findings on the benefits of this combination of protective experiences mirror those found for the same sample of children's results in attainment in Reading and Mathematics at age 10. Thus, we conclude that the educational experiences that tend to benefit social/behavioural development are similar to those that benefit cognitive outcomes in the longer term. This has important implications for the achievement of good all round development for children and thus the Every Child Matters agenda.

[1] As might be expected the benefits of attending a more academically effective primary school showed stronger positive associations with children's reading and mathematics outcomes at this age.

Aims

- To explore the impact of child, parent and Home Learning Environment (HLE) characteristics on children's social/behavioural development at age 10.
- To explore evidence of any continuing pre-school influences on children's subsequent social/behavioural development.
- To examine the combined impact of a 'good' Early years Home Learning Environment (HLE) and 'good' pre-school on social/behavioural development at age 10.
- To investigate the net influence of primary school academic effectiveness on social/behavioural development.
- To investigate the interactive effect of pre-school experience and primary school experience on social/behavioural outcomes in Year 5.

Methods

An educational effectiveness research design was adopted to explore the influence of different child, family, and HLE factors on a range of child outcomes (Sammons et al., 2005; Siraj-Blatchford et al., 2006). The analyses show the net effects of different personal, familial and educational influences on young children's social/behavioural development. Social/behavioural development was assessed by teachers using an extended version of the Goodman (1997) *Strengths and Difficulties Questionnaire.* This paper focuses on four measures of social/behavioural development: 'Self-regulation', 'Hyperactivity' 'Pro-social' behaviour and 'Anti-social' behaviour, as rated by the class teacher at the end of Year 5.

Background information on child, parent and family characteristics was obtained through parent interviews conducted soon after children were recruited to the original pre-school study. The parent interviews collected information about a child's health and care history, details of family structure and parents' educational and occupational backgrounds as well as parent-child activities and routines. The later information was used to create an Early years Home Learning Environment (HLE) index.

Background information was again collected during KS1 using a parental questionnaire. This information was used to update background measures such as marital status, number of siblings, employment etc. In addition, this parents' questionnaire was used to collect additional measures of the HLE when children were age KS1 to complement interview based information on the Early years HLE. The individual items were aggregated to form four factors representing different parental activities during Key Stage 1 (KS1): 'Home computing', 'One-to-one interaction', 'Enrichment outings' and 'Expressive play'.

Statistical analyses (contextualised multilevel models) were used to identify the unique (net) contribution of individual background characteristics to children's social/behavioural development at the end of year 5 (age 10), as well as their combined overall influence. These analyses are equivalent to those conducted during the first phase of the research when children entered pre-school and again when they started primary school. Similar models were also used to explore children's attainments in Reading and Mathematics at age 10 (see Sammons et al., 2007).

Value added multilevel models were then used to investigate *changes* in children's social/behavioural outcomes over time (from age 6 to age 10) by including *prior*

social/behavioural measures (collected in Year 1 of primary school) in addition to information about background characteristics in the statistical analyses.

The earlier analyses over the pre-school period showed that variations in the quality and effectiveness of the individual pre-school centre attended by children before they started primary school, and the time (duration in months) in pre-school had a positive impact on children's cognitive and social/behavioural gains by entry to primary school. The earlier analyses also showed that pre-school influences continued to remain evident at the end of KS1 (see Sammons et al., 2004a). The present paper extends the earlier findings on the pre- school and KS1 period, by investigating the extent to which the positive impacts of pre-school are still evident in child outcomes measured at the end Year 5 (age 10 years).

Findings for an additional sample of 'Home' children (those with no pre-school centre experience before starting primary school) recruited to the study at entry to primary school are also reported for comparison with the original pre-school sample. The contextualised multilevel analyses explore whether 'Home' children remain at a disadvantage in terms of overall social/behavioural development at the end of Year 5, as was found to occur at younger ages.

The impact of child, family and home characteristics on children's social development at the end of Year 5

'Hyperactivity'

Gender, early health problems, early behaviour problems, mother's qualifications and family income have the strongest links with 'Hyperactivity' at the end of Year 5. Boys, and children with early health and developmental problems had somewhat raised scores for 'Hyperactivity' when rated by their teachers. Increased 'Hyperactivity' was also associated with children of single or separated mothers, children in need of EAL support, those eligible for free school meals (FSM) and Black Caribbean children[2]. Children who were reported by parents as having more 'Enrichment outings' during KS1, and those who were infrequently engaged in 'Expressive play' during KS1 also showed increased levels of 'Hyperactivity'[3].

Children of mothers with a high level of qualification, and children in middle income households were reported by their teachers as displaying reduced levels of 'Hyperactivity' relative to children of mothers with a low qualification level and from households associated with the low or the high income bands. Reduced 'Hyperactivity' was also associated with children whose mothers are not working and those of Bangladeshi, Pakistani and Indian ethnic origins.

While eligibility for free school meals (FSM) is a significant predictor of increased 'Hyperactivity', it is not as strong as some other predictors in the model. The effect size of FSM is relatively small in comparison with family income or maternal qualifications.

[2] We analysed differences associated with ethnic groups. However, several ethnic groups are small in size and therefore their results should be treated with caution. They are reported here because they are in line with other research. There may be interplay between cultural influences outside school (family, community and peer) and teacher expectations.

[3] It may be that some parents took children on more outings because their children tended to show more hyperactive behaviour but it is not possible to ascertain this with the data available.

'Self-regulation'

The highest levels of 'Self-regulation' were found in children with high Early years HLE scores, higher levels of father's qualification and higher family income. The lowest levels of 'Self-regulation' were associated with the factors, need of EAL support, developmental problems (as reported by parents on entry to the study) and low birth weight.

Gender, which was the strongest predictor for 'Hyperactivity', 'Pro-social' and 'Anti-social' behaviour, had the weakest impact on 'Self-regulation', both relative to the other social/behavioural dimensions and relative to other child factors in the 'Self-regulation' model.

Overall, the model predicting 'Self-regulation' shares more similarities with the models predicting the children's cognitive outcomes (especially Reading) in Year 5 (see Sammons et al., 2007), compared with the other social/behavioural measures. Similarities between the models for 'Self-regulation' and Reading were evident in terms of the combination of predictors that were significant in the final analyses and in the patterns of association between predictors and outcomes.

'Self-regulation' is a measure of pupil's autonomy, confidence and self sufficiency specifically related to behaviour in learning, rather than a social, context. It is therefore to be expected that higher 'Self-regulation' would coincide with high attainment as indicated by the moderately high correlations between these measures. However, the finding of greater similarity between the predictive models for 'Self-regulation' and Reading than between 'Self-regulation' and the other social/behavioural outcomes, suggests that 'Self-regulation' is an outcome with a strong cognitive aspect. It may, to some extent, be affected by the same underlying child characteristics as Reading. Higher levels of 'Self-regulation' seem to foster the development of Reading skills, however it is also likely that children whose reading attainment is boosted at a younger age develop more autonomy and confidence in their learning. Thus, improvements in both Reading and 'Self-regulation' are likely to be mutually reinforcing.

'Anti-social' behaviour

Teachers' ratings indicated slightly increased scores on average for 'Anti-social' behaviour for boys, Black African children, children eligible for FSM, children whose fathers are absent, those whose parents reported as having behavioural problems (at entry to the study), and children who have low levels of 'One-to-one interaction' with their parents (as reported in the parent questionnaire) during KS1. Reduced 'Anti-social' behaviour was associated with high maternal qualifications and with moderate levels of engagement during 'Expressive play' in KS1 rather than either high or low levels.

Eligibility for free school meals (FSM) was the strongest net family predictor of 'Anti-social' behaviour. Its impact on 'Anti-social' behaviour was also the strongest relative to the other social/behavioural dimensions.

'Pro-social' behaviour

Gender was, by a very big margin, the strongest predictor of 'Pro-social' behaviour, with girls having more positive scores as a group. This was then followed by family income, 'Expressive play' during KS1, maternal qualifications and eligibility for free-school meals (FSM). Eligibility for FSM was a weaker predictor than other predictors in the model suggesting that this measure of socio-economic disadvantage has a lesser role to play in 'Pro-social' behaviour than in 'Anti-social' behaviour or in cognitive development.

Girls, children from middle income families, and children of highly educated mothers were generally rated by their teachers as showing somewhat better 'Pro-social' behaviour at age 10. Children who use computers infrequently also show increased 'Pro-social' behaviour compared with those using computers a lot at home (note that many more boys than girls were reported to play with the computer a lot at home). In contrast, children whose parents reported them as having developmental problems at entry to the study, those eligible for FSM, and children whose parents reported as engaging infrequently in 'Expressive play' during KS1, show decreased levels of 'Pro-social' behaviour.

Estimating changes in social/behavioural development (developmental *progress)* over time

Complex value added analyses were conducted for the four social/behavioural outcomes to explore changes in social/behavioural development that we term progress from Year 1 to Year 5. For these analyses we added to the contextualised multilevel models prior social/behavioural developmental level, using the relevant social/behavioural outcome collected at Year 1 in addition to the background factors presented above. These analyses were undertaken to explore whether the child, family and HLE characteristics, found to be significant in predicting aspects of social behaviour measured at the end of Year 5 were also associated with differential progress or change in social behaviour between Year 1 and Year 5 of primary school education.

'Hyperactivity'

For 'Hyperactivity' the findings indicate that girls, Indian, Pakistani and Bangladeshi children, children who have highly qualified mothers ('18 academic' and above) and who belong to families of medium income are showing better progress in terms of reduced hyperactive behaviour. On the other hand, children whose parents reported behavioural problems at entry to the study and children of single or separated mothers made less progress between their first and their fifth year of primary school education. Children who were reported by parents as having more 'Enrichment outings' during KS1, or infrequently engaging in 'Expressive play' during KS1 also showed less progress in this area. Gender and mother's education have stronger links with progress for 'Hyperactivity' than other background measures in the analysis.

'Self-regulation'

Improved 'Self-regulation' was seen in children with highly educated fathers, children of families with medium income, and children with the highest Early years HLE scores. Children with lower HLE did not show as much progress in 'Self-regulation' between Year 1 and Year 5. Progress in 'Self-regulation' was poorer for children reported by parents to have one developmental problem during pre-school and those still needing EAL support at age 10.

'Anti-social' behaviour

Increases in 'Anti-social' behaviour (poorer progress), as reported by teachers, were associated with boys, children eligible for FSM, children whose mothers had vocational level qualifications and children with absent fathers. Moderate levels of engagement in 'Expressive play' during KS1, as reported by parents, were also associated with reductions (improved progress) in 'Anti-social' behaviour by age 10.

'Pro-social' behaviour

Apart from FSM no longer being significant, the factors predicting progress in 'Pro-social' behaviour did not change significantly from the contextualised models reported in this paper. Gender was still the strongest indicator of better progress of 'Pro-social' behaviour followed by family income and maternal qualifications. Girls, children from middle income families and children of mothers with the '18 academic' qualification level and above (i.e. degree/higher degree), and children reported by parents to use computers in moderation (neither high nor low), at home in KS1, showed better progress in 'Pro-social' behaviour. In contrast, children whose parents reported a behavioural problem at entry to the study, and children whose parents reported they engaged infrequently in 'Expressive play' during KS1, showed poorer progress in 'Pro-social' behaviour during KS2.

Pre-school quality and effectiveness and primary school effectiveness

Continuing pre-school influences

As children move through primary school, we would expect pre-school influences to lose some of their potency, or to be masked by the effects of the primary schools attended. Nevertheless, significant pre-school effects are still evident in children's social behaviour five years into primary education.

Simply attending pre-school still makes a difference to children's 'Pro-social' behaviour at the end of Year 5 - those who have attended any pre-school are independently rated by their teachers as showing significantly increased levels of positive social behaviour relative to children who had stayed at home. There are also indications that those who started pre-school early (before 3 years of age), also showed more 'Pro-social' behaviour. However, for other dimensions of social behaviour, the effect of simply attending a pre-school has washed out. By contrast, the results show that the quality and effectiveness of the pre-school attended still made a significant difference to longer term developmental outcomes.

All four indicators of pre-school effectiveness in promoting children's earlier social behaviour, before they started primary school, were still significant predictors of later 'Self-regulation' and 'Pro-social' behaviour at age 10. However, there were no significant differences between the 'Home' group and those who had attended low effective pre-schools. For 'Hyperactivity' at age 10 only pre-schools that were found to be more effective in reducing 'Anti-social' behaviour before children joined primary school continued to show positive effects five years later, while the 'Home' group also showed somewhat better scores for this outcome than those from medium or low effective pre-schools for this dimension.

Pre-school quality continues to show associations with later social behaviour, but different aspects of quality were found to be associated with different aspects of behaviour. The measure of quality associated with the academic aspects of pre-school education (ECERS-E) was particularly associated with increased 'Self-regulation', while the measure of pre-school quality associated with the 'caring and emotional/relationship' aspects of pre-school (ECERS-R) was associated with reduced 'Hyperactivity' and increased 'Pro-social' behaviour.

Good Early years HLE still predicted better Self-regulation at age 10. Further analyses investigated the combined effect of the Early years HLE and pre-school quality to explore

the interplay between these two predictors and the relative contribution each makes to 'Self-regulation'. For this analysis the HLE index was regrouped into three categories representing low, medium and high.

The greatest boost in 'Self-regulation' comes from the combined effect of medium or high pre-school quality and high HLE. High HLE alone is not enough - children who have high HLE scores and attend low quality pre-schools have poorer 'Self-regulation' at age 10 years than children with medium Early years HLE scores who had attended high quality pre-school. Similarly, high quality pre-schools improve 'Self-regulation' but it is not enough by itself. Self-regulating behaviour in children who go to high quality pre-schools is still affected by the HLE. 'Home' children with high Early years HLE scores are doing well relative to 'Home' children with low and medium HLE scores, but they are not doing as well as similar children who had also attended medium and high quality pre-school.

Earlier EPPE reports (Sammons et al., 2004a; Sammons et al., 2003; Melhuish et al., 2001) had shown that an early start to centre-based child care before the age of 2 was associated with higher scores on anti-social behaviour at ages 3, 5 and 6. However, by age 10 there was no relationship between an early start in child care and higher rates of anti-social behaviour. It appears that the slightly increased risk of anti-social behaviour identified previously in children with an early start in group child care has faded by age 10.

Primary school academic effectiveness (value added)

Analyses considered the impact of primary school academic effectiveness on social/behavioural development. The effectiveness indicators for primary schools were calculated using National Assessment data for all primary schools in England linking KS1 and KS2 results. Separate indicators were calculated for English, Mathematics and Science (see Melhuish et al., 2006a; 2006b). These indicators are thus independently derived and provide a measure of the overall academic success (value added) of the primary school in promoting their pupils' academic progress over KS2 for three successive pupil cohorts.

Primary school academic effectiveness is a significant predictor of reduced 'Anti-social' behaviour. However, it is not a significant predictor of the other aspects of social/behavioural development. We conclude that the academic effectiveness of the primary school attended benefits children in terms of reductions in longer-term 'Anti-social' development. It makes an identifiable and separate contribution to children's 'Anti-social' behaviour at Year 5, after controlling for child, family and HLE influences. This suggests that school organisation and classroom processes that are associated with better academic results may influence the behavioural climate of the school positively.

However, the associations between school academic effectiveness and 'Anti-social' behaviour may also be bi-directional. Raised overall levels of 'Anti-social' behaviour in a school are likely also to impede teaching and may result in lower academic effectiveness. School effectiveness research has indicated that the creation of an orderly and positive behavioural climate in school, taking account of differences in intake, is a key characteristic of more effective schools (Teddlie & Reynolds, 2000). Also, school improvement research has indicated that improvement in behaviour climate is associated with improvements in subsequent academic results. While we cannot draw causal connections, the results indicate that, taking into account the EPPE sample's own characteristics, going to a more academically effective school does show positive net benefits in reducing their scores in terms of 'Anti-social' behaviour at age 10.

The combined impact of pre-school quality and primary school effectiveness

Overall, the effects of pre-school quality and primary school academic effectiveness are most strongly associated with 'Self-regulation' and 'Pro-social' behaviour; the main effects are weak for pre-school quality and non-significant for primary school academic effectiveness. However, when pre-school quality and primary school effectiveness are combined, the net impact on behaviour is statistically significant and relatively strong compared with other predictors. Taken together these findings suggest that pre- and primary school effects are additive and important.

Analyses of the combined influence of pre-school quality and primary school academic effectiveness suggest that those children who attended low quality pre-school followed by a low effectiveness primary school show the poorest 'Self-regulation' and 'Pro-social' behaviour at age 10. The protective effects of pre-school quality are most clearly evident for those attending medium effective primary schools, which is the majority of children.

High quality pre-school also seems to offer protection against low academic effective primary schools in terms of reducing 'Hyperactive' behaviour. The effects of pre-school quality on 'Hyperactivity', however, may be hidden in high academic effectiveness primary schools because both quality and effectiveness are having positive effects. By contrast 'Home' children who attended high academic effective primary schools showed the best outcomes in terms of reduced 'Hyperactivity' and 'Anti-social' behaviour scores. Interestingly, 'Home' children who went to low academically effective primary schools showed increased 'Anti-social' scores compared to all other groups including those who went to low quality pre-school and a low academically effective primary. Thus, pre-school seems to offer some protection against attending a low academic effective primary in terms of several social/behavioural outcomes at age 10. 'Home' children who went to a low academic effective primary school did less well in terms of outcomes for 'Anti-social' and hyperactive behaviour. This result is in broad agreement with findings on cognitive attainment at the same age for the EPPE sample (see Sammons et al., 2007).

When we examine primary school academic effectiveness in relation to social/behavioural development the relationship between negative social behaviour and level of academic effectiveness appears to be reciprocal. As long as there are not too many interruptions to prevent primary schools from implementing well established strategies, children in more effective schools tend to do well academically. The relationship between positive social behaviour and primary school academic effectiveness appears to be more complex and deserves further investigation. The patterns associated with the 'Home' group suggest that pre-schools may have a greater role to play in promoting later 'Self-regulation' and 'Pro-social' behaviour than primary schools. On the other hand, differences between schools after prior (Year 1) developmental level is taken into account indicate that some primary schools have quite a significant impact on children's positive social behaviour. This is especially true for 'Self-regulation'. The findings overall also indicate strong links between 'Self-regulation' and cognitive attainment in children in both KS1 and KS2, it would, therefore, be reasonable to assume that such associations exist on a school level too, but further analyses are required to explore such links.

In summary, while pre-school and primary school effects are present for all social behavioural outcomes, pre-school measures are more strongly related to improvements in positive social behaviour ('Self regulation' and 'Pro-social'), while primary school measures seem to be more strongly related to improvements in negative social behaviour ('Hyperactivity' and 'Anti-social').

Implications

In line with findings for cognitive outcomes at age 10 (reported separately in Sammons et al., 2007) the present findings further support the conclusion that *good* (i.e. high quality and effective) pre-school still matters for children's developmental outcomes in the longer term. There is evidence of continuing pre-school effects in terms of better social/behavioural development. Taken together the results indicate that attending a pre-school has long term benefits for 'Pro-social' behaviour. Also, in contrast to other outcomes, it appears that an earlier start (under 3) is linked with better outcomes in terms of 'Pro-social' behaviour at age 10. By Year 5 there are no longer any significant differences related to an earlier start in terms of raised scores for 'Hyperactivity' or 'Anti-social' behaviour for this sample. However, for other aspects of children's behaviour at age 10, differences in the effectiveness of pre-school attended seem to contribute to better outcomes in the longer term rather than just attending or not attending a pre-school setting. Children who had attended pre-schools that had the most positive impact on social/behavioural development before starting primary school show better behavioural profiles across the board at age 10. By contrast, turning to quality we find that those children who attended low quality pre-school no longer show benefits and poor quality pre-school is also associated with poorer self-regulation and increased hyperactivity. Thus, quality and effectiveness of pre-school are especially relevant for sustaining better developmental outcomes in the longer term.

The implications of this are clear, improving the access to high quality and more effective pre-school is likely to benefit children throughout their time in primary school by improving social adjustment to school and also by promoting cognitive development. These benefits are likely to contribute to raising both educational standards and promoting social inclusion.

Primary school academic effectiveness (measured independently by value added analyses of National Assessment data for matched pupil cohorts KS1 to KS2 across three years) is also a significant influence, in combination with pre-school quality. Those who attended more academically effective primary schools tend to show better attainment and better social/behavioural development at age 10, in terms of reduced 'Anti-social' behaviour.

The findings suggest that the academic effectiveness of the primary school tends to help in reducing 'Anti-social' behaviour as well as benefiting Reading and Mathematics attainment and progress, and that this may be especially relevant for the 'Home' group of children at age 10. It appears that the processes and organisational features of more academically effective schools may also be associated with reducing 'Anti-social' behaviour, perhaps by influencing school/classroom climate and culture. There is no evidence of any negative impact of academic effectiveness on social/behavioural development, and this is important because some have claimed that a focus on academic progress may lead to poorer outcomes in other aspects of development. The EPPE research evidence at age 10 does not support such claims. We also suggest that there may be reciprocal effects between primary school academic effectiveness and 'Anti-social' behaviour, as has been suggested in other studies in the school effectiveness and improvement tradition.

The present research provides new evidence concerning the combined effects of pre-school and primary school in shaping children's later developmental outcomes at age 10

years. It suggests that raising the effectiveness and quality of both will help to improve children's all round development.

We can conclude that no one factor is the key to enhancing outcomes in the longer term across Key Stage 2 – it is the combination of experiences over time that matters. The child who has a better Early years HLE, goes to a high quality, effective pre-school setting and who then goes on to attend a more academically effective primary school appears to have a combination of 'protective' experiences that benefit social/behavioural development. High quality and more effective pre-schools seem to support better outcomes in longer term cognitive and social/behavioural domains. Likewise, we also find that a higher quality Early years HLE benefits both cognitive and social/behavioural development throughout pre-school and primary school.

The implication of these findings and those on cognitive outcomes for the same sample that have been reported separately, is that policy should promote strategies to support improvements in the Early years HLE, especially for vulnerable groups, and also work to improve the quality and effectiveness of pre-school provision. Pre-schools are well placed to identify children who may need extra support if they do not experience a high quality HLE and settings could be guided to work with parents to improve the HLE. Improving poorer quality pre-schools needs to be given a high priority, since poor quality provision does not appear to offer long term benefits in improved cognitive or social/behavioural development.

The finding that both social/behavioural development and Reading and Mathematics attainment can be boosted by attending an academically more effective primary school has important messages for the achievement of the Every Child Matters agenda, because it shows that the promotion of better academic outcomes is not at odds with the development of better social/behavioural development.

The focus on supporting the improvement of primary schools identified as less effective and of lower quality remains important given other findings from the EPPE research which used classroom observations and showed that quality tends to vary widely and may be lower in some primary schools serving more disadvantaged communities (Sammons et al., 2006).

As with cognitive outcomes the findings again suggest that, in order to help reduce the achievement gap for multiply disadvantaged groups, actions to improve their HLE, pre-school and primary school experiences will be needed in concert, since improvements to any one in isolation would be insufficient to boost outcomes sufficiently to help close the attainment or social/behavioural 'gap' on its own. In addition, it is likely that specially targeted interventions for children who are identified as well behind their peers in cognitive or social/behavioural profiles at the start of primary school will also be helpful to prevent or at least ameliorate a widening of the gap during KS1 and KS2. This has implications for the use of baseline assessment and SEN identification and the development of well founded, evidence based interventions to support vulnerable children when they first start school, particularly if they have not attended pre-school or have had only poor quality or disruptive pre-school experiences.

Introduction

The Effective Pre-school and Primary Education Project 3-11 (EPPE 3-11) is a large-scale longitudinal study of the impact of pre-school and primary school on children's developmental outcomes, both cognitive and social/behavioural. The study has been following children from the start of pre-school (at age 3 years plus) through to primary school entry and across Key Stage 1 (KS1) and Key Stage 2 (KS2). This paper describes the results of analyses of children's social behaviour at age 10 years, a separate paper reports the findings on children's Reading and Mathematics attainment at this age (Sammons et al., 2007).

Background

EPPE 3-11 began in 1996 with the aim of investigating the influence of Early Childhood provision on young children's progress and development during their time at pre-school, and to explore whether any pre-school effects continue to influence children after they start primary school. At the time, it was the first study of pre-schools in Europe to use a longitudinal, mixed method, educational effectiveness design based on sampling children in a range of different pre-school settings and using statistical approaches that enable the identification of individual pre-school centre effects.

The initial phase of the research followed children from pre-school to the end of KS1. Beginning around the age of 3 years children were assessed and then followed up at entry to primary school. Multilevel models were used to calculate value added estimates (residuals) of individual centre level effects at the end of the pre-school period and on entry to reception (see Sammons et al., 2002a, 2003). These 'value added' measures were used as indicators of pre-school *effectiveness* in later analyses that tracked the children's development up to age 7 years. Measures of the *quality* of individual pre-school centres[4] were also collected (based on observations by trained researchers) and these were found to influence young children's progress and development from age 3 to 5 years. The continuing impact of pre-school on children's later educational outcomes was further explored at the end of KS1. This set of analyses explored whether 'Home' children (a sample of 315 children who were recruited at entry to school and who had very little or no pre-school centre experience) were lagging behind other children, and whether duration of time, quality and effectiveness of the pre-school attended still showed significant positive effects on attainment and social/behavioural development at the end of KS1 (age 7), as they were found to at entry to school.

Children's Educational Outcomes in Key Stage 2

The second follow-up phase of the longitudinal research investigates the development of the same group of children across Key Stage 2 (KS2) of primary education (age 7 to 11 years). It consists of three "Tiers". Tier 1 involves the analysis of primary school academic effectiveness across all primary schools in England using value added approaches measuring pupil progress for three successive cohorts across KS2 in terms of National Assessment outcomes (Melhuish et al., 2006a; 2006b). Tier 2 focuses on the academic and social/behavioural progress of around 2,500 individual children in the original EPPE sample and uses the results from Tier 1 to provide measures of primary school academic effectiveness for the schools attended by EPPE children. Tier 3 explores variations in observed classroom practices during KS2 focusing on a sample of 125 schools and Year 5 classes drawn from among the 850 plus primaries in which the EPPE children were located (see Sammons et al., 2006).

This paper is part of the Tier 2 analysis focusing on children's social/behavioural development in Year 5 (a separate paper reports the results of analyses of children's attainments and progress in Reading and Mathematics at age 10)[5]. Social/behavioural development was assessed by teachers using an extended version of the Goodman (1997) *Strengths and Difficulties Questionnaire*. A range of statistical methods was used to analyse data for 2,520 EPPE children for whom social/behavioural outcome data was collected in Year 5. This represents eighty-three per cent of the total child sample assessed at entry to primary school (n=3,048 children with

[4] The quality measures are described in Sylva et al., 1999a.

[5] See Sammons et al., 2007.

equivalent entry to primary school cognitive and/or social/behavioural measures). A wide range of information has been drawn upon, including teachers' assessments of social/behavioural development at age 3, 5, 7 and 10; information about child, family and Home Learning Environment (HLE) characteristics collected from parental interviews when children were recruited to the study and again in KS1; measures of pre-school quality and indicators of effectiveness collected during the first phase of the study; and independent indicators of primary school academic effectiveness derived from the Tier 1 analyses of National Assessment data for successive cohorts (Melhuish et al., 2006a).

Aims

The aims of the social/behavioural analyses are:

- To explore the impact of child, parent and home characteristics on children's social/behavioural development at this age.
- To investigate any continuing impact of pre-school, including any variations in children's social outcomes for those who attended pre-school and those who received no pre-school provision - the 'Home' sample.
- To explore evidence of any continuing pre-school influence, particularly in measures of the quality and effectiveness of the pre-school setting attended on children's subsequent social/behavioural development
- To examine the combined impact of a 'good' HLE and 'good' pre-school on these developmental outcomes at age 10.
- To investigate the net influence of primary school effectiveness on social/behavioural development, controlling for child and family and HLE characteristics.
- To investigate the interactive effect of pre-school experience and primary school experience on social/behavioural outcomes in Year 5.

Methods

An educational effectiveness research design was adopted to explore the impact of different child, family, and HLE factors on a range of child outcomes. The analyses employ a variety of statistical techniques including descriptive and correlation analysis and multilevel (hierarchical) regression methods to examine personal, familial and educational influences on children's social/behavioural development. This paper focuses on four measures of social/behavioural development: 'Self-regulation', 'Hyperactivity' 'Pro-social' behaviour and 'Anti-social' behaviour. The information was collected via a questionnaire completed about each child by their class teacher at the end of Year 5.

Background information about child, parent and family characteristics, was obtained through parent interviews conducted soon after children were recruited to the study[6]. The parent interviews were designed to obtain information about a child's health and care history, details of family structure and parents' own educational and occupational backgrounds as well as some indications of parent-child activities and routines. Parents were assured of confidentiality and anonymity in presenting results.

Background information was again collected during KS1 using a questionnaire with a response rate of eighty-one per cent. Information obtained by the parent questionnaire was used to update various background measures such as marital status, number of siblings, employment etc. In addition, the parent questionnaire was used to collect additional measures of the HLE in KS1 when children were age 6, to complement information on the pre-school HLE, such as 'Home computing' during KS1 and other activities (including Reading, play of various kinds, involvement in sport, music, dance etc).

[6] It should be noted, that most interviews were with children's mothers and usually took place at the child's pre-school centre, although for some working parents telephone interviews were found to be more convenient. All parents gave signed consent. An excellent response rate (97%) to the interview was achieved, although in some instances particular questions had a slightly lower rate of response (e.g. related to occupations). In most cases the parent interviews were conducted within 10 weeks of recruiting a child to the study, though for a small number of children in 'hard to reach' groups a longer time gap sometimes occurred.

Contextualised multilevel models were used to identify the unique (net) contribution of different background characteristics to children's social/behavioural development at different time points. These contextualised multilevel analyses are equivalent to those conducted during the first phase of the research when children entered pre-school and again when they started primary school (see Sammons et al., 1999; Melhuish et al., 2001; Sammons et al., 2002a; 2003), and subsequently at the end of Year 1 (see Sammons et al., 2004b) and Year 2 (see Sammons et al., 2004a).

Value added multilevel models were used to investigate children's progress over time by including *prior* social/behavioural measures in addition to information about children's background characteristics in the statistical analysis. Value added models have already been used to investigate children's progress over their time in pre-school. These analyses were used to create value added indicators of each pre-school centre's effectiveness in promoting positive social skills in several areas ('Independence and Concentration', 'Co-operation and Conformity', 'Peer-sociability', or in helping to reduce 'Anti-social' behaviour) during the first phase of the study. Pre-school centres where children had made significantly greater progress than predicted on the basis of prior social behaviour and intake characteristics can be viewed as *more effective* (positive outliers in value added terms). Similarly, centres where children made less progress than predicted can be viewed as *less effective* (negative outliers in value added terms). These value added indicators of centre effectiveness in these aspects of the social/behavioural domain have been included in subsequent analyses of children's educational and social/behavioural outcomes in primary school to establish whether the effectiveness of the pre-school attended continues to have an impact on later cognitive attainment or social/behavioural development in Year 5.

The earlier analyses over the pre-school period showed that variations in quality and the extent of time (duration) in pre-school had an impact on children's cognitive and social/behavioural gains at entry to primary school and that pre-school influences remained evident in KS1. This paper extends the earlier findings on the pre-school and KS1 period, by investigating the extent to which the positive impacts of pre-school are still evident in child outcomes measured at the end Year 5 (age 10 years).

Findings for a sample of 'Home' children, who had no pre-school centre experience before starting primary school, are also reported for comparison with the pre-school sample. The contextualised multilevel analyses explore whether 'Home' children remain at a disadvantage in terms of social/behavioural development at the end of Year 5, as has been found at younger ages.

Independent indicators of primary school academic effectiveness for the schools attended by EPPE 3-11 children were obtained from the Tier 1 analysis of primary school effectiveness across all primary schools in England[7]. Mean value added scores of school academic effectiveness across the years 2002 to 2004 were calculated for each primary school in England and then extracted for schools attended by children in the EPPE 3-11 sample[8]. Note, however, that these value added measures are indicators of a school's academic effectiveness in terms of National Assessment performance. Nevertheless, analyses conducted at earlier time points in the EPPE

[7] Applying value added approaches, the Tier 1 analysis measured pupil progress using matched National Assessment data across KS1 to KS2 test results (Melhuish et al., 2006a). Multilevel models controlling for individual pupils' prior attainment (KS1 results) and a variety of pupil background and area characteristics (such as gender, eligibility for free school meals [FSM], ethnicity, etc.) were used to calculate differences between expected and observed attainments at the end of KS2 for each school in England. These differences between expected and observed attainment (also referred to as 'residuals') provide a value added indicator of each school's effectiveness in promoting pupil progress in a given outcome. Using three Key Stage 2 (KS2) test results (English, Mathematics, and Science), value added measures were calculated for three consecutive years (2002, 2003, 2004).

[8] A mean value added score provides a more stable estimate of effectiveness as it helps to smooth fluctuations in effectiveness over time. The mean value added scores obtained were used in all subsequent analyses.

research showed significant associations between cognitive attainment and social/behavioural development (especially for 'Self-regulation'); these value added indicators of effectiveness, therefore, have been included in the current analyses to examine whether going on to attend a more academically effective primary school influences a child's social/behaviour development at age 10 years. In a separate report (see Sammons et al., 2007) we describe the links between a school's academic effectiveness and the individual child's attainment and progress in Reading and Mathematics at age 10.

Structure of the Report and Analyses

This report is divided into five sections. The first provides some detailed descriptive statistics concerning the characteristics of the children in the EPPE 3-11 sample for whom social/behavioural measures were available at the end of Year 5. The second section provides a brief description of data, the items included and the method used to derive the social/behavioural measures.

Section three presents differences in social/behavioural development at the end of Year 5 for different groups of children in terms of various child, family and HLE characteristics. Absolute differences in average social/behavioural development levels are presented alongside differences in 'net' impact of different child and family predictors, showing the unique contribution of a predictor to an outcome once all other predictors are taken into account. Contextualised multilevel analyses are used to identify the unique (net) contribution of particular characteristics to variation in children's social/behavioural outcomes. 'Net' impact is reported in terms of effect sizes (ES), which are statistical measures of the relative strength of different predictors in the final model.

The fourth section describes the extent of change in the influence of different background factors while young children move through primary school. Contextualised multilevel models were used to estimate the net impact of different background factors on social/behavioural outcomes in both Year 1 and Year 5. Effect sizes (ES) for the different factors were calculated and a comparison between the two years was made in terms of the relative strength of influence measured by changes in the ES over the four years. This section therefore describes whether the social/behavioural differences found for different groups of children have remained the same between Year 1 and Year 5 or whether the gaps between certain groups have reduced or increased.

Section five examines the impact of pre- and primary school on children's social/behavioural development at age 10. The first phase of the EPPE 3-11 research had shown that pre-school experience gave children a better start to school, in terms of higher cognitive attainments and improved social/behavioural outcomes. Particularly for more vulnerable groups of young children, lack of pre-school experience was found to be an additional disadvantage at the start of primary school (rising 5 years). In addition to the effect of pre-school attendance, indicators of pre-school quality and effectiveness are tested to explore any continuing effect of pre-school on children's social behaviour at the end of Year 5 in primary school. Further analyses seek to establish whether the academic effectiveness of the primary school attended has any influence on pupils' social/behavioural outcomes in Year 5. In the last part of Section 5 the combined impact of pre-school quality and primary school effectiveness is examined to establish the nature and pattern of educational influences on children's social/behavioural development at age 10.

In Section 5 the differential effect of pre-school on different sub-groups of children are explored. In particular, the differential effects of pre-school in relation to gender, FSM eligibility and pre-school HLE will be presented.

Section 6 presents results of analyses that explore children's social development from the end of Year 1 at primary school to the end of Year 5. Value added analyses of children's social/behavioural development across KS1 and KS2 have been conducted. These analyses control for prior social behaviour (at the end of Year 1) in analysing development over time.

The final section summarises the results drawing together the main findings and conclusions.

Section 1: Characteristics of the sample at the end of Year 5

The research design of the EPPE study is described in detail in EPPE Technical Paper 1 (see Sylva et al., 1999b). In summary, six English Local Authorities (LAs) in five regions participated in the research with children recruited from six main types of pre-school provision (nursery classes, playgroups, private day nurseries, local authority day nurseries, nursery schools and integrated centres [that combine education and care]). In order to enable comparison of centre and type of provision effects, the project sought to recruit around 500 children, 20 in each of 20-25 centres, from the various types of provision. Within each LA centres of each type were selected by stratified random sampling, and due to the small size of some centres (e.g. rural playgroups), more of these centres were recruited than originally proposed, bringing the sample total to 141 centres. There were 2,857 children in the EPPE pre-school sample. An additional sample of 315 'Home' children (those who had not attended a pre-school setting) was identified at entry to primary school, for comparison with those who had attended a pre-school centre, bringing the total sample to 3,172.

This section provides descriptive statistics for the child sample at the end of year 5, age 10 year. Table 1.1 provides a brief summary of selected characteristics[9] of children for whom social/behavioural outcome data were available.

Overall 2,520 children had valid social/behavioural outcome data. Within this sample fifty-one per cent of children are male; three quarters are of White UK heritage and a tenth had English as an Additional Language (EAL), but only forty per cent of those (or only 3.8% in the total sample) required EAL support at age 10. In terms of family constitution, the majority of children (63.5%) live with one sibling, nineteen per cent are singletons and fifteen per cent are part of larger families with 2 siblings or more; forty-three per cent of families have higher scores (25+) on an index of Early years Home Learning Environment (HLE) measured in the pre-school period. A substantial minority of children (30%) were from families where scores on the Early years HLE index were relatively low (below 20 was poor).

About eighteen per cent of mothers and 24 per cent of fathers have a degree or higher degree. The large majority of parents, however, are educated to GCSE level (academic 16) or below. Low family socio-economic status (SES) was recorded for seventeen per cent of the sample, forty-six per cent belong to the medium (skilled manual or skilled non manual) group and thirty-five per cent are from the higher (professional) groups. Over a third of the children in the sample (36.7%) live in households where the family earned income was reported to be under £17,500, and a fifth were recorded as eligible for free school meals (FSM). On an index of multiple disadvantage a quarter were identified as of medium to high disadvantage (3+ disadvantages= 24.7%)[10].

Overall, this sample (2520) is not noticeably different when compared to the total sample (3172); variations in the distributions of background variables are generally within 1%. There is a somewhat higher proportional representation of children of white UK heritage (2.5%), children whose family earned income is either 'none' or lower than £17,500 (3.5%) and of children with either no disadvantage or low (1) disadvantage (3.2%) in comparison to the characteristics of the sample tracked at entry to primary school (age rising 5 years).

All background variables used in the models were obtained from a detailed parent interview conducted on entry to the study with the exception of maternal employment (not shown in Table

[9] To prevent loss of sample size for further analyses, missing values of number of siblings and eligibility for free school meals (FSM) were imputed using 'the last observation carried forward' method. Please see Appendix 5 for a description of this imputation method.

[10] Only a small number of children with valid social/behavioural data had missing demographic data. The proportion of missing data generally did not exceed 4% with the exception of 'need of EAL support' (8.8%), multiple disadvantage (7.5%) and family salary (15.9%).

1.1) and family earned income; these measures were obtained during Key Stage 1 (KS1 - 6-7 years old) through a follow up parental questionnaire. Other more recent information (e.g. KS1) on background variables were also tested in the model but showed weaker associations with the social/behavioural outcomes than those collected at entry to the study (age 3+); except for current maternal employment during KS1 which had a slightly stronger effect.

Measures of FSM eligibility and 'Need of EAL support' are collected yearly through the teacher completed child profile; the measure obtained for a given year is the measure used in the models for that year's outcomes, e.g. Year 5 FSM for Year 5 models, Year 1 FSM for Year 1 models etc.

Throughout the report the variable of family earned income is used as a measure of the income level of the family. The 'no' family earned income group may have income through benefits or other sources. The 'no' family earned income group is used as the reference group in comparisons. Family earned income is a categorised into 6 levels (see Table 1.1). Any reference through out the report to 'income' equates to family earned income.

Table 1.1
Characteristics of children with valid Year 5 data compared to the total sample at entry to primary school

	Year 5 N=2,520		Total sample N=3,172	
	n	%	n	%
Gender				
Male	1289	51.2	1636	51.6
Female	1231	48.8	1536	48.4
Ethnicity				
White UK Heritage	1887	74.9	2295	72.4
White European Heritage	79	3.1	122	3.8
Black Caribbean Heritage	91	3.6	116	3.7
Black African Heritage	50	2.0	66	2.1
Indian Heritage	53	2.1	93	2.9
Pakistani Heritage	52	2.1	67	2.1
Bangladeshi Heritage	136	5.4	177	5.6
Mixed Heritage	28	1.1	40	1.3
Any Other Ethnic Minority Heritage	141	5.6	192	6.1
English as an Additional Language (EAL)	239	9.5	354	11.2
Child needs EAL support at Year 5	95	3.8	98	3.1
Number of siblings	355	14.1	455	14.3
No siblings	477	18.9	624	19.7
1 sibling	1601	63.5	1955	61.6
2+ siblings	385	15.3	483	15.2
Early years Home Learning Environment (HLE) Index				
0 – 13	227	9.0	308	9.7
14 – 19	530	21.0	665	21.0
20 – 24	580	23.0	727	22.9
25 – 32	786	31.2	960	30.3
33 – 45	296	11.7	346	10.9
Type of Pre-School				
Nursery Class	479	19.0	588	18.5
Playgroup	482	19.1	609	19.2
Private Day Nursery	435	17.3	516	16.3

Type of Pre-School- continued				
Local Authority Day nursery	320	12.7	433	13.7
Nursery school	421	16.7	519	16.4
Integrated (Combined) Centre	135	5.4	191	6.0
'Home' sample	246	9.8	314	9.9
Mother's Qualifications				
None	478	19.0	647	20.4
Vocational	366	14.5	442	13.9
16 Academic	915	36.3	1118	35.2
18 Academic	207	8.2	257	8.1
Other professional	21	.8	25	.8
Degree and higher degree	442	17.5	533	16.8
Father's Qualifications				
None	386	20.4	484	15.3
Vocational	289	15.3	346	10.9
16 academic	562	29.7	676	21.3
18 academic	185	9.8	223	7.0
Degree or equivalent	313	16.6	378	11.9
Higher degree	132	7.0	165	5.2
Other professional	24	1.3	32	1.0
Missing (father absent)	570	22.6	757	23.9
Family Highest SES				
Professional Non Manual	232	9.2	281	8.9
Other Professional Non manual	641	25.4	776	24.5
Skilled Non Manual	796	31.6	974	30.7
Skilled Manual	365	14.5	452	14.2
Semi-Skilled	303	12.0	406	12.8
Unskilled	57	2.3	79	2.5
Unemployed / Not working	62	2.5	88	2.8
Income indicator:				
Free School Meals (FSM)	496	19.7	673	21.2
No Free school meals	2011	79.8	2374	74.8
Family earned income				
No salary	493	19.6	569	17.9
£ 2,500 – 17,499	431	17.1	485	15.3
£ 17,500 – 29,999	372	14.8	411	13.0
£ 30,000 – 37,499	242	9.6	271	8.5
£ 37,500 – 67,499	419	16.6	470	14.8
£ 67,500 – 132,000+	161	6.4	173	5.5
No salary data	401	15.9	792	25.0
Total Multiple Disadvantage Index				
0 (low disadvantage)	557	22.1	644	20.3
1	655	26.0	781	24.6
2	498	19.8	613	19.3
3	288	11.4	391	12.3
4	183	7.3	257	8.1
5 plus (high disadvantage)	151	6.0	213	6.7

Some figures do not include non-response to questions therefore the total is not always 2520 (100%)

Section 2: Social/behavioural assessment and data analysis

An extended version of the Strengths and Difficulties Questionnaire (Goodman, 1997) was used to measure different features of children's social/behavioural development in Year 5. This social/behavioural child profile was completed by the class teacher who knew the child well. A principal component analysis was used to identify the main underlying dimensions of social behaviour [11] (see Appendix 3 for a more detailed description of the methodology). In this report we focus on four aspects of social behaviour – 'Hyperactivity', 'Self-regulation', 'Pro-social' behaviour and 'Anti-social' behaviour. The specific questionnaire items found to be associated with each of the four social/behavioural dimensions are presented in Box 1, the full factor solution can be found in Appendix 3.

Box 1
The specific items associated with each social/behavioural dimension in Year 5 (age 10)

'Hyperactivity'
1. Restless, overactive, cannot stay still for long
2. Constantly fidgeting or squirming
3. Easily distracted, concentration wanders
4. Thinks things out before acting
5. Sees tasks through to the end, good attention span
6. Quickly loses interest in what she/he is doing
7. Gets over excited
8. Easily frustrated
9. Impulsive, acts without thinking
10. Can behave appropriately during less structured sessions
11. Fails to pay attention
12. Makes careless mistakes

'Self-regulation'
1. Likes to work things out for self; seeks help rarely
2. Does not need much help with tasks
3. Chooses activities on their own
4. Persists in the face of difficult tasks
5. Can move on to a new activity after finishing a task
6. Open and direct about what she/he wants
7. Confident with others
8. Shows leadership in group work
9. Can take responsibility for a task

'Anti-social'
1. Often fights with other children or bullies him
2. Often lies or cheats
3. Steals from home, school or elsewhere
4. Vandalises property or destroys things
5. Shows inappropriate sexual behaviour toward others
6. Has been in trouble with the law

'Pro-social'
1. Considerate of other people's feelings
2. Shares readily with other children (treats, toys, etc.)
3. Helpful if someone is hurt, upset or feeling ill
4. Kind to younger children
5. Often volunteers to help others (teachers, other children)
6. Offers to help others having difficulties with a task
7. Sympathetic to others if they are upset
8. Apologises spontaneously

The factor scores from the principal component analysis were used in subsequent analyses. For the whole sample factor scores are normalised to an average of 100 with a standard deviation of 15[12].

Higher scores indicate better behaviour for the factors 'Self-regulation' and 'Pro-social' behaviour. By contrast, lower scores indicate better behaviour (in terms of lower incidence reported by teacher ratings) for 'Hyperactivity' and 'Anti-social behaviour'. Note that scores on all social/behavioural measures are skewed towards the more desirable end of the scale. This is especially important for the more negative aspects of social behaviour where raised scores indicating potential maladaptive behaviour (using the cut-off point suggested by Goodman) are only evident for a small minority of children (6.1%). This shows that most children are rated positively by their teachers in terms of these features of social behaviour and the results are in

[11] A number of data reduction methods were applied to the data, and structural equation modelling was used to compare the different models derived. The best fitting model was a 7 factor solution with Promax rotation (RMSEA=0.6; CMIN=14635.647 with 1463 df). The most important four factors were used in subsequent analyses.

[12] We normalised the data for ease of interpretation, because the distribution of scores produced by the factor analyses is standardised (with a mean of 0 and a standard deviation of 1) and involves negative values. See Appendix 4 for details of normalisation procedures.

line with other research on social behaviour and with the distribution of scores for social/behavioural measures for the EPPE sample at younger ages.

The following background measures have been used in the multilevel models as potential predictors of different aspects of social behaviour.

- Child factors (e.g. gender, birth weight, mother tongue and ethnicity).
- Family factors (e.g. socio-economic status [SES], parent's qualification level, family earned income, marital status).
- Early years Home Learning Environment (HLE) index during the pre-school years.
- Pre-school experience and pre-school characteristics (e.g. type, duration, quality, effectiveness).
- Primary school academic effectiveness (derived independently from value added analyses of pupil progress using National Assessment data sets for all primary schools over three years 2002-2004).

Contextualised multilevel analyses are used to investigate whether the patterns of association between social/behavioural outcomes and these child, family and HLE factors remain statistically significant when children reach the end of Year 5 of primary school. These analyses are used to identify and quantify the unique (net) contribution of particular characteristics to variation in children's social/behavioural outcomes, while other influences are controlled. For example, the impact of gender was established while taking into account the influence of mother's qualification levels, low income, ethnicity, birth weight, HLE etc. The nature and strength of such background influences have been explored individually and in total, because they are relevant to issues of equity and social inclusion. The influence of pre-school is likewise calculated net of the influence of background factors and will be reported in Section 5. The overall analysis strategy for social/behavioural outcomes is similar to that adopted for the analysis of cognitive outcomes for the same pupil sample (Reading and Mathematics see Sammons et al., 2007).

2.1 Associations between social/behavioural development and cognitive attainment and between the different aspects of social behaviour over time

Correlations were used to explore the relationships between children's social/behavioural and cognitive outcomes at the end of Year 5 and between different aspects of social behaviour over time[13]. Children's self regulating behaviour was strongly and positively correlated with both Reading (r=0.50) and Mathematics (r=0.51), indicating those who show higher 'Self-regulation' also do well in Reading and Mathematics at the end of Year 5. These correlations are stronger than those found at younger ages. Other aspects of social behaviour were also correlated with cognitive attainment, but the correlations between these dimensions of social behaviour and attainment were of markedly smaller magnitude in comparison (See Table 2.1).

'Self-regulation' is a measure of pupil's autonomy, confidence and self-sufficiency specifically related to behaviour in a *learning*, rather than a broader *social*, context. The items that combine to produce this measure include such things as the ability to independently 'move to a new task', 'select and return equipment', 'take responsibility for a task'. It is not surprising therefore, that high self regulators are likely to be high attainers, however, the direction of influence is not possible to ascertain on the basis of a correlation analysis. It may be that confidence and self efficiency promote more successful learning or it may be that doing well academically produces more confident and self efficient behaviour or, it may be that some underlying latent cognitive ability is responsible for both this aspect of behaviour and attainment. The high correlations between cognitive attainment and this aspect of social behaviour relative to the rest may indicate a stronger cognitive component to 'Self-regulation' in comparison to 'Pro-social', 'Anti-social' or even 'Hyperactive' behaviour, but this is an empirical question to which we will return in later sections.

[13] A correlation is a measure of statistical association that ranges from + 1 to -1. Correlations that are lower than r=0.2 are not reported.

Table 2.1
Correlations between social behaviour and cognitive attainment in Year 5 (age 10)

Factor scores	'Hyperactivity'	'Pro-social'	'Self-regulation'	'Anti-social'	Reading	Maths
'Hyperactivity' (n=2520)	1					
'Pro-social' (n=2520)	-.55(**)	1				
'Self-regulation' (n=2520)	-.37(**)	.50(**)	1			
'Anti-social' (n=2520)	.53(**)	-.42(**)		1		
Reading (n=2344)	-.29(**)	.24 (**)	.50(**)		1	
Maths (n=2222)	-.28(**)	.21 (**)	.51(**)		.68(**)	1

The social/behavioural scales are moderately to strongly associated with each other. The presence of correlations between the social behaviour measures is to be expected since the factor solution that provided the best fit to the data was based on a non-orthogonal solution. However, this method of analysis was used for the simple theoretical reason that different aspects of social behaviour are likely to be associated with each other by virtue of being underpinned by at least one 'latent variable', which is the individual her/himself. The point of interest here is the specific associations and their magnitude. The highest association is a negative association between 'Hyperactivity' and 'Pro-social' behaviour (r= -0.55), indicating that children who are hyperactive are likely to show reduced 'Pro-social' behaviour. This is then followed by a positive correlation between 'Hyperactivity' and 'Anti-social' behaviour (r=0.53) and between 'Self-regulation' and 'Pro-social' behaviour (r=0.50). Thus, children who exhibit 'Anti-social' behaviour are more likely to show increased 'Hyperactivity', and children who are high self regulators are likely to show more positive social behaviour. Note that 'Self-regulation' is not correlated with 'Anti-social' behaviour; similarly Reading and Mathematics are not correlated with 'Anti-social' behaviour. This may provide some evidence to support the view that 'Self-regulation' and cognitive attainment may be supported by the same underlying cognitive ability.

Table 2.2 presents correlations between different aspects of social behaviour over time. The diagonal (shaded) represents the correlations between the same social construct at different points in time. High correlations on this diagonal relative to the rest would indicate that a given construct is measuring the same aspect of social behaviour over time.

Table 2.2
Correlations between social behaviour in Year 1 (age 6) and in Year 5 (age 10)

Factors scores Year 5 / **Factors scores Year 1**	**Year 5: 'Hyperactivity'**	**Year 5: 'Pro-social'**	**Year 5: 'Self-regulation'**	**Year 5: 'Anti-social'**
Year 1: 'Hyperactivity' (n=2257)	.55(**)	-.31(**)		**.33(**)**
Year 1: 'Pro-social' (n=2257)	-.32(**)	.37(**)	.25(**)	-.23(**)
Year 1: 'Self- regulation' (n=2257)	-.29(**)	.31(**)	.49(**)	
Year 1: 'Anti-social' (n=2257)	**.26(**)**	-.24(**)		.25(**)

Fairly strong to moderate relationships are found for 'Hyperactivity' (r=0.55), 'Self-regulation' (r=0.49) and, to a lesser extent, 'Pro-social' behaviour (r=0.37) in Year 1 and Year 5. These aspects of social behaviour show stronger correlations with themselves overtime than with the

other aspects of social behaviour. 'Anti-social' behaviour, however, shows a different pattern of association. 'Anti-social' behaviour in Year 5 is more strongly correlated with 'Hyperactivity' in Year 1 (r=0.33) than with 'Anti-social' behaviour in Year 1 (r=0.25), and the correlations between 'Anti-social' behaviour in Year 1 and 'Anti-social' behaviour and 'Hyperactivity' in Year 5 are of a similar magnitude (r=0.25 and r=0.26 respectively).

'Hyperactivity' and 'Anti-social' behaviour are fairly highly correlated at age 10 (see Table 2.1) and therefore we would expect these measures to be correlated across time as well. However, it is important to note that the 'Anti-social' behaviour profile had to be adjusted at Year 5 to reflect developmental changes in the expression of this social attribute. At a younger age the boundaries between hyperactive/boisterous behaviour and 'Anti-social' behaviour are fuzzier and were more difficult to differentiate with the type of questions that were appropriate for that age group (e.g. 'bullies other children'). At age 10 however, the teacher completed social/behavioural child profile included a number of additional and more age appropriate items (e.g. 'been in trouble with law') that could more successfully discriminate between these measures. Thus, in Year 1 the probability of false positives (a child identified as more 'Anti-social' instead of more hyperactive) or false negatives (a child identified as more hyperactive instead of more 'Anti-social') would be higher.

2.2 Multilevel model estimates of prior social/behaviour measures on Year 5 social/behavioural outcomes

Table 2.3 shows which measures of prior social/behavioural development, at the end of Year 1, are significant predictors of the four main measures of social/behavioural development identified from teachers' ratings at the end of Year 5.

Table 2.3
Multilevel model estimates of prior social/behavioural development measures on Year 5 (age 10) social/behavioural outcomes

	Year 5: 'Hyperactivity' Estimate (standard error)	Year 5: 'Pro-social' Estimate (standard error)	Year 5: 'Self- regulation' Estimate (standard error)	Year 5: 'Anti-social' Estimate (standard error)
Intercept	Not significant	Not significant	0.009 (0.024)***	Not significant
Year 1:'Hyperactivity'	**-0.510 (0.020)*** **	-0.049 (0.021)**	-0.177 (0.022)***	**-0.246 (0.023)*** **
Year 1: 'Pro-social'	- 0.12 (0.020)***	**0.510 (0.022)*** **	0.131 (0.023)***	Not significant
Year 1: 'Self-regulation'	- 0.052 (0.023)*	0.069 (0.025)***	**0.221 (0.025)*** **	-0.059 (0.026)**
Year 1: 'Anti-social'	Not significant	-0.062 (0.022)***	-0.062 (0.023)***	-0.132 (0.022)***

*** p <0.001; ** p <0.025; * p <0.05

It can be seen that for 'Hyperactivity' the earlier measure of 'Hyperactivity' is the strongest predictor but the earlier measure of 'Self-regulation' also shows a moderate negative association with 'Hyperactivity' in Year 5. Contrary to the strong correlation found between 'Hyperactivity' in Year 5 and 'Anti-social' behaviour in Year 1, when the other three social dimensions are taken into account 'Anti-social' behaviour in Year 1 does not significantly predict 'Hyperactivity' in Year 5. In contrast, 'Hyperactivity' in Year 1, which also showed a strong correlation with 'Anti-social' behaviour in Year 5, was the strongest predictor of 'Anti-social' behaviour in Year 5, and stronger than the Year 1 measure of 'Anti-social' behaviour.

For 'Self-regulation' the earlier measure of 'Self-regulation' is the strongest predictor, all other social/behavioural measures show weaker associations. Early 'Pro-social' behaviour was the strongest predictor of 'Pro-social' behaviour in Year 5, but the earlier measures of 'Hyperactivity' and 'Self-regulation' also show strong relationships with this outcome.

Section 3: Links between Child and Family Characteristics and Children's Social Behaviour in Year 5

This section explores associations between the measures of social behaviour in Year 5 and selected background characteristics. Differences in raw scores are examined *alongside* differences in 'net' impact (effect sizes), showing the unique contribution of a given predictor to a child's outcome once all other predictors are taken into account. The net effects of particular child, family and Home Learning Environment (HLE) characteristics reported in this section were derived by contextualised multilevel analyses and therefore take into account any clustering related to the primary school attended. As we shall see, due to the inter-relationship between the different predictors some raw differences between sub-groups of children disappear and some become accentuated once the influences of other factors are partialled out. Presenting raw and net differences side by side helps to show how demographic factors taken together affect the relative strength of estimates of the unique influence of particular factors.

The following measures were used in the analyses:

- Child factors (e.g. gender, birth weight, ethnicity, mother tongue,)
- Family factors (e.g. eligibility for free school meals [FSM], socio-economic status [SES], parent's qualification, family earned income),
- Home Learning Environment (HLE) in the early years (how often parents read to the child, teach the child the alphabet, play with letters and numbers, teach songs and nursery rhymes, paint and draw etc.) before starting primary school,
- Parental activities during Key Stage 1 (KS1) such as the frequency of reading to the child, taking the child out on educational visits, computing activities, play, etc. (see Appendix 2 for details of these measures).

3.1 Child Measures

Gender

Table 3.1 provides descriptive statistics comparing boys and girls social/behavioural development. There are marked gender differences on all measures of social/behavioural development (Table 3.1).

Table 3.1
Gender differences in social/behavioural development at the end of Year 5 (age 10)*

		Male	Female	Total
'Hyperactivity'	**Mean**	104.7	95.1	100.00
	S.d.	16.5	11.3	15.00
	Net Effects	**0.68**	**0**	
'Self-regulation'	**Mean**	98.3	101.8	100.00
	S.d.	15.1	14.7	15.00
	Net Effects	**-0.19**	**0**	
'Pro-social'	**Mean**	95.6	104.6	100.00
	S.d.	16.1	12.3	15.00
	Net Effects	**-0.63**	**0**	
'Anti-social'	**Mean**	102.3	97.6	100.00
	S.d.	17.8	10.8	15.00
	Net Effects	**0.32**	**0**	
Total N		1289	1231	2520

***** 'Female' as the comparison category

On average teachers rated boys as displaying more hyperactive and 'Anti-social' behaviour (104.7, 102.3 respectively) than girls (95.1, 97.6). Teachers on average rated girls more highly for 'Self-regulation' and 'Pro-social' behaviour (101.8, 104.6) than boys (98.3, 95.6). Differences between the genders are greater on the 'Hyperactivity' and the 'Pro-social' scales.

Net differences between boys and girls reflect the same pattern as observed in the raw scores with differences between boys and girls being considerably large (ES=0.68) for 'Hyperactivity' and 'Pro-social' behaviour (ES=-0.63) followed by 'Anti-social behaviour' (ES=0.32). The smallest differences for gender are on the 'Self-regulation' (ES=-0.19) scale. The overall pattern of gender differences is in line with that found at younger ages.

The moderate gender effect for 'Self-regulation' reflects the findings on gender differences for Reading which were also of a moderate magnitude (ES=0.10 in favour of girls).

Birth weight

A child's weight at birth was found to be a significant predictor of both Reading and Mathematics at the end of Year 5. Social/behavioural development, however, seems to be less associated with this factor. 'Self-regulation' was the only dimension on which variations in birth weight were associated with statistically significant differences in outcomes; children with low birth weight were rated by their teachers as showing reduced 'Self-regulation' relative to children of normal birth weight[14] (ES=-0.21). However, the effects sizes for birth weight on this dimension were lower in comparison with the effect sizes for Reading (ES=0.40) and Mathematics (ES=0.42) in Year 5. 'Self-regulation' is the aspect of social behaviour most closely associated with cognitive attainment as reported earlier.

Language

The effects associated with gender (as well as most other background characteristics) tend to be consistent across the social/behavioural dimensions in that children who have higher scores on one negative outcome (e.g. 'Hyperactivity') tend to have higher scores on the other negative outcome (i.e. 'Anti-social') and relatively lower scores on the two positive outcomes. However, differences in children's social behaviour associated with mother tongue are inconsistent across the social/behavioural dimensions (see Table 3.2).

Table 3.2
Children with EAL and differences in social/behavioural development at the end of Year 5 (age 10)*

English as an Additional Language (EAL)		Not EAL	EAL	Unknown	Total
'Hyperactivity'	Mean	100.3	97.5	105.51	100
	S.d.	15.1	13.9	5.73	15
	Net Effects	**ns**	**ns**		
'Self-regulation'	Mean	100.3	97.5	96.88	100
	S.d.	15.0	14.3	.57	15
	Net Effects	**ns**	**ns**		
'Pro-social'	Mean	100.3	97.1	102.56	100
	S.d.	15.0	14.8	16.32	15
	Net Effects	**ns**	**ns**		
'Anti-social'	Mean	100.0	100.3	92.05	100
	S.d.	15.0	14.8	.08	15
	Net Effects	**ns**	**ns**		
Total N		2279	239	2	2520

*Not EAL as the comparison category

[14] Babies born weighing 2500 grams or less are defined as below normal birth weight: foetal infant classification is below 1000 grams, very low birth weight is classified as 1001-1500 grams and low birth weight is classified as 1501-2500 grams (Scott & Carran, 1989).

In the past EAL was found to be a predictor of both cognitive and social/behavioural outcomes at age 3 and 5, but this is no longer the case at age 10. At this age, many of these children were fluent in English. Indeed, only forty per cent of the children in the original EAL sample were identified as needing EAL support by Year 5 (see section 1). Therefore, further analysis was conducted using 'Need of EAL support' as an indicator of poor English. Need of EAL support was also found to be an important predictor of cognitive outcomes at age 10 (see Sammons et al., 2007).

Table 3.3 presents differences in average social/behavioural development between children who are in need of EAL support and children who are not. The raw mean differences between the groups appear to be the largest for 'Self-regulation' and 'Pro-social' behaviour while differences for 'Hyperactivity' and 'Anti-social' behaviour appear to be relatively small. Nevertheless, when all other factors are taken into account, differences between the groups were only statistically significant (and large) for 'Self-regulation' (ES=-0.53); and despite the apparent small differences between the groups on the 'Hyperactivity' scale, 'need of EAL support' was significantly associated with increased 'Hyperactivity' (ES=0.26). In addition, and also in contrast to the EAL comparisons, the differences on the two social dimensions are now in the same direction; need of EAL support is associated with negative social behaviour, increased 'Hyperactivity' and reduced 'Self-regulation'. The findings suggest that children still in need of EAL support at age 10 are 'at risk' not only of poorer cognitive outcomes in Reading and Mathematics but may also have more difficulties in some aspects of social behaviour.

Table 3.3
Children needing EAL support and differences in social/behavioural development at the end of Year 5

Need of EAL support		No	Yes	Unknown	Total
'Hyperactivity'	Mean	99.7	103.6	101.0	100
	S.d.	15.0	16.3	14.4	15
	Net Effects	**0**	**0.26**	**0.19**	
'Self-regulation'	Mean	100.7	89.6	97.1	100
	S.d.	14.7	14.4	15.8	15
	Net Effects	**0**	**-0.53**	**-0.30**	
'Pro-social'	Mean	100.2	95.7	99.5	100
	S.d.	15.1	14.6	14.4	15
	Net Effects	**0**	**ns**	**ns**	
'Anti-social'	Mean	99.9	102.0	99.7	100
	S.d.	15.0	17.3	13.7	15
	Net Effects	**0**	**ns**	**ns**	
Total N		95	2204	221	2520

***** No need of EAL support' as the comparison category

Ethnic Groups

We analysed differences associated with ethnic groups. However, several ethnic groups are small in size and therefore their results should be treated with caution. Ethnic differences in teachers' ratings of social/behavioural development varied greatly for 'Hyperactivity' and 'Anti-social' behaviour, but variations for 'Self-regulation' were less pronounced (see Table 3.4).

Bangladeshi (93.0) and Indian children (94.8) showed the lowest levels of 'Hyperactivity'. Indian children also had lower scores for 'Anti-social' behaviour (96.1) relative to the other ethnic groups. Black Caribbean children (104.6), Mixed Race (103.5) and Black African (103.2) showed relatively higher scores for 'Hyperactivity'. Black African children also had higher 'Anti-social' scores (106.8) but they were rated more positively in terms of Self-regulating behaviour (102.1), followed by Bangladeshi (101.3), White UK (100.5) and Black Caribbean children (100.3). The average score for 'Self-regulation' was lowest for Pakistani children (94.5).

Table 3.4
Ethnic groups and differences in social/behavioural development at the end of Year 5 (age 10)*

Ethnic groups		White UK	White Euro-pean	Black Cari-bbean	Black African	Other Ethnic	Indian	Pakist-ani	Bangla-deshi	Mixed Race
'Hyperactivity'	Mean	99.8	100.1	104.6	103.2	100.4	94.8	98.7	93.0	103.5
	S.d.	15.0	13.9	15.8	15.5	14.2	11.9	13.9	11.9	16.3
	Net Effects	**0**	**-0.08**	**0.19**	**0.13**	**0.02**	**-0.34**	**-0.35**	**-0.73**	**0.19**
'Self-regulation'	Mean	100.5	97.3	100.3	102.1	99.0	99.8	94.5	101.3	99.3
	S.d.	14.9	15.3	14.5	14.4	13.8	14.7	14.9	13.9	16.0
	Net Effects	0	ns	ns	ns	ns	ns	ns	ns	ns
'Pro-social'	Mean	100.5	98.8	97.4	100.0	98.2	101.0	94.8	100.5	100.8
	S.d.	15.0	14.1	16.6	13.3	16.8	13.4	14.4	15.6	14.7
	Net Effects	0	ns	ns	ns	ns	ns	ns	ns	ns
'Anti-social'	Mean	99.8	98.1	101.7	106.8	99.9	96.1	101.0	99.3	100.4
	S.d.	14.9	12.7	15.4	24.7	14.7	7.0	15.9	11.1	14.1
	Net Effects	**0**	**-0.14**	**0.05**	**0.39**	**-0.02**	**-0.27**	**-0.14**	**-0.12**	**0.02**
Total N		1887	79	91	50	53	52	136	28	141

***** White UK as the comparison category[15]

We found that ethnic group differences for two social dimensions were in the opposite direction (i.e. raised 'Hyperactivity' but higher 'Self-regulation') for some ethnic groups (e.g. Black African and Black Caribbean both of whom show better average scores for 'Self-regulation' but poorer scores for 'Hyperactivity').

Differences between ethnic groups were not statistically significant in the final contextual models for 'Self-regulation' and 'Pro-social' behaviour. This indicates that observed differences in these aspects of social/behavioural development are likely to be attributable to the influence of other demographic factors (such as low income, parents' qualifications and occupations or HLE) rather than to ethnic background per se.

Table 3.4 shows the effect sizes for 'Hyperactive' and 'Anti-social' behaviour by different ethnic groups (note that negative scores here indicate *reduced* 'Hyperactivity' and *reduced* 'Anti-social' behaviour). Differences in net effect sizes by ethnic group remain the same for most groups. Overall, Bangladeshi (ES=-0.73), Pakistani (ES=-0.35), and Indian (ES=-0.34) pupils show significantly better behaviour (reduced 'Hyperactivity') at age 10 than other groups. Differences are weaker for other ethnic groups but net effects are somewhat higher for the Black Caribbean (ES=0.19) and children of Mixed race (ES=0.19) groups. Differences between groups in 'Anti-social' behaviour are generally small with the exception of Indian children (ES=-0.27) who show significantly reduced levels of 'Anti-social' behaviour, and Black African children (ES=0.39) who show a significantly higher level of 'Anti-social' behaviour. Note however, that the standard deviation for this group is extremely high (24.7) in comparison with the full sample (Sd = 15), thus indicating large variations in this group. An association between Black African children and 'Anti-social' behaviour therefore cannot be fully substantiated by the data. Later in this section we will

[15] Any category of a predictor variable can be used as a reference group. The overall calculations (e.g. model's variance, BIC, etc.) are not affected by the choice of reference group; the absolute differences (in terms of effect size) between the different categories of the predictor variable also remain the same. The statistical models show the relative differences between categories in relation to the outcome measure. We select the category as a reference group that would show the pattern of association between the predictor variable and the outcome measure in the clearest possible way, the only restriction that the reference category is of a reasonable size. When the relationship is linear we would typically choose the lowest or the highest performing group as a reference category (e.g. highest qualification or none). If the relationship is non-linear we would select the largest category (e.g. ethnicity: white UK as the reference group). Occasionally we would select the category that is of most interest (e.g. pre-school quality: low quality) regardless of the type of association.

return to this point and examine the effects of other family characteristics and the associations between 'Anti-social' behaviour, absent fathers and gender[16].

To summarise, differences in social/behavioural development between ethnic groups are largely related to differences in demographic factors, although there are still some ethnicity effects for 'Hyperactivity'. These differences should be interpreted with caution due to small numbers. They are reported here because they are in line with other research. There may be interplay between cultural influences outside school (family, community and peer) and teacher expectations. There also seem to be links with gender and other predictors such as 'father absent'.

Health, behavioural and developmental problems and Special Education Needs

EPPE collected details for each child in the sample on whether their class teacher reported that they had been identified as having any form of special educational need (SEN) at each data collection point during Key Stage 1. There were large differences in the social/behavioural characteristics of children identified by teachers as having had any form of SEN in Year 5 or earlier. Overall, the SEN group had significantly lower scores in terms of 'Self-regulation' and 'Pro-social' behaviour and higher mean scores for 'Hyperactivity' and 'Anti-social' behaviour compared with children reported as never having any form of SEN (see Table 3.5).

Children may be identified as having SEN for a variety of reasons. Children may have health problems that prevent them from attending school regularly or they may have physical impairments (e.g. hearing or sight) that could affect/impede their ability to learn, they may have behavioural problems that disrupt their concentration and learning, or they may be developmentally delayed. Specific information about health, behavioural, and developmental problems was obtained from the parents at the start of the study, and it is these data that are typically used in the contextualised models rather than the overall measure of SEN.

Table 3.5
Children identified as SEN and differences in social/behavioural development at the end of Year 5*

SEN		Unknown	Yes	No	Total
'Hyperactivity'	Mean	102.2	108.9	96.5	100.0
	S.d.	13.3	17.2	12.5	15.0
	Net Effects	**0.46**	**0.76**	**0**	
'Self-regulation'	Mean	96.6	89.0	104.3	100.0
	S.d.	12.3	14.8	12.7	15.0
	Net Effects	**-0.45**	**-1.07**	**0**	
'Pro-social'	Mean	99.1	94.0	102.4	100.0
	S.d.	13.4	16.0	13.9	15.0
	Net Effects	**-0.08**	**-0.48**	**0**	
'Anti-social'	Mean	94.4	104.7	98.2	100.0
	S.d.	5.7	19.2	12.6	15.0
	Net Effects	**-0.27**	**0.31**	**0**	
Total N		21	699	1800	2520

***** 'No SEN as the comparison category

As would be expected, there is a large overlap between SEN and this information. Around sixty per cent (n=395) of children recorded as having any type of special need at age 10, had also previously been identified by their parents as having either health or behaviour problems, or developmentally related learning difficulties at a younger age. This however, constitutes only thirty-four per cent of all EPPE children (1,160) who were reported by their parents as having

[16] Note: findings regarding ethnicity should be interpreted with caution, as the numbers of children in some of the ethnic groups are relatively small.

either health or behaviour problems, or developmentally related learning difficulties at the start of the study; the majority of these children (66%) were not recorded as ever having any type of SEN at primary school. SEN, therefore, may be more appropriately viewed as an indicator of severity rather than of difficulty per sec.

To establish the nature of the relationship between the various difficulties children may have and the influence each of these may have on the different social/behavioural or cognitive dimensions, models were developed using the more specific health problems, behaviour problems, or developmentally related learning difficulties information. If none of these turned out to be significant, SEN would be added to examine whether the severity of a learning difficulty, regardless of what that learning difficulty might be, would have an impact on a particular outcome[17].

All three measures were still found to have a statistically significant impact on social/behavioural development, as reported in the teacher completed child profiles, at age 10 years. Health problems were significant in the 'Hyperactivity' model, developmentally related learning difficulties were significant in the model for 'Self-regulation', and behavioural problems were significant in all but the 'Self-regulation' model.

The very small proportion of children who were reported by their parents as having three or more health problems at the beginning of the study still showed increased 'Hyperactivity' in Year 5 (ES=0.56) relative to children who had no known health problem on entry to the study. However, there were no significant differences between children with one or two reported health problem and children with none. Also, children whose parents had reported their child had behavioural problems at the start of the study also showed later increased hyperactive behaviour in comparison with children where no behavioural problems were reported (one behavioural problem: ES=0.34, more than one behavioural problem: ES=0.51).

Health problems did not show any significant effects on the other three social/behavioural dimensions, but behavioural problems continued to show a link with children's later 'Pro-social' and 'Anti-social' behaviour. Children who were reported to have had behavioural problems at age 3 also showed reduced 'Pro-social' behaviour (one behavioural problem: ES=-0.21, more than one behavioural problem: ES=-0.22) and increased 'Anti-social' behaviour (one behavioural problem: ES=0.18, more than one behavioural problem: ES = 0.23) at age 10.

By contrast, early behavioural problems did not continue to show any significant influence for 'Self-regulation'. 'Self-regulation', was, however, linked with developmental problems. Children who were reported to have one developmental problem at the beginning of the study showed poorer 'Self-regulation' than children for whom no developmental problems were reported (ES=-0.25). There were no significant differences between children whose parents had reported their child had two or more developmental problems at the start of the study and children whose parents had reported no developmental problems for 'Self-regulation' at age 10[18].

Siblings

Children with either one or two siblings (ES=-0.10) and children from larger families with 3 siblings or more (ES=-0.11) were rated as less hyperactive than singletons. The number of siblings did not have a significant effect on any other aspects of social behaviour.

[17] If any of these were significant, SEN, as an indicator of severity, would be significant as well, but including it in the model would reduce the effects sizes of the more specific information due to the large overlap between this and the reporting of ever having had any form of SEN in Year 5 or earlier.

[18] We might expect more developmental problems to result in poorer 'Self-regulation', however, the standard error (akin to standard deviation) (0.20) in the group of children for whom two or more developmental problems were reported was much higher than the estimate (akin to the mean) (-0.14), suggesting extreme outliers in this group. This is in combination with a small group size, and therefore decreased power, which could result in an effect not reaching significance level despite it being a valid effect.

Summary of child measures

Overall, of the child measures gender, health problems and behavioural problems (reported by parents at the start of the study) had the strongest links as predictors of 'Hyperactivity' and need of EAL support had the strongest link with 'Self-regulation'. The strongest predictor for 'Pro-social' and 'Anti-social' behaviour was gender. Interestingly, gender had the weakest impact on 'Self-regulation' both relative to the other social/behavioural dimensions and relative to other child factors in the 'Self-regulation' model. This pattern parallels findings from the analysis of cognitive outcomes and further reinforces evidence of an important association between 'Self-regulation' and cognitive development.

3.2 Family measures

Mother's qualification

Mother's highest qualification level shows an association with raw differences in teacher ratings of child behaviour in all four dimensions (see Table 3.6).

Hyperactive behaviour was found to be raised for children whose mothers have no qualifications or only vocational level qualifications in comparison with other groups; differences between the medium and high qualification categories are less pronounced. The patterns observed in the distribution of raw scores become even more evident after controlling for all other demographic factors, in terms of child and family characteristics; children of mothers with low qualifications tend to be rated by their teachers as more hyperactive. Thus, 'Hyperactivity' decreases with increasing maternal qualifications, with children of mothers with the highest qualifications scoring lowest on the hyperactive scale (ES=-0.36).

Table 3.6
Mother's qualifications and differences in social/behavioural development at the end of Year 5*

Mother's Highest Qualification level		None	Vocational	16 Academic	18 Academic	Degree/ higher degree	Other professional
'Hyperactivity'	Mean	102.5	103.2	99.1	98.4	96.4	96.9
	S.d.	16.1	16.8	14.2	13.5	12.8	10.5
	Net Effects	**0**	**0.11**	**-0.15**	**-0.19**	**-0.36**	**-0.32**
'Self-regulation'	Mean	95.6	99.3	99.8	101.5	105.7	102.8
	S.d.	15.1	15.5	15.3	13.7	12.5	14.3
	Net Effects	**0**	**0.00**	**0.02**	**0.06**	**0.21**	**0.24**
'Pro-social'	Mean	96.9	98.4	101.2	100.8	102.7	99.0
	S.d.	15.3	16.0	14.9	14.6	13.4	15.7
	Net Effects	**0**	**-0.05**	**0.17**	**0.13**	**0.19**	**-0.03**
'Anti-social'	Mean	102.8	102.0	99.0	98.7	97.0	98.2
	S.d.	18.0	17.7	14.1	12.3	9.6	17.4
	Net Effects	**0**	**0.08**	**-0.11**	**-0.09**	**-0.16**	**-0.18**
Total N		478	366	915	207	442	21

***** 'No qualifications' as the comparison category

'Self-regulation' on the other hand shows a steady and positive increase as a function of increasing level of mother's qualifications. Differences in 'Self-regulation' are most notable in children whose mothers have a degree/higher degree qualification (105.7) and children whose mothers have no qualifications (95.6). However, the net effect of mother's qualification on 'Self-regulation' is not as strong as the raw data initially indicated; when other factors are taken into account, Self-regulating behaviour seems similar across most qualification categories, the 'degree/higher degree' category is the only group with significantly higher scores (ES=0.21)

A similar pattern of association emerged with the 'Anti-social' behavioural scale. While there seems to be a linear increase in the distribution of raw scores as a function of decreasing maternal qualifications, when other factors are taken into account, 'Anti-social' behaviour appears similar across most qualification categories, the 'degree/higher degree' and the 'Other professional' categories both have significantly lower scores (ES=-0.16 and ES=-0.18 respectively).

For 'Pro-social' behaviour, the distribution of raw scores and the distribution of net effect show a more consistent pattern. Overall, children of mothers in the medium or higher qualification categories show increased 'Pro-social' behaviour relative to children whose mothers have no qualifications or only vocational level qualifications; differences between the medium and high categories were less pronounced (ES in the range of 0.13-0.19).

Father's qualification

Children's 'Hyperactivity' and 'Pro-social' behaviour did not vary greatly by paternal qualifications. Differences between groups were small and not significant in the final models for 'Hyperactivity' and 'Pro-social' behaviour (Table 3.7).

Table 3.7
Father's qualifications and differences in social/behavioural development at the end of Year 5*

Fathers Qualifications		None	Vocational	16 Academic	18 Academic	Degree & Higher	Missing data[19]	Other profes-sional
'Hyperactivity'	Mean	101.7	98.9	98.9	98.2	96.1	103.5	102.6
	S.d.	15.1	14.5	14.4	14.0	12.7	16.3	16.6
	Net Effects	ns	ns	ns	ns	ns	ns	ns
'Self-regulation'	Mean	95.3	99.9	100.1	101.7	105.3	99.0	98.8
	S.d.	15.5	14.7	14.7	14.6	12.8	15.5	15.9
	Net Effects	**0**	**0.12**	**0.17**	**0.21**	**0.30**	**0.23**	**0.27**
'Pro-social'	Mean	97.5	100.1	101.5	101.4	102.7	98.2	92.4
	S.d.	15.6	15.1	14.7	13.4	13.4	15.8	19.1
	Net Effects	ns	ns	ns	ns	ns	ns	ns
'Anti-social'	Mean	101.3	99.6	99.0	97.9	97.1	102.7	105.8
	S.d.	16.3	14.9	13.4	13.0	10.5	18.0	21.5
	Net Effects	**0**	**0**	**0**	**0**	**0**	**0.15**	**0**
Total N		386	289	562	185	454	570	24

*'No qualifications' as the reference group for 'Self-regulation';

In contrast, the relationship between paternal qualifications and 'Self-regulation' is positive and linear, showing a steady increase in Self-regulating behaviour with increasing level of qualification. Children whose fathers have a degree or higher show the highest level of 'Self-regulation' (ES=0.30) taking account of other factors including mother's qualification level (note as might be expected there is a positive association between mother's and father's qualification levels). Children who have missing father's qualifications data due to the special case of father's absence show increased 'Self-regulation' (ES=0.23) relative to children whose fathers have no qualifications.

[19] Missing data is included here for the special cases where data was missing due to father's absence. This is included as a category for the 'father qualifications' predictor in order to avoid the loss of 570 children from the analysis. The inclusion of this group does not alter the relationship between the categories of the predictor variable; it just shows the relationship between these categories and where data was missing due to father's absence. Where we want to examine the effect of absent father on an outcome directly, we test it separately as a dichotomous variable, i.e. absent versus not absent.

Absent fathers

There were modest but significant differences between children whose fathers were absent from their households and other children in the study whose fathers were present on the 'Anti-social' dimension (ES=0.15). Children with absent fathers show significantly increased levels of 'Anti-social' behaviour at age 10. Thus, for 'Anti-social' behaviour there is a separate and negative effect of absent fathers regardless of other demographic attributes. When the group of children with absent fathers is compared to the rest of the sample, the net effect of fathers being absent on 'Self-regulation' is fairly low (ES=0.09).

Marital status and maternal employment

Marital status and maternal employment were both significant in the final model for 'Hyperactivity', but not significant in the models for any of the other social dimensions. 'Hyperactivity' was slightly raised in children whose mothers who were single and living alone (ES=0.20) and children whose mothers were separated (ES=0.23); 'Hyperactivity' appears to be somewhat lower in children whose mothers were not working (ES=-0.15).

Family earned income

The distribution of raw scores (Table 3.9) for 'Hyperactivity', 'Anti-social' and 'Pro-social' behaviour indicates poorer behaviour (increased hyperactive and 'Anti-social' behaviour, and reduced 'Pro-social' behaviour) for children in the low and no salary bands, while the behaviour of children the middle and high income bands does not appear to be very different. The distribution of raw scores for 'Self-regulation' shows a more linear relationship. 'Self-regulation' is lowest for the 'no salary' group; it then steadily increases with increasing income.

Table 3.9
Differences social/behavioural development at the end of Year 5 (age 10) by family earned income*

Family earned income		**No Salary**	**£2,500 to £17, 499 Low**	**£17,500 to £29,999 Low-Medium**	**£30,000 to £37,499 Medium**	**£37500 to £67,499 High**	**£67,500 to £132,000+ Very High**	**Unknown**
'Hyperactivity'	**Mean**	103.0	101.0	97.1	97.7	97.8	99.3	101.9
	S.d.	16.2	15.7	13.5	13.7	14.1	13.4	15.3
	Net Effects	**0**	**-0.10**	**-0.33**	**-0.29**	**-0.13**	**-0.02**	**-0.36**
'Self-regulation'	**Mean**	96.1	98.9	101.4	102.1	103.9	105.5	97.2
	S.d.	15.5	14.8	13.8	15.5	13.5	12.6	15.7
	Net Effects	**0**	**0.08**	**0.22**	**0.25**	**0.23**	**0.25**	**0.04**
'Pro-social'	**Mean**	97.2	98.6	102.4	101.6	101.8	102.3	99.1
	S.d.	15.9	16.0	13.7	14.8	14.3	13.3	14.6
	Net Effects	**0**	**-0.03**	**0.24**	**0.18**	**0.15**	**0.14**	**0.39**
'Anti-social'	**Mean**	103.1	100.5	98.3	97.3	98.0	96.7	102.2
	S.d.	18.7	15.7	12.3	9.7	12.6	8.1	17.4
	Net Effects	ns	ns	ns	ns	ns	ns	ns
Total N		493	431	372	242	419	161	401

*'No Salary' as comparison category

Overall, children in the low-medium income band were rated by their teacher as the least hyperactive and they were rated highly for 'Self-regulation' and most highly for 'Pro-social' behaviour. Children in the no and low income band were rated least favourably on all three measures, and children of the highest income band were rated less favourably for 'Hyperactivity' and 'Pro-social' behaviour but most positively for 'Self-regulation'.

The net effect of family earned income on all four dimensions of social/behavioural development is quite different from the pattern suggested by the distribution of raw scores:

- 'Hyperactive' behaviour is higher in children of either low (ES=-0.10), or high (ES=-0.13) earned income band, and it is lowest in the low-medium (ES=-0.33) and medium income bands (ES=-0.29).
- The linear pattern of association observed with the distribution of raw scores for 'Self-regulation' disappears; 'Self-regulation' is low only in children of low family income (ES=0.08) but there are no statistically significant differences between the middle and upper income bands.
- 'Pro-social' behaviour is highest for children in the low-med band (ES=0.24) and lowest in the low band (ES=-0.03), 'Pro-social' behaviour in the medium to very high income bands is of a similar magnitude and lower than the low-medium band.
- Family income was not a significant net predictor of 'Anti-social' behaviour, after account was taken of other influences.

It should be noted that the inclusion of the FSM measure is likely to pick up some of the differences relating to low income groups.

Free school meals (FSM)
The eligibility for free school meals (FSM) indicator of poverty shows an association with all aspects of social/behavioural development.

Table 3.8
Differences in social/behavioural development at the end of Year 5 (age 10) by FSM eligibility*

FSM eligibility		No	Yes	Unknown	Total
'Hyperactivity'	Mean	99.0	104.0	103.6	100.0
	S.d.	14.4	16.6	15.9	15.0
	Net Effects	**0**	**0.18**		
'Self-regulation'	Mean	100.7	96.9	102.9	100.0
	S.d.	14.8	15.4	9.2	15.0
	Net Effects	**0**	**-0.17**		
'Pro-social'	Mean	101.1	95.6	100.9	100.0
	S.d.	14.7	15.5	12.6	15.0
	Net Effects	**0**	**-0.15**		
'Anti-social'	Mean	99.0	104.1	96.8	100.0
	S.d.	13.9	18.4	11.7	15.0
	Net Effects	**0**	**0.23**		
Total N		2011	496	13	2520

*** 'Not FSM' as the comparison category**

For each dimension, as a group children recorded as eligible for free meals (FSM) have poorer behaviour ratings compared to other children. On average FSM children show increased 'Hyperactivity' (104.0) relative to non FSM children (99.0) and increased 'Anti-social' behaviour (104.1) relative to non FSM children (99.0); they also show poorer Self-regulating behaviour (96.9) compared to non FSM children (100.7) and decreased 'Pro-social' behaviour (95.6). The net impact of FSM is weaker but remains statistically significant for all four social dimensions ('Hyperactivity': ES=0.18; 'Self-regulation': ES=-0.17; 'Pro-social' behaviour: ES=-0.15; and 'Anti-social' behaviour: ES=0.23), and in all cases it is of weak to moderate magnitude.

Socio-Economic Status (SES)
SES was not significant in the final models for 'Hyperactivity' and 'Self-regulation'. The overall effect of SES in the final models for 'Pro-social' and 'Anti-social' behaviour was significant but differences between the SES categories were not. Thus, while there were no significant variations in 'Pro-social' or 'Anti-social' behaviour that were *directly* related to socio-economic classification, it seems there may be indirect influences on these aspects of behaviour that were mediated by SES through other variables in the model (e.g. parental qualifications).

Multiple Disadvantage

Poor social behaviour is associated with higher levels of disadvantage. Table 3.10 shows the mean scores for different levels of multiple disadvantage by 'Hyperactivity', 'Pro-social' behaviour, 'Self-regulation' and 'Anti-social' behaviour. 'Self-regulation' and 'Pro-social' behaviour steadily decreases with increasing disadvantage. The relationship between 'Hyperactivity' and multiple disadvantage, on the other hand, appears to be distinguish primarily between two main groups relatively low and relatively high; the low disadvantage groups (0-2 factors) show similar levels of 'Hyperactivity', which are lower than the high disadvantage groups (3-5+ factors); the high disadvantage groups do not differ greatly from each other either. 'Anti-social' behaviour steadily increases with increasing disadvantage and then levels out for the high disadvantage groups (4-5+ factors). However, when multiple disadvantage is entered in the final social/behavioural models, the observed raw differences between the groups turn out to be non-significant. This suggests that once the influence of individual more specific predictors (child, family and HLE) are taken into account there is no additional effect of multiplicity (of disadvantage) on social/behavioural outcomes. Overall, multiple disadvantage is a useful summary predictor, that indicates an increased risk of both poor cognitive outcomes and less favourable social/behavioural development in pre-school and across the early years of primary school (for pre-school and KS 1 findings on multiple disadvantage see Sammons et al., 2002b; 2004c). However, it seems that it is the individual predictors that make up multiple disadvantage that have the impact on child outcomes at Year 5 rather than an additional additive effect.

Table 3.10
Total Multiple Disadvantage and differences in social/behavioural development at the end of Year 5

Multiple disadvantage		0	2	3	4	5+	Unknown
'Hyperactivity'	Mean	98.4	98.3	99.3	103.5	102.8	101.8
	S.d.	13.9	14.1	13.9	16.8	16.5	16.4
'Self-regulation'	Mean	103.6	102.2	99.7	97.1	94.3	94.4
	S.d.	13.7	14.0	15.7	15.3	15.3	14.6
'Pro-social'	Mean	102.5	101.0	100.6	98.2	96.5	95.0
	S.d.	13.8	15.1	14.7	16.4	14.6	15.1
'Anti-social'	Mean	97.9	98.8	99.5	102.4	102.2	102.6
	S.d.	11.2	14.0	14.2	18.7	15.5	18.1
Total N		557	655	498	288	183	151

Summary of Family measures

Overall, of the family factors, mother's qualification and family income had the strongest links as net predictors of 'Hyperactivity'; family income was also the strongest predictor of 'Pro-social' behaviour and it also showed a strong association with 'Self-regulation', but the strongest predictor of 'Self-regulation' was father's qualification. FSM is an important predictor of 'Anti-social' behaviour.

3.3 Home Learning Environment (HLE)

Early years Home Learning Environment (HLE)

A number of measures provide an indication of aspects of the Early years HLE. These are based on the frequency of specific activities involving the child, as reported by parents when children were recruited to the study (i.e. teaching the child the alphabet, playing with letters and numbers, library visits, reading to the child, teaching the child songs or nursery rhymes). These measures were combined to create an overall Early years HLE index with scores between 0 (very low Early years HLE) to 45 (very high Early years HLE) (see Melhuish et al., 2001; in press).

Table 3.11
Early years HLE and differences in social/behavioural development at the end of Year 5*

Early years Home Learning Environment (HLE)		0-13	14-19	20-24	25-32	33-45
'Hyperactivity'	Mean	103.0	101.2	100.9	98.7	96.2
	S.d.	15.3	15.5	15.5	14.3	13.2
'Self-regulation'	Mean	93.8	98.1	99.4	101.6	106.2
	S.d.	15.9	15.2	15.0	14.2	12.8
	Net Effects	**0**	**0.20**	**0.21**	**0.29**	**0.49**
'Pro-social'	Mean	95.5	99.1	99.1	101.7	103.1
	S.d.	15.4	15.4	15.1	14.2	14.3
'Anti-social'	Mean	101.5	101.3	101.1	98.5	97.2
	S.d.	17.3	16.4	16.6	12.9	10.2
Total N		227	530	580	786	296

*Low Early years HLE score (0-13) as comparison group

When the Early years HLE index was tested, the overall quality of HLE remains a powerful predictor for 'Self-regulation' but not for the other social/behavioural dimensions.

While the raw scores for 'Hyperactivity' would suggest a possible association with Early years HLE (see Table 3.11), this indicator of the quality of the Home Learning Environment during the pre-school years is not significant in the final model. The relationships between the Early years HLE and 'Pro-social' and 'Anti-social' behaviour were weak and similarly not significant in the models.

In contrast, the relationship between Early years HLE and 'Self-regulation' shows a strong linear pattern. For 'Self-regulation', the HLE continues to show strong positive association, with the effect sizes of this predictor being the largest in the model. The ES of low versus high HLE (0.49) is much stronger than that found for FSM, for example.

Key Stage 1 (KS1) Home Learning Environment (HLE)

As the learning environment at home during the pre-school period was shown to have a strong impact on children's academic attainments during the early years, parents were again surveyed about their interactions with their EPPE child at home via a parent questionnaire during KS1. They reported on activities such as the frequency of reading to the child, taking the child out on educational visits, computing activities, sport activities, dance, etc.

The individual measures have been aggregated to form four factors representing different activities during Key Stage 1 (KS1): 'Home computing', 'One-to-one interaction', 'Enrichment outings' and 'Expressive Play' (see Appendix 2). These factors were tested with respect to their influence on social/behavioural development at the end of Year 5 (age 10)[20].

None of the four KS1 HLE factors showed a significant association with 'Self-regulation'. For 'Self-regulation', the Early years HLE remains the stronger predictor. Therefore, we can conclude that early years experiences are particularly important for cognitive outcomes (as reported separately Sammons et al., 2007) at age 10 and also for the dimension of social behaviour most associated with cognitive outcomes, 'Self-regulation'.

[20] KS1 HLE factors were not aggregated into a single HLE Index as was done with the Early years HLE since the types of extra curricular activities children are engaged in at this age do not form a simple additive scale. This is for two reasons: first, each of the HLE factors shows a unique pattern of association with different outcome measures, certain activities show a linear relationship (e.g. 'Enrichment outings' during KS1) while others show an inverted U shape function (e.g. 'Home computing' during KS1, suggesting an optimum level of engagement that is neither high nor low). Second, they are differentially and strongly influenced by gender, for example boys are significantly more likely to be reported by their parents to play with computers whereas girls are significantly more likely to be reported as engaging in expressive play. Combining these distinct types of activities into a single scale would cancel out contrasting or disparate influences. Consequently, the resulting scale might show no statistically significant associations with outcomes.

'Home computing'

'Home computing' during KS1 shows a significant linear and negative association with 'Pro-social' behaviour; the more time children spend with their computer the lower their 'Pro-social' behaviour scores. Children who spend no or little time engaged with their computers show greater levels of 'Pro-social' behaviour (ES=0.22) when compared to children who are engaged with their computers on a daily basis. 'Pro-social' behaviour then gradually decreases with increasing computer usage (ES=0.17 for the moderate category and ES=0.12 for the high category). It is not possible to say whether this association is causal of course; those who play with the computer a lot may already find it less easy to play with other children. There is also a gender link as more boys scored highly on computer use, reported in the KS1 parent questionnaire, than girls.

'Enrichment outings'

'Enrichment outings' during KS1 shows a significant association with 'Hyperactivity' and in this case too, the association is negatively linear. Thus, more 'Enrichment outings' during KS1 are associated with somewhat increased 'Hyperactivity' (ES=-0.25 for low, ES=-0.12 for moderate and ES=-0.17 for high compared to the very high scoring group ES=0). These findings may appear to be counter intuitive at first, however, given the strong gender effect for 'Hyperactivity', the negative relationship this factor forms with 'Enrichment outings' during KS1 may not be surprising. One of the three items loading on this HLE factor is sporting activities, which is more strongly associated with boys; who are also more hyperactive. Indeed when the multilevel model is applied only on the sub-group of girls, the 'Enrichment outings' during KS1 factor fails to reach significance, thus indicating that the negative association between 'Hyperactivity' and 'Enrichment outings' during KS1 is gender driven and is likely to be a reflection of an interactive effect between the 'sport' part of the 'Enrichment outings' during KS1 factor, gender (boys) and 'Hyperactivity'. In other words, boys who are rated as being more hyperactive are more likely to be taken out on sporting (or other outdoor) activities more often than less hyperactive children. This may possibly reflect parental strategies as a way of helping them to 'work out' their hyperactivity.

'One-to-one interaction'

'One-to-one interaction' is a significant predictor of 'Anti-social' behaviour but the association in this case is only significant for the low activity group. Low scores on 'One-to-one interaction' are significantly associated with increased 'Anti-social' behaviour (ES=0.18); moderate and high scores on this HLE factor are no different from each other or from the very high scoring reference group (ES around 0 for all).

'Expressive play'

'Expressive play' was a significant predictor for 'Hyperactivity', 'Pro-social' behaviour and 'Anti-social' behaviour. For 'Hyperactivity' and 'Pro-social' behaviour only the low activity group shows a significant association. Children who were not reported to engage in 'Expressive play' much during KS1 show increased 'Hyperactivity' (ES=0.20) and reduced 'Pro-social' behaviour (ES=-0.24). The moderate and high activity groups are no different from each other or from the very high activity group (ES around 0 for all). Again this may reflect the association between gender and these dimensions of social behaviour, given the finding that girls score more highly on 'Expressive play' during KS1 than boys.

The relationship between 'Anti-social' behaviour and 'Expressive play' during KS1 shows a U shape pattern of association; those in the middle range group show reduced 'Anti-social' behaviour (ES=-0.17 for the moderate group and ES=-0.13 for the high group) relative to the low and very high activity groups. This may suggest that in some cases over engagement in 'Expressive play' during KS1 (especially pretend play which is one of the three items contributing to this scale) may be an indication of a reduced ability to relate to other children. When the 'Anti-social' model is applied in a model just based on girls in the sample, 'Expressive play' during KS1 continues to be significant. In addition to this, reports by parents at the start of the study of developmental problems, which was not significant in the model for the full sample, is now significant and the effect size is stronger for this predictor (ES=0.36) than for 'Expressive play' during KS1 (ES=-0.25 for the moderate group). Overall, these findings suggest there could be

some developmental component to 'Anti-social' behaviour in girls, which may be manifested as an over-engagement in 'Expressive play' during KS1. However, without further evidence such possible links must be interpreted with caution.

3.4 An overview of the social/behavioural dimensions

The net influences of different child, family and HLE characteristics are illustrated in tables 3:12-3.15. The ES are presented without an algebraic sign, but the direction of change is explained in the text[21].

'Hyperactivity'

Gender, early health problems, early behaviour problems mother's qualifications and family income have the strongest links with 'Hyperactivity' (Table 3.12). Ethnicity was also associated with 'Hyperactivity', however the group sizes are relatively small, and interpretation, therefore, should be treated with caution.

Table 3.12
'Hyperactivity' – factors with significant Net effect at the end of Year 5 (age 10)

Factor	Effect size	Description
Gender	0.68	Boys higher than girls
Ethnicity	-0.73 to 0.19	White UK lower/higher than some minority groups. Asian groups lower
Siblings	0.11	Singletons are more hyperactive than children with siblings
Health problems	0.56	3+ Early health problems a predictor for increased 'Hyperactivity'
Behavioural problems	0.51	1+ Early behavioural problems = predictor for increased 'Hyperactivity'
Need of EAL support	0.26	Need of EAL support a predictor for increased 'Hyperactivity'
Mother's Qualifications	0.36	Linear: Higher qualifications reduced 'Hyperactivity'
Marital status	0.23	Single or separated mother a predictor of increased 'Hyperactivity'
Maternal employment	0.15	Mother not working a predictor of reduced 'Hyperactivity'
FSM	0.18	FSM a predictor of increased 'Hyperactivity'
Family income	0.33	Middle income band a predictor of reduced 'Hyperactivity'
KS1 HLE: Enrichment outings	0.25	Linear: more Enrichment outings a predictor of increased 'Hyperactivity'
KS1 HLE: Expressive play	0.20	Infrequent engagement in play a predictor of increased 'Hyperactivity'

Teachers rated boys, and children with three or more health problems and one or more behavioural problems (as reported by parents at the start of the study) more hyperactive. Increased 'Hyperactivity' was also associated with children of single or separated mothers, children in need of EAL support, those eligible for FSM and Black Caribbean children.

Children of mothers with a high level of qualification, and children in households belonging to the middle band income categories, were reported by teachers as displaying reduced levels of 'Hyperactivity' relative to children of mothers with a low qualification level and those children from households associated with the low or the high income bands. Reduced 'Hyperactivity' was also associated with children whose mothers are not working.

While FSM is a significant predictor of increased 'Hyperactivity', it is not as strong as some other predictors in the model. The effect size of FSM is relatively small in comparison with the family income factor or maternal qualification.

[21] For factors where more than one category showed a significant effect (e.g. mother's qualification or Early years HLE), the effect size of the most representative category is shown in tables 3.12-3.15. Details on effect sizes for other categories can be found in previous tables.

'Self-regulation'

The highest levels of 'Self-regulation' were associated with high Early years HLE scores, higher levels of father's qualification and higher family income. The lowest levels of 'Self-regulation' were associated with need of EAL support, developmental problems (as reported by parents at the start of the study) and low birth weight (see Table 3.13).

Overall, the model for 'Self-regulation' shares more similarities with the cognitive models (especially Reading), described in a separate report of the Year 5 cognitive outcomes (see Sammons et al., 2007), than with the other social/behavioural measures. Similarities between 'Self-regulation' and Reading were evident in terms of the combination of predictors that were significant in the final models and in the patterns of association between predictors and outcomes in the models.

Birth weight and developmental problems (as reported by parents at the start of the study) were not significant in the final models of 'Hyperactivity', 'Pro-social' behaviour and 'Anti-social' behaviour, but both were significant in the final models for 'Self-regulation' and for Reading. Similarly, Early years HLE was significant in the model of 'Self-regulation' and both Reading and Mathematics, but it was not a significant predictor of the other social/behavioural dimensions; for the other three aspects of social behaviour the KS1 HLE factors had a stronger impact.

In contrast, gender, which was the strongest predictor for 'Hyperactivity', 'Pro-social' and 'Anti-social' behaviour, had the weakest impact on 'Self-regulation', both relative to the other social/behavioural dimensions and relative to other child factors in the 'Self-regulation' model. In the cognitive models gender also had a relatively low impact on Reading (ES=10) and no statistically significant impact on Mathematics at age 10.

Table 3.13
'Self-regulation' – factors with significant Net effect at the end of Year 5 (age 10)

Factor	Effect size	Description
Gender	0.19	Girls higher than boys
Birth weight	0.21	Linear: Increasing 'Self-regulation' with increasing birth weight
Developmental problems	0.25	Developmental problems a predictor for lower 'Self-regulation'
Need of EAL support	0.53	Need of EAL support a predictor for lower 'Self-regulation'
Mother's Qualifications	0.21	Linear: Increasing 'Self-regulation' with increasing qualifications
Father's qualifications	0.30	Linear: Increasing 'Self-regulation' with increasing qualifications
FSM	0.17	FSM a predictor of lower 'Self-regulation'
Family income	0.25	Salary > £30,000 a predictor of higher 'Self-regulation'
Early years HLE	0.49	Linear: Increasing 'Self-regulation' with increasing HLE scores

The pattern of association with family income for 'Self-regulation' also reflects the pattern observed with the cognitive outcomes. The relationship between 'Self-regulation' and family income is a steady linear relationship; the higher the income the higher the 'Self-regulation' score. This is in contrast to the inverted U shaped pattern of association found between family income and the two of the other aspects of social behaviour, 'Hyperactivity' and 'Pro-social' behaviour, where the middle income band, rather than the high or low, show relatively higher scores for positive social behaviour.

The only notable differences between the models for 'Self-regulation' and cognitive attainment are first, the absence of SES as a predictor for 'Self-regulation' and second, the impact of parental qualifications. In the 'Self-regulation' model, father's qualifications has a stronger impact overall than mother's qualifications; in contrast, in the cognitive models mother's qualification is the stronger predictor. Nonetheless, father's qualification, which did show fairly strong links with cognitive attainment, was not significantly associated with any of the social/behavioural dimensions apart from 'Self-regulation', which is a further indication of the similarities between this aspect of social behaviour and cognitive attainment.

As already mentioned in Section 2, 'Self-regulation' is a measure of pupil's autonomy, confidence and self sufficiency specifically related to behaviour in a learning, rather than social, context. It is therefore to be expected that higher 'Self-regulation' would coincide with high attainment as indicated by the moderately high correlations between this measure and cognitive outcomes. However, the findings of greater similarities between 'Self-regulation' and Reading than between 'Self-regulation' and the other social/behavioural dimensions, in terms of the overall combination of factors predicting the behaviour, indicate that 'Self-regulation' may have a stronger cognitive than a social component, and beyond a simple association with Reading, it may, to some extent, be underlined by the same core cognitive ability.

'Anti-social' behaviour

Teachers' ratings indicated somewhat increased scores on average for 'Anti-social' behaviour for Black African children, boys, children whose fathers are absent, children eligible for FSM, those with one or more behavioural problems (as reported by parents at the start of the study) and children who have low levels of 'One-to-one interaction' with their parents during KS1. Reduced 'Anti-social' behaviour was associated with high maternal qualifications and with moderate levels of 'Expressive play' during KS1.

Eligibility for free school meals (FSM) was the strongest net family predictor of 'Anti-social' behaviour; its impact on 'Anti-social' behaviour was also the strongest relative to the other social/behavioural dimensions.

Table 3.14
'Anti-social' behaviour – factors with significant Net effect at the end of Year 5 (age 10)

Factor	Effect size	Description
Gender	0.32	Boys higher than girls
Ethnicity	0.39	Some minority groups lower e.g. Indian, others higher e.g. Black African
Behavioural problems	0.22	1+ Early behavioural problems a predictor for increased 'Anti-social' behaviour
Mother's Qualifications	0.16	Linear: Decreasing 'Anti-social' with increasing qualifications
Absent fathers	0.15	Absent fathers a predictor of 'Anti-social' behaviour
FSM	0.23	FSM a predicator of 'Anti-social' behaviour
KS1 HLE: One-to-one interaction	0.18	Infrequent One-to-one interaction a predictor of increased 'Anti-social' behaviour
KS1 HLE: Expressive play	0.17	Moderate levels of Expressive play a predictor of reduced 'Anti-social' behaviour (low and very high both predictors of increased 'Anti-social' behaviour)

The high ES for ethnicity represents slightly raised 'Anti-social' behaviour scores for Black African children and lower scores in other groups especially Indian children. However, as already mentioned in the previous section, this finding must be interpreted with great caution. The proportion of missing fathers in this group of children (Black African) is nearly half, which is significantly higher (almost double) the quarter in the general sample; the proportion of children eligible for FSM is also higher in this group (35%) relative to the general sample (20%). Both of these factors are significant predictors of 'Anti-social' behaviour but are already included in the model so the effect of ethnicity on 'Anti-social' behaviour should be seen as a net effect independent of other factors. Nevertheless, considering the small number of children (50) and the large standard deviations in this group (Sd=24.7) relative to the sample (Sd=15), the possibility of extreme cases, as well as interactive effects between predictors, producing inflated effect sizes cannot be ruled out. No significant differences were found for the Black Caribbean group.

Earlier EPPE reports (Sammons et al., 2004b; Sammons et al., 2002; Melhuish et al., 2001) had shown that an early start to child care before the age of 2 was associated with higher scores on 'Anti-social' behaviour at ages 3, 5 and 6. However, by age 10 there was no relationship between

an early start in child care and higher rates of 'Anti-social' behaviour. It appears that the slightly increased risk of 'Anti-social' behaviour in children with an early start in group child care has faded by age 10.

'Pro-social' behaviour

Gender was, by a very big margin, the strongest indicator of 'Pro-social' behaviour, with girls having more positive scores as a group. This was then followed by total family income, 'Expressive play' during KS1, 'Home computing' during KS1, maternal qualifications and eligibility for free-school meals (FSM). Eligibility for free school meals (FSM) was the weakest predictor in the model suggesting that disadvantage has a lesser role to play in 'Pro-social' behaviour than in 'Anti-social' behaviour or in cognitive development.

Girls, children in the middle income bands (£17.5k-£37.5k annual family income) and children of mothers with high qualification levels were rated by their teachers as showing more 'Pro-social' behaviour. Children who use computers infrequently also show increased 'Pro-social' behaviour. In contrast, children who were reported to have had one or more behavioural problems at the start of the study, children who engage infrequently in 'Expressive play' during KS1 and those eligible for FSM show decreased levels of 'Pro-social' behaviour.

Table 3.15
'Pro-social' behaviour – factors with significant Net effect at the end of Year 5 (age 10)

Factor	Effect size	Description
Gender	0.63	Girls higher than boys
Behavioural problems	0.21	1+ behavioural problems = reduced 'Pro-social' behaviour
Mother's Qualifications	0.19	Linear: Increasing 'Pro-social' behaviour with increasing qualifications
FSM	0.15	FSM = reduced 'Pro-social' behaviour
Family income	0.24	Middle income band = increased 'Pro-social' behaviour
KS1 HLE: Home computing	0.22	Infrequent usage = increased 'Pro-social' behaviour
KS1 HLE: Expressive play	0.24	Infrequent Expressive play = reduced 'Pro-social' behaviour

Further analyses were conducted to examine the influence of individual background factors in Year 1 compared to Year 5, and the results show that some background factors increased in their impact on social behaviour whereas others reduced. These results are reported in the next section and are important to show for which groups of pupils the gap in social/behavioural development widened or alternatively reduced in KS2.

Section 4: Exploring the Impact of Background Factors on Children's Social/Behavioural developmental level and developmental progress over time

This section presents results from multilevel contextualised models and value added[22] contextualised models to explore the impact of child and family characteristics on children's social/behavioural developmental level and progress over time. In the first part of this section we focus on children's *developmental level* over time by comparing the net effects of background factors in Year 5 relative to Year 1 using results from contextualised multilevel models calculated independently for each year. In the second part we focus on children's social/behavioural *progress* over time using value added models that include prior (Year 1) developmental level to explore whether background factors, found to be significant predictors of developmental level at the end of Year 5, were also associated with differential progress (value added) in social behaviour from Year 1 to Year 5. This is a new analysis of Year 1 data that extends earlier analyses by focussing explicitly on developmental progress from Year 1 to Year 5.

4.1 Exploring the Impact of Background Factors on Children's Social/Behavioural developmental level in Year 5 Compared to Year 1

This section presents the main results of multilevel contextualised models that compare the net effects of child and family characteristics as well as the net effects of the Early years Home Learning Environment (HLE) on social/behavioural developmental level in Year 1 compared to Year 5. The change of net impact of different influencing factors reveals whether certain groups of children that showed increased levels of negative social behaviour at the end of Year 1 have sustained this behaviour or have worsened by the end of Year 5. It also explores whether certain groups of children have further improved or fallen behind compared to the average in terms of their social/behavioural development during Key Stage 2.

The same factors used in the contextualised models for Year 5 social/behavioural outcomes (presented in the previous section) were tested as potential predictors of Year 1 social/behavioural outcomes so that direct comparisons at the two time points could be made. Comparisons were made on the basis of the effect sizes of the individual predictors in each set of models. In the following description of the results, differences in effect sizes between Year 1 and Year 5 (_ES) are presented to indicate the extent of change in the impact of different background factors on social/behavioural development rather than using absolute effect sizes. The changes in effect sizes are presented without an algebraic sign, but the direction of change is explained in the text. Table 4.1 summarizes the extent of change in effects.

Child Measures

Gender lost some of its impact on 'Self-regulation' (_ES=0.19) by Year 5. Girls are still doing better than boys but boys are catching up. Boys, however, are falling further behind when compared to girls on the other three aspects of social/behavioural development. Differences between the genders have increased over the years with boys showing higher levels of 'Hyperactivity' (_ES=0.25) and 'Anti-social' behaviour (_ES=0.26) and lower levels of 'Pro-social' behaviour (_ES=0.15) by Year 5.

In both years children with low birth weight showed lower 'Self-regulation' than children with normal birth weight; the effect of low birth weight on 'Self-regulation' has become somewhat stronger (_ES=0.10) by Year 5.

With regard to mother tongue the effect of 'needing EAL support' has remained the same for 'Hyperactivity' (_ES=0.01) with children who need EAL support still showing significantly higher levels of hyperactive behaviour. In contrast, the impact of 'needing EAL support' has become

[22] Including prior attainment.

stronger for 'Self-regulation' (_ES=0.29) showing children who need EAL support are falling further behind in terms of self-regulating behaviour.

Table 4.1
The impact of child, family and HLE on Social behaviour at Year 5 compared to Year 1

'Hyperactivity'	Effect is now	Description
Gender	Stronger	Boys show an increase in hyperactive scores at Year 5
Ethnicity	Stronger	Higher 'Hyperactivity' for children of Black Caribbean, Black African and Mixed race ethnic origins and lower for children of Bangladeshi ethnic origins at Year 5
Siblings	Weaker	Effect of siblings decreased
Health problems	Same	Same for 1-2 Health problems; stronger for 3+ health problems at Year 5
Behavioural problems	Same	Early developmental problems still predictor for increased 'Hyperactivity'
Need of EAL support	Same	Need of EAL support still a predictor for increased 'Hyperactivity'
Mother's Qualifications	Slightly Stronger	Children of more educated mothers show reduced 'Hyperactivity' in Year 5
Marital status	Stronger	Children of single or separated mothers show higher 'Hyperactivity' by Year 5
Maternal employment	Same	Mother not working still a predictor of reduced 'Hyperactivity'
FSM	Same	FSM still a predictor of raised hyperactive scores in both years
Family earned income	Stronger	Middle income band are doing even better (less 'Hyperactivity') in Year 5
'Self-regulation'	**Effect is now**	**Description**
Gender	Weaker	Gap between girls and boys decreased; though girls still higher in Year 5
Birth weight	Stronger	Effect of low birth weight is stronger
Developmental problems	Same	Same for 1 developmental problem; weaker for 2+
Need of EAL support	Stronger	The effect for 'need of EAL support' increased
Mother's Qualifications	Slightly Weaker	The effect of mother's qualification slightly decreased
Father's qualifications	Stronger	Increasing 'Self-regulation' with increasing qualifications
FSM	Same	FSM still a predicator of reduced 'Self-regulation'
Family earned income	Slightly Stronger	Slight increases across all categories
Early years HLE	Mixed Pattern	Effect remained the same for the top but was weaker for all others
'Anti-social'	**Effect is now**	**Description**
Gender	Stronger	Boys higher than girls
Ethnicity	Weaker	Effect is weaker for all groups apart from Black African
Behavioural problems	Same	Same for 1 behavioural problem; Weaker for 2+
Mother's Qualifications	Weaker	The effect of mother's qualification slightly decreased
Absent fathers	Stronger	The effect of absent father slightly increased
FSM	Same	FSM still a predicator of 'Anti-social' behaviour
'Pro-social'	**Effect is now**	**Description**
Gender	Stronger	The gap between girls and boys increased; girls are still higher in Year 5
Behavioural problems	Same	Same for 1 behavioural problem; Stronger for 2+
Mother's Qualifications	Slightly Stronger	Increasing 'Pro-social' behaviour with increasing qualifications
FSM	Same	FSM still a predicator of reduced 'Pro-social' behaviour
Family earned income	Stronger	Decrease for lower band; small increases for all other categories

The effect of early health, developmental and behavioural problems has remained the same for all aspects of social/behavioural development (_ES< 0.05) for the '1 problem' categories[23]. Children with siblings show reduced levels of 'Hyperactivity' relative to singletons in both years, but the effect has decreased (1-2 siblings: _ES=0.06; 3+ siblings _ES=0.14) by Year 5.

The impact of ethnicity has become stronger for 'Hyperactivity'. Children of Black Caribbean (_ES=0.21), Black African (_ES=0.11) and Mixed race (_ES=0.24) ethnic origin showed increased levels of 'Hyperactivity' by Year 5. In contrast, hyperactive behaviour in Bangladeshi (_ES=0.34) children has decreased. 'Hyperactivity' remained the same for all other ethnic groups (ES≤0.06).

In contrast, to findings for 'Hyperactivity', findings for ethnicity and 'Anti-social' behaviour suggest that the influence has weakened between Year 1 and Year 5. The effects have reduced significantly for all ethnic groups especially for children of Indian (_ES=0.28), Pakistani (_ES=0.36) and Bangladeshi (_ ES=0.47) ethnic origin, for whom the pattern is reversed, from showing higher levels of 'Anti-social' behaviour relative to White UK children in Year 1, to showing lower levels of 'Anti-social' behaviour in Year 5. The only exception was the group of Black African children for whom the effect has become slightly stronger (_ES=0.14) by Year 5. However, as already noted, given the relatively small sizes of some ethnic groups in the EPPE 3-11 sample the results should be interpreted with caution. Nonetheless they suggest that changes in the relative strength of differences in social behaviour between pupil sub-groups are worth further exploration and may link with changes in the relationships between ethnicity and cognitive attainment.

Family Measures

It was found that the highest qualification level of the mother was a somewhat stronger predictor of children's social/behavioural development at Year 5 than at earlier time points. Investigating the change of strength of effect size between Year 1 and Year 5, the findings illustrate that the influence of mother's qualification is slightly stronger for 'Hyperactivity' and 'Pro-social' behaviour, but has become weaker for 'Anti-social' behaviour and slightly weaker for 'Self-regulation'. For both years the comparison group was 'mothers with no qualification'. Differences in effect sizes (_ES) between Year 1 and Year 5 for 'Anti-social' behaviour lie in the range between _ES = 0.09 (Higher degree) and _ES=0.22 (18 academic); differences between categories on 'Self-regulation' are between _ES=0.02 and _ES=0.08 indicating a very small decrease in the strength of effect for both these outcome measures. Differences between categories on 'Hyperactivity' and 'Pro-social' behaviour lie in the range between _ES=0.02 and _ES=0.10; these _ES are relatively small indicating a marginal increase in the strength of mother's qualification on these aspects of social/behavioural development.

The overall impact of father's qualification on 'Self-regulation' is somewhat higher in Year 5 compared to Year 1. The effect sizes for the higher qualification categories '18 academic' and above (_ES=0.10) have increased while the effect sizes for the lower qualification levels have decreased (_ES≤0.05). Overall, this pattern of change indicates that differences in 'Self-regulation' between the children whose father's have lower and higher qualification bands have become larger, and that the overall increase in developmental level of children whose fathers are of the lower qualification bands is poorer relative to children whose fathers have an 18 academic level of qualification and above.

The effect of maternal employment on 'Hyperactivity' remained the same over the years (_ES=0.02), but the net effect of marital status on this aspect of social/behavioural development has become somewhat stronger with children of single (_ES=0.12) and separated (_ES=0.10) mothers showing increasing levels of 'Hyperactivity' by Year 5.

The impact of family earned income has increased in strength for 'Hyperactivity'. Differences in effect sizes between Year 1 and Year 5 were in the range of _ES=0.04 and _ES=0.18. The

[23] The number of children in the 2+ categories is too small for consistent patterns. In some cases the effects were stronger and in others the effect was weaker. Details are provided in Table 4.1.

largest increments were for the medium income categories (£17.5K-30K _ES=0.14; £30K-37.5K _ES=0.18), however the change relative to the initial Year 1 level was more or less constant across income categories. Taken together these results suggest that while family earned income has become a stronger predictor of 'Hyperactivity' (relative to other predictors), and that the relative differences between income categories have remained constant.

Differences in effect sizes between Year 1 and Year 5 on 'Self-regulation' are in the range of _ES=0.04 to 0.09 indicating a slight increase in the overall predictive strength of family earned income. 'Pro-social' behaviour differences between Year 1 and Year 5 indicated small positive changes (_ES≤0.05) for most income groups with the exception of the lowest earned income band (<£17.5K) for which a larger decrease (_ES=0.12) was evident. This suggests that children from the lowest income category are lagging further behind for 'Pro-social' behaviour relative to all other income groups.

Looking at eligibility for free school meals (FSM), the findings illustrate that the impact has remained very stable for 'Self-regulation' (_ES=0.06), 'Pro-social' behaviour (_ES=0.04), 'Hyperactivity' (_ES=0.02) and 'Anti-social' behaviour (_ES=0.02).

Early Years Home Learning Environment (HLE) Measures

The quality of the Early years HLE was found to be an important predictor for 'Self-regulation' at earlier time points. Early years HLE continues to be an important predictor of 'Self-regulation' but its impact has somewhat decreased for all categories (_ES=0.03 to 0.12) with the exception of the very top scoring category for which it has not changed. This indicates that the gap between children who experienced a very good Early years HLE and those for whom the HLE was less favourable has increased somewhat[24]. However, as an overall predictor of 'Self-regulation', Early years HLE has reduced its impact relative to other factors such as father's qualifications. It is the very high scoring Early years HLE group that shows the strongest and most stable long term influence.

4.2 Estimating social/behavioural developmental progress over time

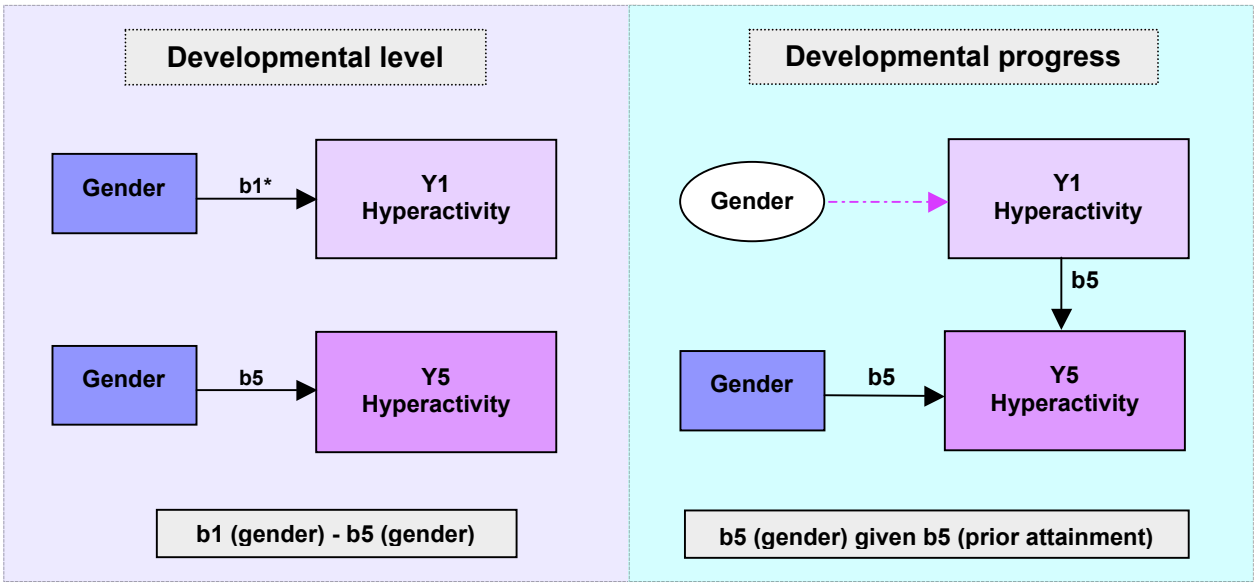
So far we have focused on changes in developmental level over time by examining changes in the strength of background factors (e.g., gender) as predictors for Year 1 outcomes (e.g., 'Hyperactivity' in Year 1) relative to the equivalent models in Year 5 (e.g., 'Hyperactivity' in Year 5). In this part we focus on developmental progress over time by using the relevant Year 1 outcome as a predictor variable in the Year 5 models (see figure 4.1).

Complex value added[25] analyses were conducted for the four social/behavioural outcomes to explore changes in social/behavioural development from Year 1 to Year 5. For these analyses we included in the contextualised multilevel models prior social/behavioural developmental level, using the relevant social/behavioural outcome collected at Year 1 in addition to the background factors presented in previous sections. These analyses were undertaken to explore whether the child, family and HLE characteristics, found to be significant in predicting social behaviour at the end of Year 5 were also associated with differential progress or change in social behaviour between Year 1 and Year 5 of primary school education.

[24] We did not use the KS1 HLE for the comparison analysis since these data were collected at a later time point.

[25] Complex value added models are contextualised models (controlling for background characteristics) that also include prior social behaviour. Simple value added models include prior social behaviour only; they do not control for backgrounds characteristics.

Figure 4.1: Modelling children's developmental level and developmental progress over time`



* b_i is the model's estimate of a predictor variable used to calculate the effect size (ES)

Using prior (Year 1) developmental level as a predictor in the contextualised models for Year 5 would render some background factors in these models non significant since some (or all) of their influence could be absorbed in the Year 1 outcome measure. Any effect left over after prior developmental level has been taken into account would therefore indicate that a given factor not only predicts level of development at a given time point (developmental level) but also rate of improvement over time (progress). Thus, if in the previous analysis a given factor has become stronger in Year 5 relative to Year 1 (e.g. gender for 'Hyperactivity') we would expect this factor to remain significant after prior developmental level has been taken into account. Factors for which there was no change in effects size or those which have become weaker from Year 1 to Year 5 are likely to, but may not necessarily become non significant in the value added models since the effects are not strictly additive. Results from the value added analyses are presented in Table 4.2.

For 'Hyperactivity' the findings indicate that girls (ES=0.46), Indian (ES=-0.27) Pakistani (ES=-0.23) and Bangladeshi children (ES=-0.51), children who have high qualified mothers (18 academic' and above ES=-0.14 to ES=-0.32) and who belong to families of medium income band (ES=-0.20) are showing significantly better progress in terms of reduced hyperactive behaviour. On the other hand, children whose parents reported (at the start of the project) that children had behavioural problems (ES=0.15 for 1-2 problems and ES=0.33 for 2+ problems) and children to single (ES=-0.17) or separated (ES=-0.16) mothers made significantly less progress between their first and their fifth year of primary school education in terms of reduced 'Hyperactivity'. Children who had very high scores on 'Enrichment outings' during KS1 (ES=0.14) and those who were infrequently engaged in 'Expressive play' during KS1 (ES=0.21) also showed less progress. Gender and mother's qualification have the stronger links with progress for 'Hyperactivity' relative to other background measures.

Improved 'Self-regulation' was significant for children to fathers with the highest qualification level (degree or higher ES=0.27) children of families belonging to the medium income band and above (≥£17,500) (ES=0.19 to ES=0.27) children with the highest Early years HLE scores (ES=0.35) and children with absent fathers (ES=0.11). Children in the lower HLE categories did not show significant progress in 'Self-regulation' between Year 1 and Year 5. Progress in 'Self-regulation' was poorer for children with one developmental problem (ES=-0.18) and those needing EAL support (ES=-0.38). 'Need of EAL support' was the stronger predictor of the value added model for 'Self-regulation'.

Table 4.2
The impact of child, family and HLE characteristics on Social/behavioural development at Year 5 compared to Year 1

'Hyperactivity'	Effect is now	Description
Gender	Significant	Boys relatively more hyperactive at Year 5 (ES=0.46)
Ethnicity	Significant	Indian (ES=-0.27), Pakistani (ES=-0.23) and Bangladeshi (ES=-0.51) ethnic groups still show reduced 'Hyperactivity'
Siblings	NS	
Health problems	NS	
Behavioural problems	Significant	Children with 1-2 (ES=-0.15) and 2+ (ES=-0.33) early behavioural problems still show increased 'Hyperactivity'
Need of EAL support	NS	
Mother's Qualifications	Significant	Children of more educated mothers are still doing better (ES=-0.32)
Marital status	Significant	Children of single (ES=-0.17) or separated (ES=-0.16) mothers have fallen further behind
Maternal employment	NS	
FSM	NS	
Family income	Significant	Middle income band (ES=-0.20) are doing relatively better
'Self-regulation'		**Description**
Gender	NS	
Birth weight	NS	
Developmental problems	Significant	Children with 1 developmental problem (ES=-0.18) poorer scores
Need of EAL support	Significant	Children in need of EAL support doing worse (ES=-0.38)
Mother's Qualifications	NS	
Father's qualifications	Significant	Children of highest qualified fathers (ES=0.27) are making relative improvement
FSM	NS	
Family income	Significant	Medium income band and above doing better (ES=0.19 to ES=0.27)
Early years HLE	Significant	Only the very high HLE are doing significantly better (ES=0.35)
'Anti-social'		**Description**
Gender	Significant	Boys show an increase in scores for 'Anti-social' at Year 5 (ES=0.32)
Ethnicity	NS	
Behavioural problems	NS	
Mother's Qualifications	Significant	Significant only for 'vocational' qualification level (ES=0.18)
Absent fathers	Significant	Increased scores for children with absent fathers (ES=0.16)
FSM	Significant	Poor progress (ES=0.23)
'Pro-social'		**Description**
Gender	Significant	Girls show greater gains in 'Pro-social' behaviour (ES=0.52)
Behavioural problems	Significant	Poor progress for 1 behavioural problem (ES=-0.17); Stronger for 2+ behavioural problems (ES=-0.29)
Mother's Qualifications	Significant	Significant progress only for the '16 academic' (ES=0.19 and 'degree and higher (ES=0.12) groups
FSM	NS	
Family income	Significant	Significant progress only for the £17.5K to £30K income band (ES=0.18)

The value added model for 'Anti-social' behaviour indicated relatively increased levels (poorer progress) for boys (ES=0.32), children eligible for FSM (ES=0.23), children to mothers with vocational level qualifications (ES=0.16) and children to absent fathers (ES=0.16). Moderate levels of 'Expressive play' during KS1 (ES=-0.14) were indicative of reductions (improved progress) in 'Anti-social' behaviour. In the contextualised model of 'Anti-social' behaviour (Section 3) only the low level category of 'One-to-one interaction' during KS1 was a significant

predictor of ‘Anti-social’ behaviour. In the value added models all ‘One-to-one interaction’ during KS1 categories were strongly associated with increased ‘Anti-social’ behaviour (ES=0.18 to ES=0.15) in comparison with very high ‘One-to-one interaction’ during KS1 category. This points to the value of high levels of one-to-one parent child interaction during KS1 in reducing ‘Anti-social’ behaviour for this age group.

Apart from FSM no longer being significant, the combination of variables predicting progress in ‘Pro-social’ behaviour did not change significantly from the contextualised models reported in section 3. Gender was still the strongest indicator of positive progress of ‘Pro-social’ behaviour followed by family income and maternal qualifications; however the only categories for which progress was significant were the low/medium (£17.5K to £30K) income band categories and the ’16 academic’ (ES=0.17) and ‘degree and higher’ (ES=0.12) categories of maternal qualifications.

Girls (ES=0.52), children in the middle income bands (17.5k-30K annual family income) (ES=0.18) and children to mothers with the ’16 academic’ qualification level (ES=0.18) and ‘degree and higher’ (ES=0.12) and children who use computers in moderation (ES=0.21) showed significant progress in ‘Pro-social’ behaviour. In contrast, children who were reported (by their parents at the start of the study) to have behavioural problems (ES=-0.17 1 behavioural problem; 2+ behavioural problems ES=-0.29) and children who engage infrequently in ‘Expressive play’ during KS1 (ES=-0.22) show poorer progress in ‘Pro-social’ behaviour.

Section 5: The overall impact of background characteristics and prior developmental level on social/behavioural development

5.1 Null models

Table 5.1 shows the null models with no explanatory variables included for the four social/behavioural outcomes. The intra-school correlation measures the extent to which the scores of children in the same primary school resemble each other as compared with those from children at different schools. The intra-school correlation for the social/behavioural measures indicate that approximately four to twelve per cent of the variation in children's social behaviour is related to differences between individual primary schools; while the majority of the variation reflects differences between individual children. These proportions are of similar magnitude to those identified for the social/behavioural outcomes at the end of Year 1. However, when compared with the equivalent analysis of Reading and Mathematics attainment at Year 5, the proportion of school level variation in social/behavioural outcomes in Year 5 is significantly lower than the proportions reported for cognitive attainment (19%-21%). This is perhaps not surprising as schools have explicit curriculum goals to promote academic outcomes such as progress in Reading and Mathematics. The greatest variation between primary schools is for 'Pro-social' (12%) behaviour and the least for 'Self-regulation' (4%), which, again, reflects the pattern of results reported for Year 1.

Table 5.1
Null model showing primary school and child level variance of Year 5 Social/behavioural outcomes

	'Hyperactivity' Estimate (standard error[26])	'Self-regulation' Estimate (standard error)	'Pro-social' Estimate (standard error)	'Anti-social' Estimate (standard error)
School level variance estimate	0.072(0.02)	0.039(0.015)	0.121(0.023)	0.049(0.020)
Child level variance	0.930(0.03)	0.961(0.029)	0.879(0.029)	0.952(0.031)
Intra-school correlation	0.072	0.039	0.121	0.049
Number of children	2405	2410	2402	2396
Number of schools	924	926	923	922

Caution is needed in interpreting the intra-school correlations because approximately sixty per cent of the primary schools in our analysis had only one EPPE child in attendance and the average number of EPPE children per school is 2.6 (maximum = 40). The observed intra-school correlations for this sample therefore, are likely to be a conservative estimate of differences between schools.

5.2 Contextualised and Simple value added models

The effects of background characteristics, as well as prior developmental level, on the intra-school correlations are reported in Table 5.2. Results from contextualised multilevel models show the proportion of variance in Year 5 social/behavioural outcomes accounted for by *child, family and Home Learning Environment (HLE) characteristics*; while results from simple value added analyses show the proportion of variance in Year 5 social measures accounted for by *prior developmental level*. Thus, the simple value added models controlled only for prior social/behavioural developmental level using the relevant social/behavioural outcome collected at Year 1.

[26] The standard error provides a measure of the confidence limits associated with each estimate and is used to establish the statistical significance of the results.

Intra-school correlations

The intra-school correlations for the contextualised models range from 0.03 to 0.14 indicating that there is still some variation between primary schools in pupils' social/behavioural outcomes after taking into account the influence of background factors, most notably for 'Pro-social' behaviour. It is interesting that when background is controlled for, the intra-school correlation for 'Pro-social' behaviour increases, whereas intra-school correlations for the other aspects of social behaviour decrease. This suggests that 'Pro-social' behaviour is more likely to be affected by differences between schools (e.g. in classroom climate, behavioural expectations, peer influences etc).

The intra-school correlations for the value added models are in the same range (0.03-0.14) as those for the contextualised models. The value added models however show an increase in school variation not only for 'Pro-social' (0.14) behaviour but also for 'Self-regulation' (0.075) for which the intra-school correlation almost doubled in magnitude relative to the null model (0.039). This suggests that differences between individual schools in promoting self regulating behaviour in their pupils become more pronounced once earlier self regulating behaviour is taken into account.

Table 5.2
Contextualised models of social/behavioural measures at Year 5 showing primary school and child level variance

		'Hyperactivity' Estimate (standard error)	'Self-regulation' Estimate (standard error)	'Pro--social' Estimate (standard error)	'Anti-social' Estimate (standard error)
School level variance estimate (se)	**Contextualised models**	0.048(0.015)	0.027(0.013)	0.12(0.022)	0.039(0.017)
	Value add models	*0.040(0.013)*	*0.057(0.016)*	*0.12(0.022)*	*0.030(0.016)*
Child level variance (se)	**Contextualised models**	0.75(0.024)	0.850(0.027)	0.747(0.025)	0.859(0.028)
	Value add models	*0.64(0.021)*	*0.709(0.027)*	*0.754(0.026)*	*0.885(0.029)*
Intra-school correlation	**Contextualised models**	0.06	0.031	0.143	0.044
	Value add models	*0.059*	*0.075*	*0.137*	*0.033*
% Reduction in school level variance	**Contextualised models**	33.1	29.9	No reduction variance increased 2.3	18.8
	Value add models	*43.6*	*No reduction Variance increased -46.7*	*No reduction Variance increased - 1.5*	*38.0*
% Reduction in child level variance	**Contextualised models**	19.4	11.5	14.9	9.8
	Value add models	*31.0*	*26.2*	*14.3*	*7.0*
% Reduction total variance	**Contextualised models**	20.4	12.3	12.8	10.2
	Value add models	*31.9*	*23.4*	*12.7*	*8.5*

Child level variance - differences between individual children

The proportion of variance at the child level accounted for by child, family and the HLE factors ranges from 10 to 19 per cent, being higher for 'Hyperactivity' (19%) and 'Pro-social' (15%) behaviour and lower for 'Self-regulation' (12%) and 'Anti-social' (10%) behaviour. Whilst this represents a significant proportion, the majority of the variation in individual children's behaviour at the end of Year 5 (age 10) is attributable to other factors.

The proportion of child level variance accounted for by prior developmental level in Year 1 varies quite significantly for the four different aspects of social behaviour. The highest reduction in child level variance accounted for by prior developmental level is for 'Hyperactivity' (31%) indicating that a significant proportion of the variation in individual children's hyperactive behaviour at age 10 is attributable to their hyperactive behaviour at age 6. In contrast, a much lower reduction in child level variance is associated with 'Anti-social' behaviour (7%) indicating that little variation in this aspect of social behaviour can be attributed to behaviour at the earlier time point. The comparatively low correlation between Year 1 and Year 5 measures of 'Anti-social' behaviour reported in Section 2, and the age related differences in the expression of this social attribute (also discussed in Section 2) are in line with this finding. This suggests that 'Anti-social' behaviour is more variable over Key Stage 2 than other social behaviours.

Overall, prior developmental level accounts for a greater reduction in child level variance in 'Hyperactivity' and especially 'Self-regulation' than background characteristics, suggesting that for these two aspects of social behaviour, factors intrinsic to the child, but not included in the analyses (e.g. general ability) have a greater role to play in shaping behaviour than factors such as those included in the model (e.g. gender, ethnicity). Reductions in child level variance for 'Pro-social' and 'Anti-social' behaviour are of similar magnitude in the contextualised (background characteristics) and value added (prior developmental level) models, suggesting that for these aspects of social behaviour background characteristics and child specific factors (as manifested in prior behaviour) are of similar importance.

School level variance - differences between schools

Reductions in school level variance reflect the importance of school composition and intake characteristics in accounting for differences in pupil outcomes between schools. When child/family background factors such as ethnicity, FSM, family income etc. are taken into account, differences between schools decrease for 'Hyperactivity' (33%) 'Self-regulation' (30%) and 'Anti-social' (19%) behaviour indicating that for these social/behavioural outcomes a reasonably large proportion of the variation between schools is attributable to differences in school composition. While these proportions of variance are high, they are notably lower than the proportions reported for Reading (94%) and Mathematics (64%) where the majority of the school level variance was attributed to school intake composition.

By contrast, we find that school level variance in the contextualised models for 'Pro-social' behaviour increases, indicating that differences between schools in terms of their impact on 'Pro-social' behaviour become more apparent when intake differences are taken into account.

The proportion of school level variance accounted for by prior developmental level is quite high for 'Hyperactivity' (43%) and 'Anti-social' behaviour (38%). This suggests that a fairly large proportion of the variation between schools on these two social/behavioural outcomes is explained by their pupil's developmental level at an earlier time point in Key Stage 1 (Year 1). Thus, schools that had a high proportion of pupils with raised 'Hyperactivity' and 'Anti-social' scores at the end of Year 1 are likely to have a high overall score for 'Hyperactivity' and 'Anti-social' behaviour at the end of Year 5, and vice versa. That prior 'Anti-social' behaviour accounts for around 40 per cent of the reduction in school level variance while accounting for only 7 per cent reduction in child level variance indicates strong school context (e.g. peer) influences. In other words, children in schools with high incidence of 'Anti-social' behaviour are likely to be more 'Anti-social' even if they had relatively low 'Anti-social' scores at entry to school, whereas children with high 'Anti-social' scores in low incidence schools may be less 'Anti-social' than otherwise expected. Given the small numbers of children per school any interpretations must remain

tentative. It is possible that school climate and processes affect, or are affected by, the 'Anti-social' behaviour of children in different ways. This and other findings will be further explored in the Tier 3 report linking Year 5 outcomes to classroom observations.

In contrast, school variations in the value added models for 'Self-regulation' (46%) and 'Pro-social' behaviour (1.5%) increase, thus emphasising differences in the impact of prior social behaviour between schools. This suggests that differences between schools in promoting self-regulating and 'Pro-social' behaviour in their pupils become more pronounced once prior developmental level is taken into account. Thus, regardless of the proportion of pupils in a school who showed increased positive 'Self-regulation' and 'Pro-social' behaviour at the end of Year 1, certain schools further developed these behaviours in their pupils, while other schools were much less successful in promoting these attributes.

Overall, there are greater changes (increase or decreases) in school level variance accounted for by prior developmental level than by background factors. This is in contrast to the results reported for the cognitive outcomes where background accounted for much more of the school level variance in Reading (94%) and Mathematics (64%) than prior attainment (35% and 50% respectively).

Total variance

Overall, background factors account for around a fifth of the total variance in 'Hyperactivity' in Year 5, with somewhat lower proportions for 'Self-regulation' (12%), 'Pro-social' behaviour (13%) and 'Anti-social' behaviour (10%). Prior developmental level accounts for around 32% of the total variance in 'Hyperactivity' and around 23% in 'Self-regulation'. The proportion of total variance accounted for by prior developmental level in 'Pro-social' (13%) and 'Anti-social' behaviour (9%) is somewhat lower. More of the total variance in 'Self-regulation' and 'Hyperactivity' is accounted for by prior developmental level than by background characteristics.

While a significant proportion of variance is attributable to differences in background and prior developmental level for all social/behavioural outcomes, taken together the predictive power of background characteristics and prior developmental level is weaker for social behaviour (contextulaised-10%-20%; value added 9%-32% reduction in total variance) than for cognitive outcomes at age 10 (22%-28%; and 32%-42%). In contrast, variations in behaviour associated with child level variance are greater for the social behaviour measures (10%-19% reduction) than for cognitive attainment (11%-13%) in the contextualised model. In the simple value added models, reductions in child level variance are greatest for Mathematics (40%), 'Hyperactivity' (31%), and 'Self-regulation' (26%).

Section 6: Pre-school quality and effectiveness and primary school effectiveness

After taking account of the impact of child, family and Home Learning Environment (HLE) characteristics, pre- and primary school characteristics have been entered into the model as additional potential influencing factors on subsequent social/behavioural development. Measures of pre-school quality were collected using the ECERS-E and ECERS-R observational instruments (see Sylva et al., 1999a). Effectiveness indicators for individual pre-school settings were calculated using value added multilevel models of EPPE children's progress from age 3+ to entry to reception in primary school during the pre-school phase of the research. Effectiveness in this context is measured in terms of pre- or primary school settings that promoted progress in positive social skills (e.g. 'Self-regulation'), or help to reduce negative aspects of social behaviour (e.g. 'Hyperactivity'). In addition, independent academic effectiveness indicators for primary school were calculated using National Assessment data sets for all primary schools in England linking KS1 and KS2 results for successive cohorts over three school years 2002-2004 (see Melhuish et al., 2006a).

6.1 The effect of attending pre-school compared to none

At age 10, there are no significant net effects of 'just' attending pre-school (compared to none) on 'Hyperactivity', 'Self-regulation' and 'Anti-social' behaviour. This is in contrast to patterns found at younger ages, particularly at entry to primary school. The comparison in this case is between children who have attended pre-school and 'Home' children (who did not), and the differences are no longer statistically significant. There is, however, a significant net effect of pre-school for 'Pro-social' behaviour. Children who attended pre-school were rated by their primary teachers as showing significantly more 'Pro-social' behaviour than the 'Home' group (ES=0.16) in Year 5. There were no significant differences in relation to type of pre-school attended, number of sessions attended, or the number of months (duration) spent in pre-school. Time spent in pre-school was only statistically significant and positive for 'Pro-social' behaviour and only for those who started under the age of 3 years (ES=0.28). This suggests some longer term benefits in adjustment to school at age 10 years. In contrast to findings at younger ages there are no indications that a longer duration has any continued impact on outcomes such as 'Anti-social' behaviour in KS2.

6.2 The impact of pre-school effectiveness (as measured by value added analyses)

Significant effects on social behaviour at age 10 years are still found for indicators of effectiveness (as measured by value added analysis) and quality of the individual pre-school setting attended. Children who had attended a more effective pre-school setting (in terms of its impact on positive social/behavioural change during the pre-school period up to entry to reception) still show significantly better social/behavioural development five years later.

Separate pre-school indicators of effectiveness were calculated for the different social dimensions at pre-school. These included 'Independence and Concentration', 'Peer-sociability' and 'Co-operation and Conformity'; for these indicators positive values represent an increase in that aspect of positive behaviour. A pre-school indicator for 'Anti-social' behaviour was also created but in this case positive values represent an increase in 'Anti-social' behaviour; for this indicator therefore, greater effectiveness is indicated by low or negative values.

All four indicators of pre-school (value added) effectiveness, in promoting better social/behavioural development, were found to be statistically significant predictors for better scores on later 'Self-regulation' and 'Pro-social' behaviour at age 10 (Figure 6.1 and Figure 6.2) although the effects for 'Pro-social behaviour are somewhat higher. Overall, children who have attended any pre-school regardless of effectiveness show better 'Self-regulation' and more 'Pro-social' behaviour than the 'Home' group. However, attending a highly effective pre-school has a stronger impact on later 'Self-regulation' and 'Pro-social' behaviour.

Children who have attended highly effective pre-schools were rated by their teachers as showing better 'Self-regulation' (ES=0.18 to ES=0.23) and more 'Pro-social' behaviour (ES=0.25 to ES=0.34) relative to the low and medium effectiveness pre-schools. Children in the low and medium effectiveness groups are not significantly different from each other, with the exception of 'Peer- sociability', for which low (ES=0.24) and high (ES=0.25) effectiveness pre-schools are associated with similar levels of 'Pro-social' behaviour.

Figure 6.1
The impact of pre-school effectiveness on 'Self- regulation' behaviour at Year 5

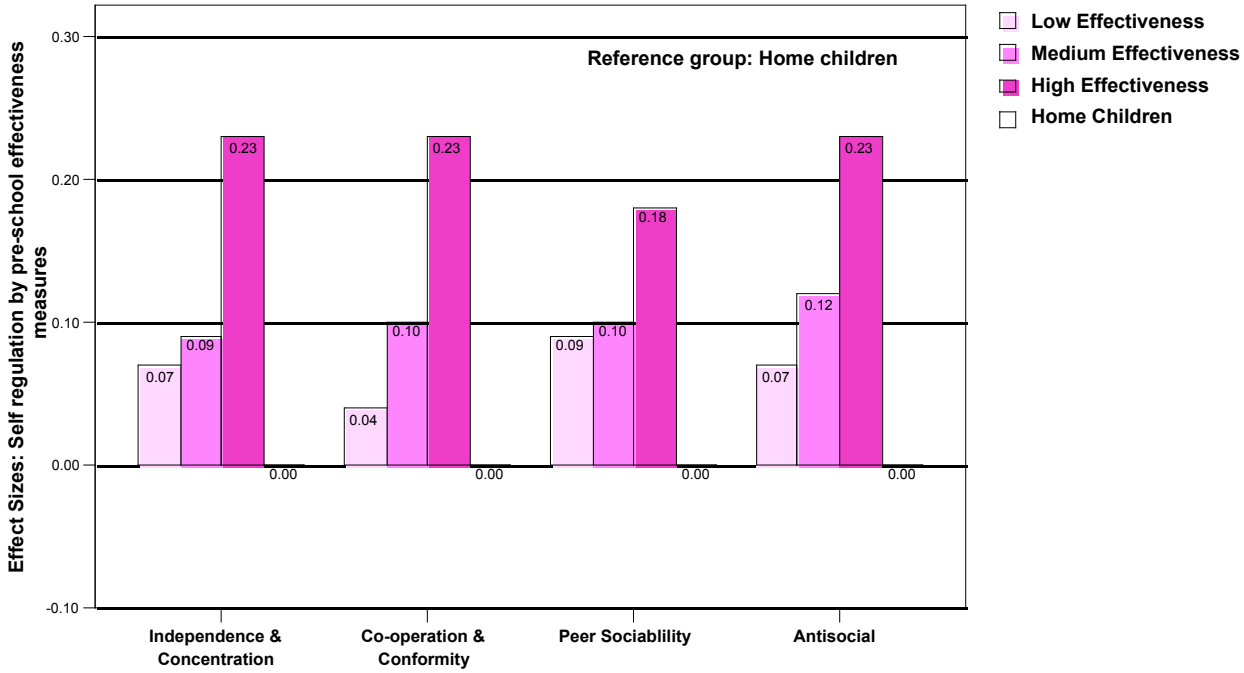
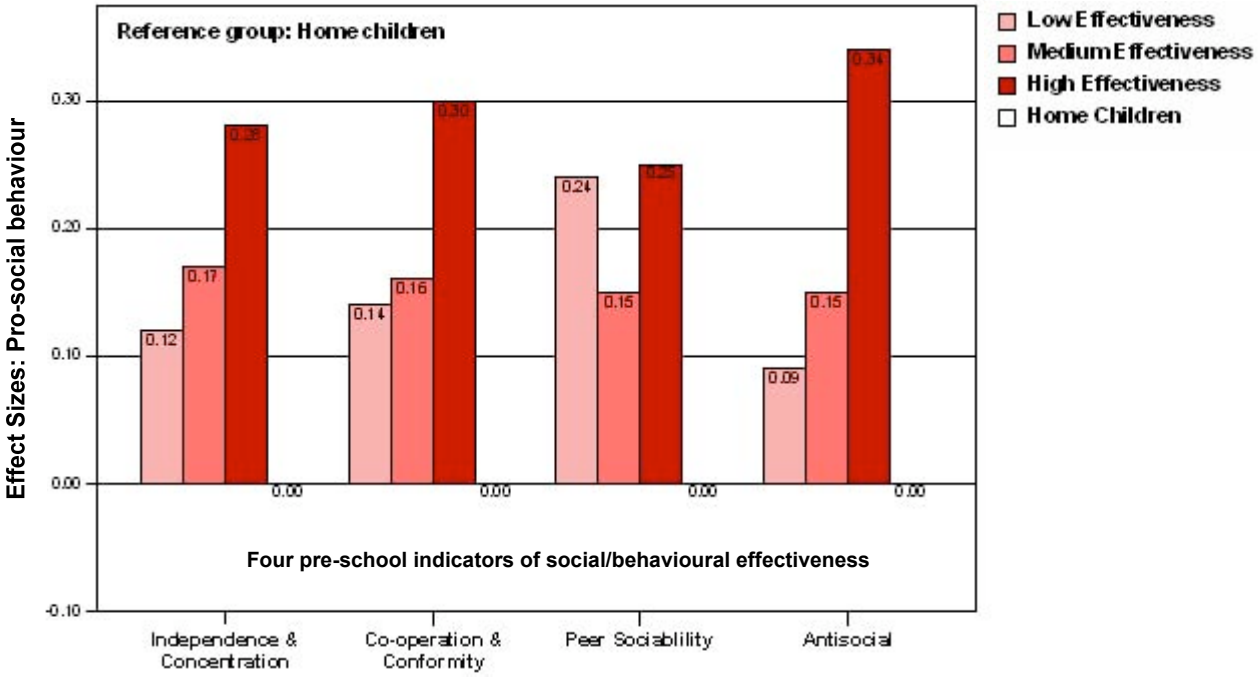
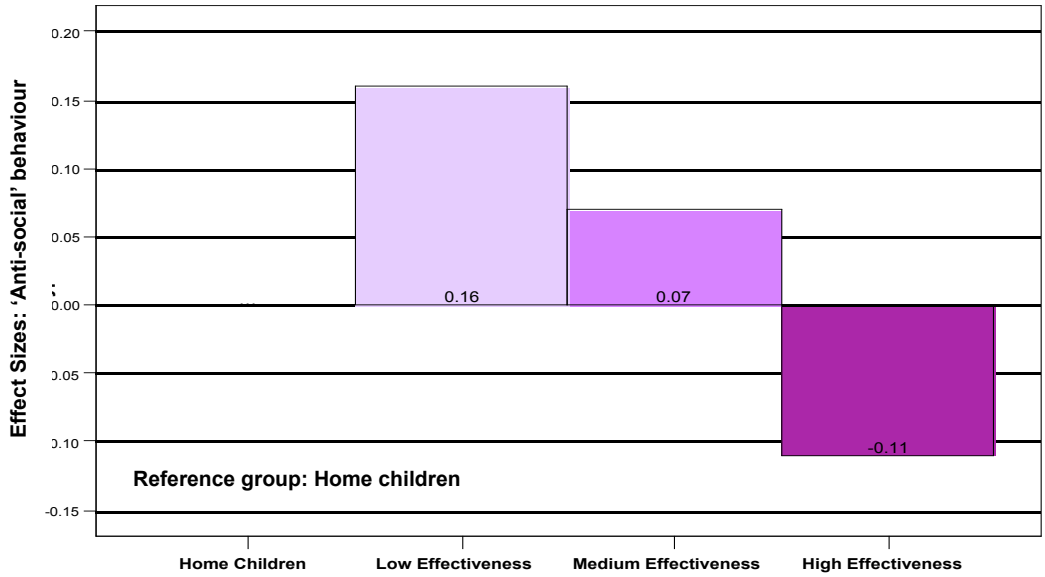


Figure 6.2
The impact of pre-school effectiveness on 'Pro-social' behaviour at Year 5



Interestingly pre-school effectiveness for 'Anti-social' behaviour was significant in predicting reduced 'Hyperactivity in the longer term. Children who had attended a better (high effective) pre-school setting (one that reduced 'Anti-social' behaviour) are still showing better outcomes at age 10 relative to all other groups (ES=-0.11) (see Figure 6.3). This effect is most notable relative to children who have attended low effective pre-schools (in terms of the 'Anti-social' behaviour indicator), where the absolute differences are of the greatest magnitude (ES=0.27; 0.16-[-0.11]). 'Hyperactivity' was also reduced in the 'Home' children relative to children who have attended a low (ES=0.16) or medium (ES=0.07) effectiveness pre-school, which may resonate with the finding of decreased 'Hyperactivity' in children of non-working mothers.

Figure 6.3
The impact of pre-school effectiveness ('Anti-social' indicator of effectiveness) on later 'Hyperactivity'

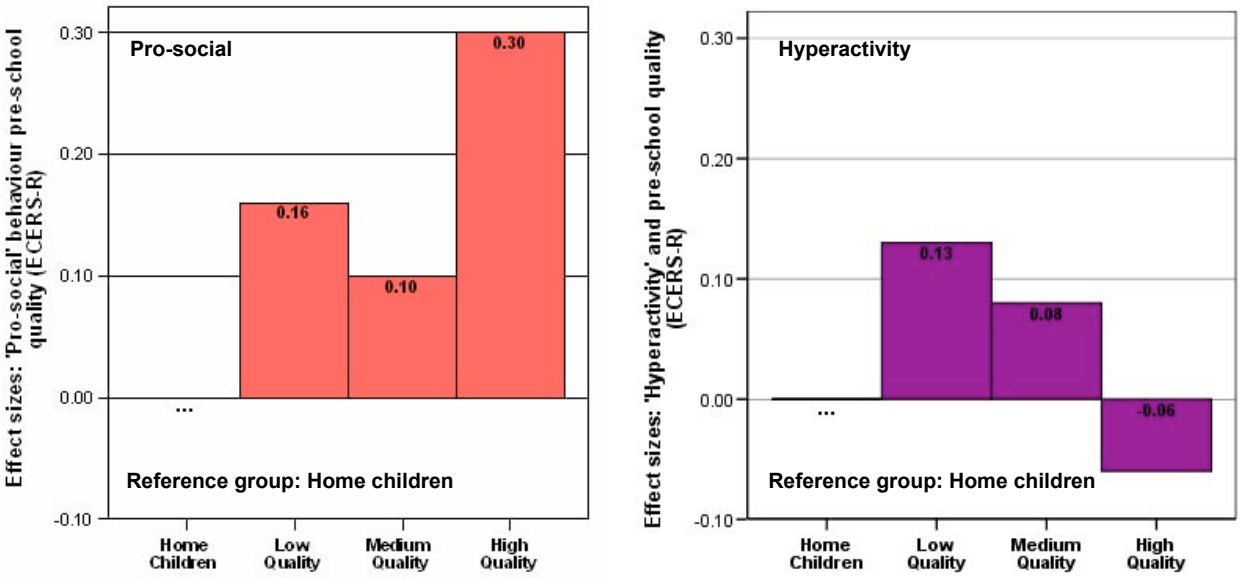


6.3 The impact of pre-school quality

Results from earlier phases of the study indicate the positive impact of higher quality pre-school provision. The sample was divided into groups of children whose pre-school experience could be classified as ranging from no quality (i.e. the 'Home' group, approximately 9% of the sample) through low (14%), medium (54%) and high quality (22%), based on individual pre-school centres' quality scores. The results in Year 5 indicate that the quality of the pre-school attended continues to have an impact on different aspects of social/behavioural development at the end of Year 5. Of the two pre-school measures of quality (ECERS-R and ECERS-E), ECERS-R, which is a measure of quality related to the 'caring' aspects of the pre-school experience, had a stronger relationship with reduced 'Hyperactivity' and better scores for 'Pro-social' behaviour at age 10. In contrast, ECERS-E, which is a measure of quality related to the educational aspects of the pre-school experience, was significantly associated with better later outcomes in 'Self-regulation' at age 10, which is itself linked with attainment. There was no significant effect of the quality of the pre-school attended on 'Anti-social' behaviour at age 10.

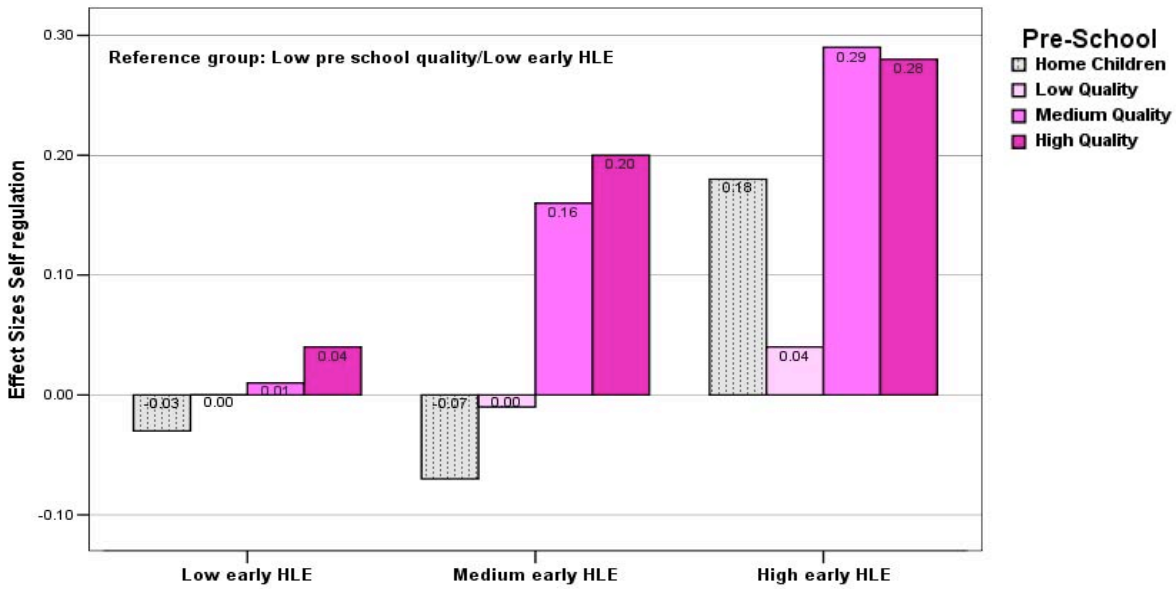
The net effects of quality as measured by ECERS-R were statistically significant for 'Hyperactivity' and 'Pro-social' behaviour (Figure 6.4). At age 10 'Home' children are rated by teachers as displaying significantly lower levels of 'Pro-social' behaviour relative to children who had attended any pre-school, although the difference is most marked for those who attended high quality (ES=0.30). This is in accord with the finding on duration (reported earlier in this section). 'Home' children, however, are rated by teachers as displaying significantly lower levels of 'Hyperactivity' relative to children who have attended low quality (ES=0.13) and medium quality pre-school (ES=0.08). Children who have attended high quality pre-schools are rated by teachers as displaying the highest levels of 'Pro-social' behaviour (ES=0.30) and the lowest levels of 'Hyperactivity' (ES=-0.06).

Figure 6.4a and 6.4b
The impact of pre-school quality (ECERS-R) on 'Pro-social' behaviour and 'Hyperactivity'



'Home' children and children who have attended low quality pre-school (ES=-0.01) (measured by ECERS-E) show poorer 'Self-regulation' at age 10 than children who have attended high (ES=0.15) or medium (ES=0.13) quality pre-school, although the differences are moderate. In previous sections we have shown that the Early years HLE has a very strong and lasting positive effect on children's later 'Self-regulation'. Considering the relatively small differences between the 'Home' and high quality group in 'Self-regulation', we conducted an analysis of the combined effect of the Early years HLE and pre-school quality to further explore the interplay between these two predictors and the relative contribution each predictor makes to 'Self-regulation'. For this analysis the Early years HLE index was regrouped into three categories representing low, medium and high[27]. All the relevant predictors were included in this analysis.

Figure 6.5: The combined impact of pre-school quality and Early years HLE on 'Self-regulation'



[27] There are theoretical reasons in favour of testing the Early years HLE measures because the EPPE research seeks to explore pre-school influences, and identify whether the pre-school attended also shows a positive relationship with subsequent outcomes. If the pre-school period is seen to be of crucial importance to child development, the home environment during these formative years is of particular interest.

As can be seen in Figure 6.5, 'Home' children with high Early years HLE scores (ES=0.18) are doing well relative to 'Home' children with low (ES=-0.03) and medium (ES=-0.07) HLE scores, but they are not doing as well as similar children who have attended medium (ES=0.29) and high (ES=0.28) quality pre-school. The greatest boost in 'Self-regulation' comes from the combined effect of medium or high pre-school quality and high Early years HLE (ES-0.20-0.28).

High Early years HLE alone is not enough; children who have high Early years HLE scores and attend low quality pre-schools still have poorer 'Self-regulation' at age 10 years than children with medium Early years HLE scores who had attended high quality pre-school. Similarly, high quality pre-schools improve 'Self-regulation' but it is not enough by itself; Self-regulating behaviour in children who go to high quality pre-schools still varies as a function of the HLE.

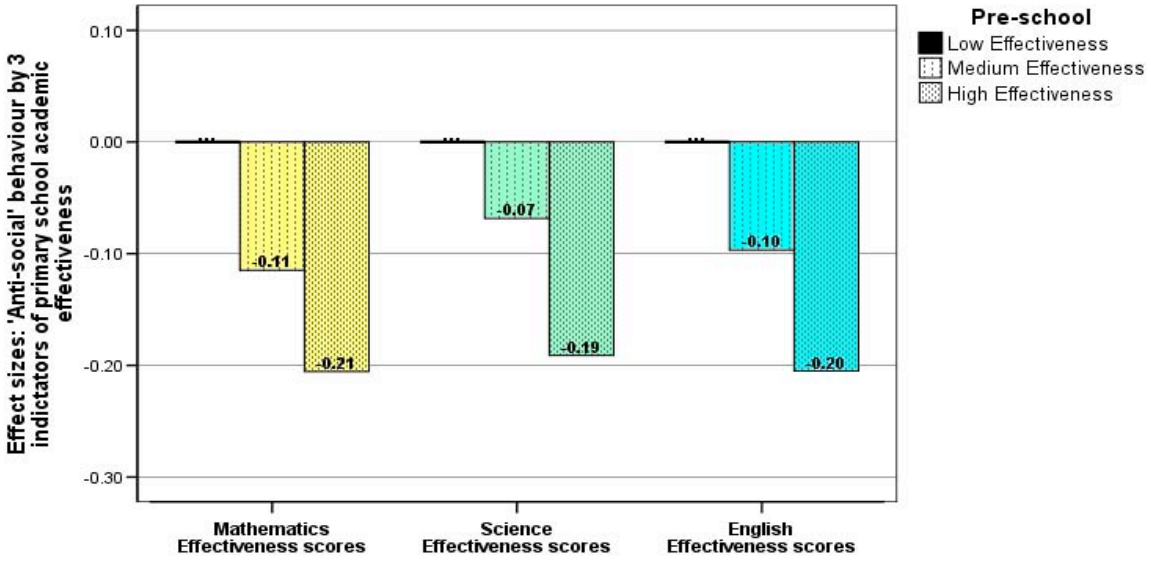
6.4 Primary school academic effectiveness (measured by value added analyses)

Contextualised multilevel analyses presented in Section 3 of this report have shown that school variation in social *behaviour* was strongly reduced after taking account of pupil intake characteristics. This result is not surprising given that a large number of schools in the EPPE 3-11 sample are only attended by one EPPE child (see Section 5) and it should not be concluded wrongly that the characteristics of an individual school do not make any difference in promoting the certain aspects of social/behavioural development.

Analyses were conducted on the EPPE 3-11 data to establish the net impact of primary schools academic effectiveness in terms of social/behavioural development without taking into account any characteristics of pre-school experience in the first instance (but all the other relevant background, HLE and child characteristics). The value added effectiveness indicators for primary schools were calculated using National Assessment data for all primary schools in England linking KS1 and KS2 results; separate indicators were calculated for the different core curriculum subjects English, Mathematics and Science (see Melhuish et al., 2006a; 2006b). These measures are thus independently derived and provide a measure of the academic success of the primary school in promoting its pupils' academic progress over several years. The academic effectiveness of the primary school has already been shown to benefit children's cognitive outcomes at age 10 years (See Sammons et al., 2007). It is also of interest to see whether academic effectiveness has an impact (positive or negative) on social behaviour.

The primary school's academic effectiveness is found to be a significant predictor of the 'Anti-social' behaviour aspect of social/behaviour development (Figure 6.6), however, it is not a significant predictor of the other aspects of social/behaviour development.

Figure 6.6: The impact of primary school academic effectiveness on 'Anti-social' behaviour



High academically effective schools appear to reduce 'Anti-social' behaviour. 'Anti-social' behaviour in children who attend medium and high effectiveness primary schools is significantly lower than it is in children who attend high effectiveness primary schools.

From these findings we conclude that the academic effectiveness of the primary school attended matters for longer term development of 'Anti-social' behaviour. It makes an identifiable and separate contribution to children's later 'Anti-social' behaviour at Year 5, after controlling for child, family and HLE influences. This suggests that school factors are associated with better academic outcomes and these may influence the behavioural climate of the school. School effectiveness research has previously suggested that an important feature of academically effective schools is the creation of a positive and orderly school and classroom climate and these EPPE results are in accord with such research (Teddlie & Reynolds, 2000).

In addition, it is possible that effective primary schools that are able to improve attainment showed an impact on reducing 'Anti-social' behaviour via the creation of such positive school and classroom climates. Also, the associations between school academic effectiveness and 'Anti-social' behaviour may be bi-directional. Prior 'Anti-social' behaviour accounted for twice as much of the reduction in school level variance in 'Anti-social' behaviour at the end of Year 5 (38%) relative to background characteristics (19%). It also accounted for a much greater reduction in school level variance (38%) than in child level variance (7%) (see Section 5 for discussion). Overall, this supports the suggestion that raised overall levels of 'Anti-social' behaviour in a school may result in low effectiveness and that school differences in effectiveness at the end of Year 5 are likely to reflect differences in the distribution of 'Anti-social' behaviour within a school at Year 1. Indeed when the school effectiveness indicators are entered in the complex value added models, which account for prior developmental level as well as background factors, the impact of school effectiveness is diminished.

6.5 An overview of pre- and primary school effects

As children move through primary school, we would expect pre-school influences to lose some of their potency, or to be masked by the more positive or negative effects of the primary schools attended. Nevertheless, pre-school effects are still evident in children's social behaviour five years into primary education.

Simply attending pre-school still makes a difference to children's 'Pro-social' behaviour at the end of Year 5; those children who attended pre-school are rated by their teachers as showing significantly increased levels of 'Pro-social' behaviour relative to children who stayed at home. For other dimensions of social behaviour, the effect of simply attending pre-school has washed out. However, the quality and effectiveness of the pre-school attended still makes a significant difference.

All four indicators of pre-school effectiveness were found to be significant predictors of later 'Self-regulation' and 'Pro-social' behaviour, although the impact on 'Pro'-social' behaviour was somewhat stronger (see Table 6.1). Children's 'Hyperactive' behaviour was linked only with the 'Anti-social' indicator of pre-school effectiveness, indicating that children who have attended centres that were effective in reducing 'Anti-social' behaviour show reduced levels of 'Hyperactive' behaviour at age 10.

Pre-school quality also continues to show significant associations with later social behaviour, but different aspects of quality were found to be associated with different aspects of behaviour. The measures of quality associated with the academic aspects of pre-school education (ECERS-E) was associated with 'Self-regulation', while the measure of quality associated with the 'caring' aspects of pre-school (ECERS-E) was associated with 'Hyperactivity' and 'Pro-social' behaviour.

Table 6.1
Interim summary of pre- and primary school influences on social behaviour

	'Hyperactivity'	'Self-regulation'	'Pro-social'	'Anti-social'
Pre-school*				
Attending			0.16	
Duration in months			0.29	
Sessions				
Pre-school quality				
ECERS-E (Academic/curricular)		0.17		
ECERS-R (Emotional/caring)	0.13(Low quality) -0.06 (High quality)		0.30	
Pre-school Effectiveness				
Co-operation and conformity		0.23	0.30	
Independence & Concentration		0.23	0.28	
Peer sociability		0.18	0.25	
Anti-social	0.16 (Low quality) -0.11 (High quality)	0.23	0.34	
Primary school effectiveness**				
Mathematics				- 0.21
English				- 0.18
Science				- 0.20

*The reference group for all pre-school comparisons is the 'Home' group.
** The reference group for Primary school is 'low effectiveness'
The highest effect sizes are presented in the tables.

'Anti-social' behaviour at age 10 was not significantly associated with either effectiveness or quality of the pre-school attended. 'Anti-social' behaviour, however, was the only social/behavioural dimension to be associated with the academic effectiveness of the primary school attended.

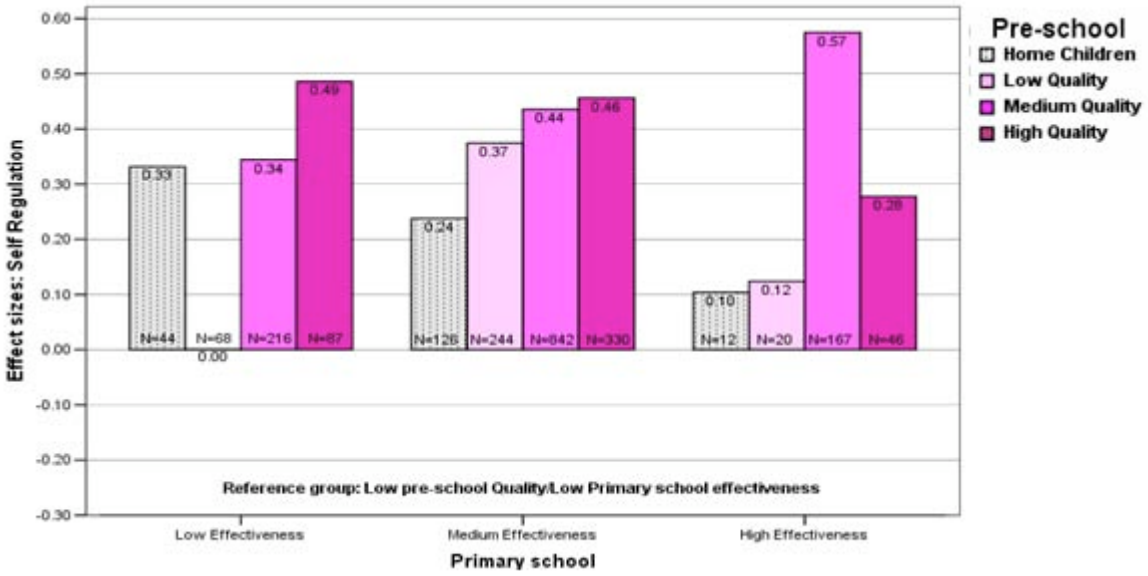
6.6 The combined impact of pre-school quality and primary school academic effectiveness

Primary school academic effectiveness was not a statistically significant predictor of social/behavioural dimensions (apart from 'Anti-social' behaviour) on its own. We sought to establish whether primary school academic effectiveness might be significant in combination with pre-school quality as was found in analyses of children's cognitive outcomes in Year 5 (Sammons et al., 2007).

For these analyses, we combined measures of pre-school quality and indicators of primary school effectiveness to explore whether going to a higher quality pre-school had a protective function if a child went to a less academically effective primary school later on. Similar to the analyses for cognitive outcomes at age 10 years (Sammons et al., 2007), we sought to establish whether children who did not go to pre-school or went to only a low quality pre-school appeared to have benefited more from the academic effectiveness of the primary school in terms of their social/behavioural development. We combined the primary school academic effectiveness indicators with the ECERS-E measure of pre-school quality, which is also a measure of *academic* quality, and tested these measures in the full contextualised models controlling for all relevant background factors. Results are shown in Figures 6.7-6.10.

The overall impact of the combination of pre-school quality and primary school effectiveness was found to be greater for 'Self-regulation' and 'Pro-social' behaviour than for 'Hyperactivity' and 'Anti-social' behaviour. This is consistent with the findings that 'Self-regulation' is closely correlated with attainment measures at all ages.

Figure 6.7
The impact of pre-school quality and Primary school effectiveness on 'Self-regulation'



For children who attend low and medium effective primary schools, higher quality pre-school (compared with low quality or no pre-school) was significantly related to increased 'Self-regulation' (Figure 6.7) and better 'Pro-social' behaviour (Figure 6.8). Attending a medium quality pre-school also had a more positive effect on 'Self-regulation' and 'Pro-social' behaviour relative to the 'low quality' and 'Home' groups within each of the primary school effectiveness categories. Across the effectiveness indicator, positive social behaviour increased as a function of increasing primary school effectiveness for both social dimensions.

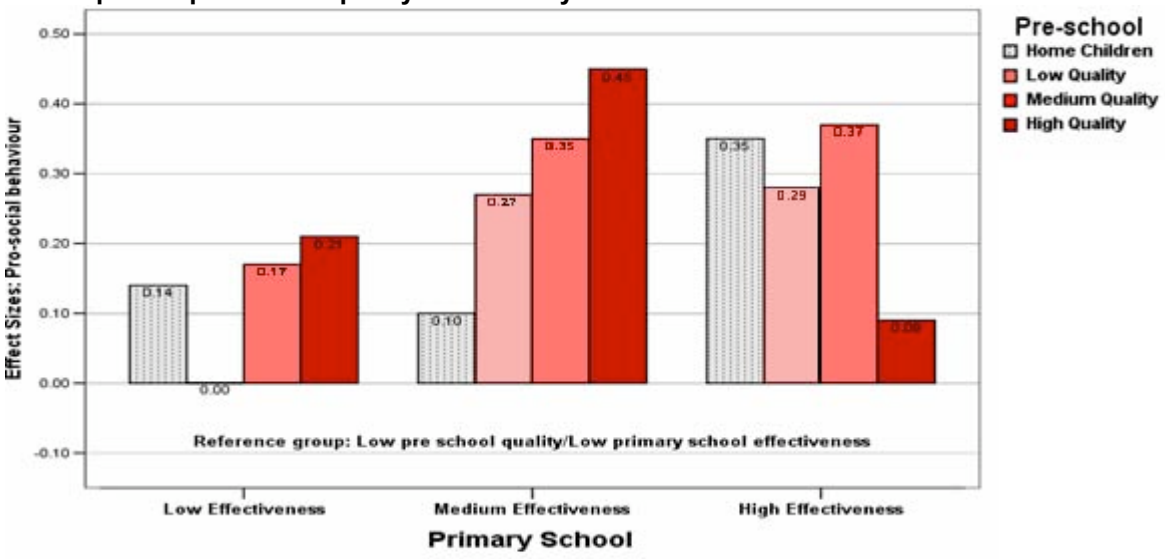
Contrary to the general pattern for children who had attended high quality pre-school and a high effective primary school both 'Self-regulation' and 'Pro-social' behaviour outcomes were not significantly better than those who had attended medium quality pre-school. Earlier in Section 6.3 we presented results from an analysis of the combined impact of pre-school quality and Early years HLE on 'Self-regulation' showing that children with low Early years HLE scores who have attended high quality pre-school show low levels of 'Self-regulation' at age 10 (figure 6.5). The high quality/high effectiveness group consists of proportionally less children with high HLE (28%) relative to the rest of the sample (43%) and this may have contributed to the reduced levels of 'Self-regulation' (as well as 'Pro-social' behaviour) in this group, since the interaction between Early years HLE and pre-school quality is not controlled for in these analyses.

'Home' children who attend low or medium effectiveness primary schools are not significantly different in terms of their 'Self-regulation' and 'Pro-social' behaviour. For both social outcomes the 'Home' children show more positive social behaviour relative to the low quality/low effectiveness pupil group and reduced positive social behaviour relative to the low quality/medium effectiveness group. However, for 'Home' children attending highly effective primary schools, the patterns of influence are different for 'Self-regulation' and 'Pro-social' behaviour.

'Pro-social' behaviour in 'Home' children who attend high effectiveness primary schools is on a par (ES=0.35) with pre-school children who attended a medium quality pre-school (ES=0.37). They were also doing better than pre-school children who attended low quality pre-school school in the same (high) effectiveness primary school category (ES=0.28).

'Pro-social' behaviour in 'Home' children who attend high effectiveness primary schools is also better than 'Pro-social' behaviour in 'Home' children who attend low (ES=0.14) or medium (ES=0.10) effectiveness primary schools. In contrast, 'Self-regulation' in the same group of children (i.e. 'Home'/high effectiveness) (ES=0.10) is the same as 'Self-regulation' in pre-school children who attended a low quality pre-school and high effectiveness primary (ES=0.10).

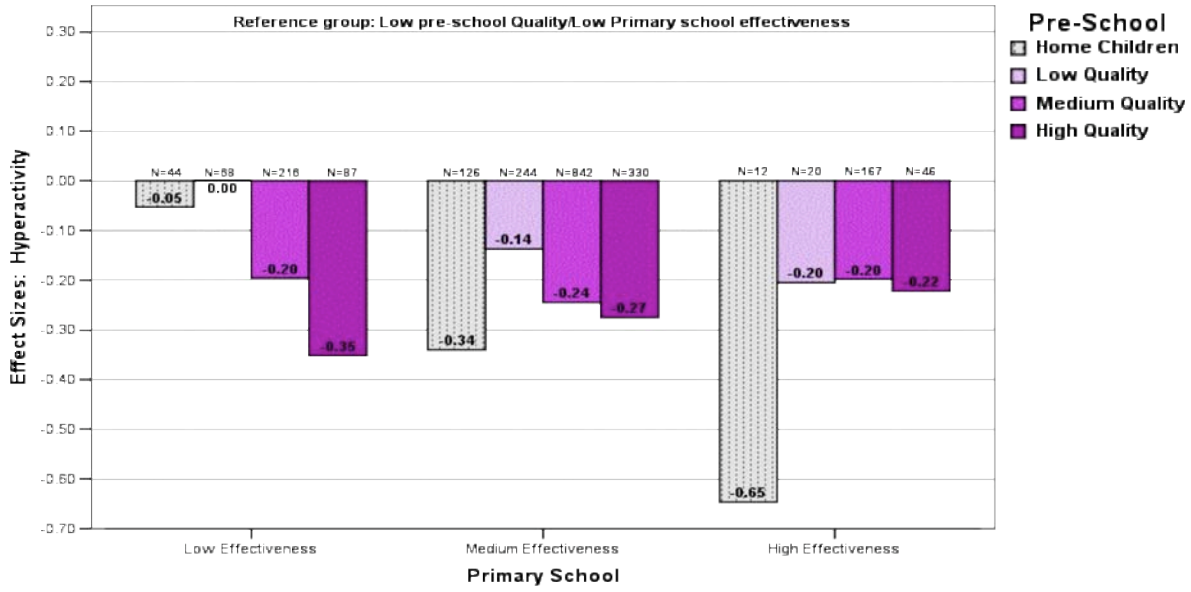
Figure 6.8
The impact of pre-school quality and Primary school effectiveness on 'Pro-social' behaviour



'Self-regulation' in the 'Home'/high effectiveness group was notably lower than for pre-school children who attended medium quality pre-school and high effectiveness primaries (ES=0.57). It is also lower than 'Self-regulation' in 'Home' children who attended low (ES=0.33) or medium (ES=0.24) effectiveness primary school. Overall, this pattern indicates that 'Self-regulation' in 'Home' children tends to be reduced if they attend highly effective primary schools. This finding is puzzling and will be explored later in this section.

The impact of Primary school effectiveness on 'Home' children is of a significantly greater magnitude for 'Hyperactivity' (Figure 6.9) and 'Anti-social' behaviour (Figure 6.10). 'Home' children who go to low academically effective primary schools have significantly higher 'Hyperactivity' and 'Anti-social' scores at age 10 relative to nearly all other children. 'Home' children who go to high academically effective primary schools by contrast have the lowest 'Hyperactivity' (ES=-0.65) and 'Anti-social' scores (ES=-0.37) of all other categories showing them to be the least hyperactive and the least 'Anti-social' of all other children.

Figure 6.9: The impact of pre-school quality and Primary school effectiveness on 'Hyperactivity'



The impact of school effectiveness on the 'Home' group is most pronounced for 'Anti-social' behaviour where the difference between attending a low effectiveness and a high effectiveness school is the largest observed (ES=0.93; 0.56-[-0.37]).

Figure 6.10
The impact of pre-school quality and Primary school effectiveness on 'Anti-social' behaviour

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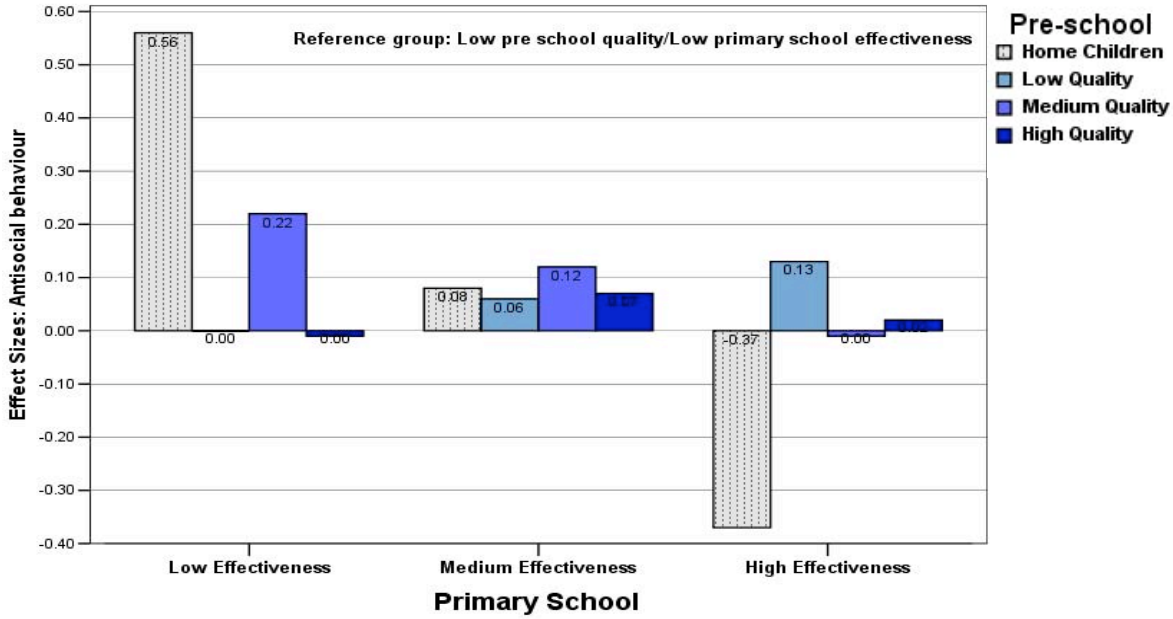

Overall, the combined effects of pre-school quality and primary school academic effectiveness are most strongly associated with 'Self-regulation' and 'Pro-social' behaviour (see Table 6.2). It is interesting that neither 'Self-regulation' nor 'Pro-social' behaviour was significantly associated with primary school effectiveness. The pre-school (academic) quality was significant only for 'Self-regulation' and the effects were of moderate size, yet when pre-school quality and primary school effectiveness are combined, the impact on behaviour is significant and distinctively large.

Taken together these findings suggest that pre- and primary school effects are additive, and that the 'masking' of pre-school effects referred to earlier in this section may be bi-directional. Thus,

primary school influences may not only mask pre-school effects but may also be masked by the positive or negative effects of the pre-schools that children had attended, such that high quality pre-schools may attenuate negative effects of primary schools and low quality pre-schools may reduce positive effects.

Indeed, high quality pre-school is found to offer protection against low academic effective primary schools, it is related both to reduced 'Hyperactivity' and increased 'Self-regulation' and 'Pro-social' behaviour. The effects of pre-school quality in high academic effectiveness primary schools are diminished for 'Hyperactivity' but not for 'Self-regulation' or 'Pro-social' behaviour (with the exception of the high quality group discussed earlier in this section).

Pre-school quality does not seem to play much of a role in predicting future 'Anti-social' behaviour at age 10. 'Anti-social' behaviour was the only social/behavioural dimension that was significantly associated with primary school academic effectiveness (Section 6.4). The analysis of the combined impact of pre-school quality and primary school effectiveness mirrors the 'main effect' of primary school effectiveness on 'Anti-social' behaviour in the medium pre-school quality group, which is the largest in the sample, and in the 'Home' group for whom the effect is large and independent of pre-school influences.

Table 6.2
The combined impact of pre-school quality and primary school effectiveness on social/behavioural outcomes

Primary school	Pre-school	'Hyperactivity'	'Self-regulation'	'Pro-social'	'Anti-social'
Low Effectiveness	**'Home' n=44**	-0.05	0.33	0.14	0.56
	Low quality n=38	0	0	0	0
	Medium quality n=210	-0.20	0.34	0.17	0.22
	High quality n=87	-0.36	0.49	0.21	0
Medium Effectiveness	**'Home' n=126**	-0.34	0.24	0.10	0.08
	Low quality n=244	-0.14	0.37	0.27	0.06
	Medium quality n=842	-0.24	0.44	0.35	0.12
	High quality n=330	-0.27	0.46	0.45	0.07
High Effectiveness	**'Home' n=12**	-0.65	0.10	0.35	-0.37
	Low quality n=20	-0.20	0.12	0.28	0.13
	Medium quality n=167	-0.20	0.57	0.37	0
	High quality[#] n=46	-0.22	0.20	0.09	0.02

Reference group: Low pre-school quality – Low primary school effectiveness
[#]The high effectiveness/ high quality group is small in size and consists of proportionally fewer children with high HLE (28%) relative to the rest of the sample (43%) and this may have contributed to the anomalous results for this particular group, since the interaction between early years HLE and pre-school quality is not controlled for here.

The group of 'Home' children who attend high effectiveness primary schools are rated by their teachers as showing higher levels of 'Pro-social' behaviour relative to most other groups, they are also rated as being the least 'Hyperactive' and the least 'Anti-social' of all other children, yet their level of 'Self-regulation' is the lowest in the sample. The number of children in this group may be too small (n=12) to draw generalised conclusions, yet when compared with the group of 'Home' children who attend low effectiveness primary schools, the patterns are reversed. 'Home' children in low effectiveness schools show the highest levels of 'Hyperactive' and 'Anti-social'

behaviour. They also show poorer 'Pro-social' behaviour when compared to most other groups, but in terms of 'Self-regulation', they do not do as poorly as might have been expected. This indicates once again that 'Self-regulation' varies independently to the other three social/behavioural dimensions.

The 'Home' group is different from all the rest because in this group the primary school effects are untainted by pre-school influences. For this group we found (as expected) a linear reduction in negative social behaviour (reduced 'Hyperactivity' and 'Anti-social' scores) as a function of increasing primary school effectiveness, but also an unexpected linear reduction in 'Self-regulation' as a function of increasing effectiveness and a non linear relationship with 'Pro-social' behaviour. Recall from Section 5 that prior developmental level reduced school level variance for 'Hyperactive' and 'Anti-social' behaviour, but increased school level variance for 'Pro-social' behaviour and especially for 'Self-regulation', indicating that for these aspects of behaviour, differences between school increase when children's developmental level on entry to school is taken into account.

When we examine primary school academic effectiveness in relation to social/behavioural development it would seem that the relationship between negative social behaviour and level of effectiveness is reciprocal (mutual influence). As long as there aren't too many interruptions to prevent schools from implementing well established strategies, children in their school will do well academically. The relationship between positive social behaviour and primary school academic effectiveness is more complex. The patterns associated with the 'Home' group appear to suggest that pre-schools have a greater role to play in promoting 'Self-regulation' and 'Pro-social' behaviour than primary schools. On the other hand, the increase in school level variance when prior developmental level is taken into account indicates that some primary schools have quite a significant impact on children's positive social behaviour, and especially 'Self-regulation', while some do not. However, the extent to which this is associated with primary school academic effectiveness remains an open question. The findings indicate that overall strong links between 'Self-regulation' and cognitive attainment on the child level, and it would, therefore, be reasonable to assume that such associations exist on a school level too, but further analyses would be required to explore such links.

Section 7: Summary and Conclusions

The earlier EPPE research studied young children's cognitive and social/behavioural development from age 3 to 7 years. It pointed to important differences in attainment related to child, family and Home Learning Environment (HLE) characteristics. It also identified significant pre-school effects. These were most marked at entry to primary school where it was shown that pre-school (particularly high quality and longer duration) gave children a better start to school (Sylva et al., 2004). However, benefits also remained evident during Key Stage 1 (KS1) in 'follow-ups' of child outcomes at ages 6 and 7 years; although the pre-school influence was somewhat less strong. In addition the first phase of the research pointed to the benefits of pre-school in reducing the 'risk' of SEN (Sammons et al., 2002a; 2002b; 2004c).

This report focuses on children's social/behavioural development at age 10 and provides a detailed analysis of differences in four important dimensions of social behaviour for different groups of pupils in the sample, demonstrating the influence of child, family and Home Learning Environment (HLE) on such outcomes and comparing changes over time from age 6 to age 10. The results complement those reported on cognitive outcomes reported separately (Sammons et al., 2007) and the findings have informed the Interim and Final Report of the recent Equalities Review (see http://www.theequalitiesreview.org.uk/).

As at younger ages information about social behaviour was collected from teachers' ratings of individual child profiles. The profiles identified a number of separate dimensions of social behaviour; the four most important reported here are 'Hyperactivity', 'Self-regulation', 'Pro-social' behaviour and 'Anti-social' behaviour. 'Self-regulation' is the social/behavioural trait found to be most closely associated with Reading and Mathematics attainment at age 10.

7.1 Background influences and the Home Learning Environment (HLE)

There are significant differences in social/behavioural development at age 10 years related to pupils' background characteristics. Taken together such factors account for less of the variance in pupils' scores for certain social/behavioural dimensions than others. Background influences are stronger predictors for 'Hyperactivity' and 'Self-regulation'. A summary of the effects associated with all predictor variables for the four social/behavioural outcomes is presented in Table 7.1 below.

The strongest net effects for 'Self-regulation' are for measures of Early years HLE and need for EAL support, followed by father's qualification levels, family earned income and developmental problems reported by parents at entry to the study. Gender effects have the strongest impact on 'Hyperactivity' and 'Pro-social' behaviour.

The Early years Home Learning Environment (HLE) was an important predictor of better child outcomes at earlier time points (ages 3, 5, 6 and 7). The current findings again draw attention to the importance of the quality of the Early years HLE for children's social behaviour at age 10. These results are in line with those already reported for academic attainment at this age. It is likely that parental interactions that contribute to a 'good' HLE promote children's overall development in the longer term. The implication of this for policy makers is that more attention be given to ways to promote and support positive parenting. This can have significant benefits to future generations of children and may prove cost effective (in terms of reducing the risk of later SEN at primary school; see Grabbe et al., forthcoming).

In addition, we explored the way the Early years HLE interacts with pre-school quality in shaping social/behavioural development at age 10. This is the first time such interactions have been explored and the results demonstrate that for the most vulnerable groups of children (those at greater risk of poor developmental outcomes) taken together both high quality pre-school and a better Early years HLE help improve their outcomes in the longer term. In other words, to have a high Early years HLE on its own is not as beneficial as having a high Early years HLE and experiencing medium or high quality pre-school. However, if a child experiences a low Early years HLE, even high quality pre-school has little impact.

Table 7.1
Summary of background factors and pre- and primary school influences on social behaviour
(Only the largest effect sizes are reported; for details see earlier tables – comparison group in brackets)

	'Hyperactivity'	'Self-regulation'	'Pro-social'	'Anti-social'
Child Factors				
Gender (girls)	0.68	- 0.19	-0.63	0.32
Birth weight (very low)		- 0.22		
Siblings (singletons)	-0.11			
Ethnicity (white UK)	0.35			0.39
Developmental problems (none)		- 0.25		
Behavioural problems (none)	0.51		- 0.21	0.22
Health problems (none)	0.56			
Need of EAL support	0.26	- 0.53		
Family factors				
Mother's qualifications (none)	- 0.36	0.21	0.19	- 0.16
Father's Qualifications (none)		0.30		
Father absent		0.09		0.15
Marital Status (married)	0.23			
Maternal employment (employed)	- 0.15			
Family earned income (none)	- 0.33	0.25	0.24	
FSM	0.18	- 0.17	- 0.15	0.23
Home Learning Environment				
Early years HLE (low)		0.49		
Home computing (high)			0.22	
Enrichment outings (high)	- 0.25			
One to one interactions (high)				0.18
Expressive play (high)	0.20		- 0.24	- 0.17
Pre –school*				
Attending				
Duration in months			0.29	
Sessions				
Pre-school quality				
ECER-E		0.17		
ECER-R	0.13(Low quality) -0.06 (High quality		0.30	
Pre School Effectiveness				
Co-operation and conformity		0.23	0.30	
Independence & Concentration		0.23	0.28	
Peer sociability		0.18	0.25	
Anti-social	0.16 (low quality) -0.11 (High quality)	0.23	0.34	
Primary school effectiveness**				
Mathematics				- 0.21
English				- 0.18
Science				- 0.20

*The reference group for all pre-school comparisons is the 'Home' group.
** The reference group for Primary school is 'low effectiveness'

7.2 Educational experiences

The importance of educational experiences in shaping social/behavioural development at age 10 years has been highlighted in Sections 6. We have shown that some pre-school influences, identified as important for child outcomes at earlier time points (ages 5, 6 and 7) still remain evident after five years in primary school. However, at this stage just having attended a pre-school is not sufficient to ensure better social/behavioural development in the longer term, except for 'Pro-social' behaviour. Interestingly, for 'Pro-social' behaviour an earlier start at pre-school (2 years or under) continues to show positive benefits on 'Pro-social' behaviour at age 10 years while 'Home' children remain at a disadvantage. However, further analyses indicate that it is the quality and effectiveness of the pre-school attended that generally predict better social/behavioural development. Poor quality pre-school, however, does not improve social/behavioural development at age 10 years, whereas medium and especially high quality provides benefits for most outcomes. Children who attend high quality pre-school show the strongest advantage. However, there are some indications that attending poor quality pre-school may adversely affect certain aspects of social/behavioural development.

In addition, the effectiveness of the pre-school centre attended, in terms of promoting better social behaviour at entry to primary school, shows a positive impact on later social/behavioural development at age 10 years for children who attended pre-school in comparison with the 'Home' group. It is particularly striking that attending a pre-school identified as reducing 'Anti-social' behaviour at a younger age (between 3 and 5 years) still shows a benefit in terms of reduced hyperactive behaviour at age 10.

The findings on both quality and effectiveness of pre-schools and their longer term benefits on social/behavioural development at age 10 complement and extend the findings already reported on cognitive outcomes in Reading and Mathematics for this sample. It appears therefore that high quality, effective pre-school offers benefits to all round development during Key Stage 2.

Table 7.2 The combined impact of pre-school quality and primary school effectiveness on social/behavioural outcomes*

		'Hyperactivity'	'Self-regulation'	'Pro-social'	'Anti-social'
Primary school	**Pre-school**				
Low Effectiveness	**'Home' n=44**	-0.05	0.33	0.14	0.56
	Low quality n=38	0	0	0	0
	Medium quality n=210	-0.20	0.34	0.17	0.22
	High quality n=87	-0.36	0.49	0.21	0
Medium Effectiveness	**'Home' n=126**	-0.34	0.24	0.10	0.08
	Low quality n=244	-0.14	0.37	0.27	0.06
	Medium quality n=842	-0.24	0.44	0.35	0.12
	High quality n=330	-0.27	0.46	0.45	0.07
High Effectiveness	**'Home' n=12**	-0.65	0.10	0.35	-0.37
	Low quality n=20	-0.20	0.12	0.28	0.13
	Medium quality n=167	-0.20	0.57	0.37	0
	High quality# n=46	-0.22	0.20	0.09	0.02

*Reference group: Low pre-school quality – Low primary school effectiveness

#The high effectiveness/ high quality group is small in size and consists of proportionally fewer children with high HLE (28%) relative to the rest of the sample (43%) and this may have contributed to the anomalous results for this particular group, since the interaction between early years HLE and pre-school quality is not controlled for here.

The academic effectiveness of the primary school attended (calculated independently using value added analysis) promoted better child outcomes in terms of 'Anti-social' behaviour for those who attended the more academically effective primary schools. In addition, the academic effectiveness of the primary school attended also had a significant impact on social/behavioural development at age 10 years, when studied in interaction with pre-school quality. For 'Home' children (who did not attend pre-school), the academic effectiveness of the primary school attended helped to promote better social/behavioural development in Year 5 for two outcomes (reduced 'Hyperactivity' and 'Anti-social' behaviour); for those who attend a high academic effectiveness primary school there is a particular boost. Moreover, attending high quality pre-school seems to act as a protective factor for children who went on to attend a less academically effective primary school.

Overall it seems that primary school academic effectiveness is particularly associated with reductions in negative social behaviour ('Hyperactive' and 'Anti-social') while pre-school influences are more strongly related to improvements in positive social behaviour ('Self regulation' and 'Pro-social').

7.3 Implications

In line with findings for cognitive outcomes at age 10 (reported separately in Sammons et al., 2007) the present findings further support the conclusion that good (high quality and effective) pre-school still matters. There is new evidence of continuing pre-school effects in terms of better social/behavioural development. Taken together the results indicate that attending pre-school has long term benefits on 'Pro-social' behaviour, in contrast to other outcomes it appears that an earlier start (2 or under) is linked with better outcomes in terms of 'Pro-social' behaviour at age 10. There are no longer any significant differences related to an earlier start in terms of raised scores for 'Hyperactivity' or 'Anti-social' behaviour for this sample. However, for other aspects of children's behaviour at age 10, differences in the effectiveness of pre-school attended contribute to better outcomes in the longer term rather than just attending or not attending a pre-school setting. Children who attended pre-schools that had the most positive impact on social/behavioural development before starting primary school show better behavioural profiles across the board at age 10. By contrast, turning to quality we find that those children who attended low quality pre-school no longer show benefits and poor quality pre-school is associated with poorer social/behavioural development in some areas. Thus, quality and effectiveness of pre-school are especially relevant for later benefit.

The implications of this are clear; improving the access to high quality and more effective pre-school is likely to benefit children in the longer term by improving social adjustment to school and promoting cognitive development. These benefits will contribute to both raising standards and inclusion agendas.

Primary school academic effectiveness (calculated independently by value added analyses of National Assessment data for matched pupil cohorts KS1 to KS2 across three years) is also a significant influence, in combination with pre-school quality. Those who attended more academically effective primary schools tend to show better cognitive attainment and better social/behavioural development at age 10.

The findings suggest that the academic effectiveness of the primary school is important in reducing 'Anti-social' behaviour, and that this may be especially relevant for the 'Home' group of children at age 10. It appears that the processes and organisational features of more academically effective schools may be also associated with reducing 'Anti-social' behaviour, perhaps by influencing school/classroom climate and culture. There is no evidence of any negative impact of academic effectiveness on social/behavioural development, and this is important because some have claimed that a focus on academic progress may lead to poorer outcomes in other aspects of development. The EPPE research evidence at age 10 does not support such claims. There may well be reciprocal effects between primary school academic effectiveness and 'Anti-social' behaviour.

The present research provides new evidence concerning the combined effects of pre-school and primary school in shaping children's later educational outcomes at age 10 years. Raising the effectiveness and quality of both will help to improve children's all round development

We can conclude that no one factor is the key to enhancing educational outcomes in the longer term across Key Stage 2. It is the combination of experiences over time that matters. The child who has a better Early years HLE, goes to a high quality, effective pre-school setting and who then goes on to attend a more academically effective primary school appears to have a combination of 'protective' experiences that tend to reduce the risk of low attainment and also similarly tend to benefit social/behavioural development. High quality and more effective pre-schools seem to support better outcomes in longer term cognitive and social/behavioural domains. Likewise, we also find that a higher quality Early years HLE benefits both cognitive and social/behavioural development throughout pre-school and primary school.

The implication of these findings is that policy should promote strategies to support improvements in Early years HLE, especially for vulnerable groups, and also work to improve the quality and effectiveness of pre-school provision. Such pre-schools are well placed to identify children who may need extra support if they do not experience a high quality HLE and could be guided to work with parents to improve HLE. Ways to improve the provision in poorer quality pre-schools need to be given a high priority, since poor quality provision does not appear to offer long term benefits in improved child outcomes.

The finding that both social/behavioural development and Reading and Mathematics attainment can be boosted by attending an academically more effective primary school has important messages for the achievement of the Every Child Matters agenda, because it shows that the promotion of better academic outcomes is not at odds with the development of better social/behavioural development. The focus on supporting the improvement of primary schools identified as less effective and of lower quality remains important given other findings from classroom observations that quality tends to vary widely and may be lower in some schools serving more disadvantaged communities (Sammons et al., 2006).

As with conclusions related to cognitive outcomes the findings again suggest that, in order to help reduce the achievement gap for multiply disadvantaged groups, actions to improve their HLE, pre-school and primary school experiences will be needed in concert, since improvements to any one in isolation would be insufficient to boost outcomes on its own. In addition, it is likely that specially targeted interventions for children who are identified as well behind their peers in cognitive or social/behavioural profiles at the start of primary school will also be necessary to prevent a widening of the gap during KS1 and KS2. This has implications for baseline assessment and SEN identification and the development of well founded, evidence based interventions.

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Appendix 2: Details of Selected Measures used in the EPPE Study

A.2.1 The Multiple Disadvantage Index

The Multiple Disadvantage Index was developed as part of the Early Years Transition & Special Educational Needs (EYTSEN) Project which focuses on the identification of children 'at risk' of SEN). An index was created based on 10 indicators in total: three child variables, six parent variables, and one related to the Early years Home Learning Environment (HLE). All the variables were chosen because they related to low baseline attainment when looked at in isolation. Where indicators were closely related, such as first language and ethnic groups, only the most significant was included.

Child variables

- First language: English as an additional language (EAL)
- Large family: 3 or more siblings
- Pre-maturity / low birth weight

Parent variables

- Mother's highest qualification level: no qualifications
- Social class of father's occupation: Semi-skilled, unskilled, never worked, absent father
- Father not employed
- Young Mother (Age 13-17 at birth of EPPE child)
- Lone parent
- Mother not working / unemployed
- Low Early years Home Learning Environment (HLE)

The EPPE Project - Children's activities at home

Does X have?
- A regular bedtime
- Rules about watching TV/videos
- How often does X watch TV/videos in a typical weekday?

How many days in a typical week has X?
- Played with friends at home

Does X have friends home to play?
- Played with friends elsewhere

Does s/he go anywhere else to play?
- Gone shopping with you
- Gone on visits to friends or relatives
- Sat down and eaten a meal with the whole family together

Does anyone at home ever read to X? If yes, how often?

Does anyone at home ever take X to the library? How often?

Does X ever play with letters or numbers? How often?

Does X ever paint and draw at home? How often?

Have you ever tried to teach X? ABC/ The Alphabet/ letters?
Numbers? How often?
Any songs/poems? How often?
Can you tell me which?
Any nursery rhymes ? How often?
Can you tell me which?

The Effective Provision of Pre-School Education 1997

A.2.2 The Key Stage 1 Home Learning Environment (HLE)

HLE Factors and the items loading on these factor:

- **Home Computing**
  - The Child plays on computer by themself.
  - Respondent plays computer games with the child.
  - Respondent uses computer with the child in educational ways.

- **Parent-Child Enrichment outings/activity outside home.**
  - Respondent visits library with the child.
  - Respondent does sport/physical activity with the child.
  - Respondent goes on educational visits with the child.

- **Parent-child one-to-one interactions at home**
  - Respondent plays with the child using toys/games/puzzles.
  - Respondent reads to the child.
  - Respondent listens to the child read.

- **Expressive play**
  - The Child plays ‘make believe’ or pretend games.
  - The Child paints/draws/makes models.
  - The Child enjoys dance music and movement.

Appendix 3: Methodology for the social/behavioural analysis

Overall, questionnaires were not returned for 651 children. Of those children for whom the questionnaire was returned, 2079 had a complete set of scores for the social/behavioural items, i.e., a valid value for all 56 items. The remaining children (441) had one or more missing values in the 56-item set. For these 441 cases missing values were substituted with the child's own mean.

The social/behavioural instrument consists of a wide range of items (56) rated on a 3-point scale, (1 = not true; 2 = somewhat true; 3 = certainly true) some of which are measuring more adaptive social behaviour, e.g., 'considerate of other peoples feelings', and some measuring maladaptive behaviour e.g., 'has many fears, easily scared'. For the purpose of the missing substitution analysis, the items were divided into two sub-groups; of
1. Adaptive (29) and
2 Maladaptive behaviour (26items) and questions were substituted with the child's mean of items belonging to the same sub-group. One item was substituted with the overall mean as it was considered neutral 'gets on better with adults than with children'. The items with the missing substitution were then used for all subsequent factor analysis.

A number of data reduction methods were applied to the data, these included Principal Components Analysis (PCA) with varimax (orthogonal) rotation and PCA with promac (opaque) rotation. The exploratory analysis yielded 8 factors explaining 54.9% of the variance with both types of rotation. However, the last factor was relatively weak, i.e., with very few items loadings, consequently two further analyses were conducted forcing a 7 factor solution on the data. The resulting analysis accounted for 53.2% of the variance. Structural equation modelling was used to compare between the different models derived. The best fitting model was the 7 factor solution with promac rotation (RMSEA=0.6; CMIN=14635.647 with 1463 df). The factor scores produced by this analysis were normalized and used in further analyses. For the whole sample the average factor score is 100 with a standard deviation of 15. (see Appendix 3 for details on normalization procedures).

	Component						
F1 – Hyperactivity scale	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2:restless, overactive, cannot stay still for long	997						
10:constantly fidgeting or squirming	.995						
15:easily distracted, concentration wanders	.844						
21:thinks things out before acting	-.474						
25:sees tasks through to the end, good attention span	-.557		.498				
27:quickly loses interest in what she/he is doing	.671						
36:gets over excited	.817						
39:is easily frustrated	.496			.312			
45:is impulsive, acts without thinking	.787						
50:can behave appropriately during less structured sessions	-.468						
54:fails to pay attention	.751						
56:makes careless mistakes	.572		-.324				
F2 – 'Pro-social' behaviour scale							
1:considerate of other people's feelings		.493					
4:shares readily with other children (treats, toys pencils, etc.)		.445					
9:helpful if someone is hurt, upset or feeling ill		.817					
17:kind to younger children		.743					
20:often volunteers to help others (teachers, other		.927					

children)							
51:offers to help others having difficulties with a task		.730					
52:is sympathetic to others if they are upset		.848					
29:apologises spontaneously		.448				.361	
F3 – 'Self-regulation'							
32:likes to work things out for self; seeks help rarely		-.372	.791			.317	
35:does not need much help with tasks			.800				
38:chooses activities on their own			.715			.427	
41:persists in the face of difficult tasks	-.306		.575				
44:can move on to a new activity after finishing a task			.579				
46:is open and direct about what she/he wants	.414		.430				
47:is confident with others	.365		.503				
53:shows leadership in group work			.552				
55:can take responsibility for a task			.622				
F4 –Emotional symptoms scale/Anxious							
3:often complains of headaches, stomach-aches and or sickness				.504			
8:many worries, often seems worried				.703			
13:often unhappy, down-hearted or tearful				.470	.345		
16:nervous or clingy in new situations, easily loses confidence				.667			
24:many fears, easily scared				.726			
F5 – Peer problems scale (Goodman)/ Social isolation							
6:rather solitary, tends to play alone					.677		
11:has at least one good friend					-.795		
14:generally liked by other children					-.619		
19:picked on or bullied by other children					.613		
23:gets on better with adults than with other children					.812		
34:can play or work easily with others					-.429		
F6 – Positive social							
5:often has temper tantrums or hot tempers (Goodman's conduct problems scale)	.337					-.403	
31:is calm and easygoing						.445	
33:shows wide mood swings	.310					-.466	
37:says 'please' and 'thank you' when reminded						.603	
40:gets over being upset easily						.708	
42:waits his/her turn in games and activities						.358	
43:co-orperates with requests						.341	
F7 – Conduct problems scale (Goodman)/ 'Anti-social' behaviour							
12:often fights with other children or bullies him							.320
18:often lies or cheats							.477
22:steals from home, school or elsewhere							.729
26:vandalises property or destroys things							.676
28:shows inappropriate sexual behaviour toward others							.642

30:has been in trouble with the law							.663
Less than 0.4 loadings							
5:often has temper tantrums or hot tempers							
7:generally obedient, usually does what adults request (Goodman's conduct problems scale)	-.364						
48:teases other children, calls them names	.314						
49:in social activities just tends to watch others				.317	.346	.331	

Goodman items are in bold. All the Goodman factors fit well in this analysis, All apart from the conduct problems scale keep together within the same factor, the conduct problems scale splits between 3 factors but 3 of the 5 items are together loading on the ''Anti-social'' scale.

Appendix 4: Details of normalisation procedures

We normalised the data since the distribution of scores produced by the factor analyses is standardised (with a mean of 0 and a standard deviation of 1) and involves negative values. A common normalisation is the use of IQ format scores, where the mean is 100 and the standard deviation is 15:

Normalised score=original score*15+100

The advantage in using these scores is that they are easily interpretable and comparable. This means that a child who has a score of 115 is one standard deviation above the average in this specific sample at this specific point whilst taking age effects into account. A child that achieves a score of 85 points is one standard deviation below average.

Appendix 5: EPPE 3-11 imputation of missing data

In order to conduct analysis on as large a sample as possible from the EPPE 3-11 data, a select number of variables were subject to 'imputation' of values where item level data were missing, either due to item or wave non-response. The imputation methods employed as was 'last observation carried forward'. Specifically, the 'last observation' was data from the initial EPPE parent interview, conducted when the children were in Key Stage 1, aged about three years old or in the case of most 'Home' children four years old.

The variables subject to imputation used in the analyses for this report were: Sibling count; Socio-economic status (SES) of mother / father.

Such data, where appropriate, was used to complete missing items from the Parent Questionnaire conducted at Key Stage 1, when the children were age 6 to 7 years old. In each case the variables in the source were comparable, in terms of scale or possible item response categories, with those in the target. This was not the case for parents' qualifications, and hence as yet this measure has not been subject to such imputation.

Appendix 6: Results of contextualised multilevel analyses

Table A.6.1
'Hyperactivity' Contextualised Model (impact of child, parent, home environment and other measures on Year 5 standardised Mathematics attainment)

*Statistically significant at 0.05 level
Just failed to reach statistical significance at 0.05 level

'Hyperactivity'	Estimate	SE	Effect Size
Age	-0.0093	0.0051	**-0.01**
Gender (Compared to girls)	0.5889*	0.0399	**0.68**
Ethnic group (compared to White UK Heritage)			
White European Heritage	-0.0687	0.1106	**-0.08**
Black Caribbean Heritage	0.1634	0.1073	**0.19**
Black African Heritage	0.1142#	0.1383	**0.13**
Indian Heritage	0.0187*	0.1285	**0.02**
Pakistani Heritage	-0.2994*8	0.1448	**-0.34**
Bangladeshi Heritage	-0.3017*	0.1154	**-0.35**
Mixed Race Heritage	-0.6306*	0.1897	**-0.73**
Any other ethnic minority Heritage	0.1659	0.0845	**0.19**
No. of siblings (compared to singleton)			
1-2	-0.0888*	0.0490	**-0.10**
3+	-0.0924	0.0668	**-0.11**
Health problems (compared to none)			
1	-0.0155	0.0436	**-0.02**
2	-0.0550	0.0739	**-0.06**
3+	0.4881*	0.1664	**0.56**
Behavioural problems (compared to none)			
1	0.3237*	0.0637	**0.37**
2+	0.4266*	0.1275	**0.49**
Need of EAL support in Year 5 (compared to no need of EAL support)			
Missing data	0.1632*	0.0676	**0.19**
EAL support needed	0.2288*	0.1107	**0.26**
Free School Meal Eligibility (FSM) (compared to not eligible)			
Eligible for FSM	0.1555*	0.0580	**0.18**
Mother's highest level of qualification (compared to no qualifications)			
Vocational	0.0914	0.0697	**0.11**
Academic age 16	-0.1314*	0.0577	**-0.15**
Academic age 18	-0.1675*	0.0846	**-0.19**
Degree and Higher degree	-0.3167*	0.0770	**-0.36**
Other	-0.2777	0.2034	**-0.32**

'Hyperactivity'	Estimate	SE	Effect Size
Family salary (Compared to 'no salary')			
Missing data	-0.3094*	0.1300	**-0.36**
2,500-17,499	-0.0882	0.0960	**-0.10**
17,500-29,499	-0.2873*	0.0934	**-0.33**
30,000-37,499	-0.2547*	0.0982	**-0.29**
37500-67,499	-0.1089	0.0868	**-0.13**
67,500-132,000+	-0.0154	0.1070	**-0.02**
Marital status (Compared to Married)			
Single never married	0.1771*	0.0657	**0.20**
Living with partner	0.0583	0.0552	**0.07**
Separated/Divorced	0.1987*	0.0644	**0.23**
widow	-0.3560	0.3738	**-0.41**
Other	-0.2060	0.2330	**-0.24**
Maternal Employment (compared to working)			
Missing data	0.2012	0.2131	**0.23**
Not employed	-0.1270*	0.0486	**-0.15**
Key Stage 1 HLE			
Enrichment outing (compared to very high)			
Missing data	0.2230	0.0668	**0.26**
Low	-0.2172*	0.1267	**-0.25**
Moderate	-0.1067	0.0835	**-0.12**
High	-0.1466*	0.0713	**-0.17**
Expressive Play (compared to very high)			
Low	0.1731*	0.0726	**0.20**
Moderate	-0.0197	0.0619	**-0.02**
High	-0.0308	0.0596	**-0.04**

Table A.6.2
'Self-regulation' Contextualised Model (impact of child, parent, home environment and other measures on Year 5 standardised Mathematics attainment)

*Statistically significant at 0.05 level
Just failed to reach statistical significance at 0.05 level

'Self-regulation'	Estimate	SE	Effect Size
Age	-0.0093	0.0051	**-0.01**
Gender (Compared to girls)	0.1897*	0.0392	**0.19**
Birth weight (compared to normal birth weight)			
Missing data	-0.0346	0.1509	**-0.04**
Very low birth weight (<= 1500g)	-0.1235	0.1710	**-0.13**
Low birth weight (1501g – 2500g)	-0.1887	0.0765	**-0.21**
Behavioural problems (compared to none)			
1	-0.2302*	0.0621	**-0.25**
2+	-0.1385	0.1876	**-0.15**
Need of EAL support in year 5 (compared to no need of EAL support)			
Missing data	-0.2750	0.0690	**-0.30**
EAL support needed	-0.4834	0.1085	**-0.53**
Free School Meal Eligibility (FSM) (compared to not eligible)			
Eligible for FSM	-0.1521*	0.0582	**-0.17**
Mother's highest level of qualification (compared to no qualifications)			
Vocational	0.0002	0.0722	**0.00**
Academic age 16	0.0189	0.0603	**0.02**
Academic age 18	0.0509	0.0882	**0.06**
Degree and Higher degree	0.1929*	0.2170	**0.21**
Other	0.2379	0.0863	**0.24**
Father's highest level of qualification (compared to no qualifications)			
Vocational	0.1106	0.0675	**0.12**
Academic age 16	0.1561*	0.0899	**0.17**
Academic age 18	0.1902*	0.0873	**0.21**
Degree and Higher degree	0.2511	0.1148	**0.27**
Other	0.2742*	0.2049	**0.30**
Missing (father absent)	0.2054*	0.0646	**0.22**
Family salary (Compared to 'no salary')			
Missing data	0.0355	0.0681	**0.04**
2,500-17,499	0.0751	0.0675	**0.08**
17,500-29,499	0.2038*	0.0724	**0.22**
30,000-37,499	0.2282*	0.0830	**0.25**
37500-67,499	0.2142*	0.0762	**0.23**
67,500-132000+	0.2290*	0.1033	**0.25**
Early years HLE (compared to 0 - 13) 14-19	0.1796*	0.0772	**0.20**
20-24	0.1887*	0.0775	**0.21**
25-32	0.2680*	0.0772	**0.29**
33-45	0.4500*	0.0915	**0.49**

Table A.6.3
'Pro-social' Contextualised Model (impact of child, parent, home environment and other measures on Year 5 standardised Mathematics attainment)

*Statistically significant at 0.05 level
Just failed to reach statistical significance at 0.05 level

'Pro-social'	Estimate	SE	Effect Size
Age	0.0129	0.0052	**0.01**
Gender (Compared to girls)	0.5428*	0.0395	**0.63**
Behavioural problems (compared to none)			
1	-0.1823*	0.0648	**-0.21**
2+	-0.1877	0.1285	**-0.22**
Free School Meal Eligibility (FSM) (compared to not eligible)			
Eligible for FSM	-0.1270*	0.0574	**-0.15**
Mother's highest level of qualification (compared to no qualifications)			
Vocational	-0.0398	0.0688	**-0.05**
Academic age 16	0.1484*	0.0571	**0.17**
Academic age 18	0.1124	0.0842	**0.13**
Degree and Higher degree	0.1616*	0.0793	**0.19**
Other	-0.0224	0.2053	**-0.03**
Social Class (Compared to Low)			
Medium	0.0874	0.0681	**0.10**
High	0.0704	0.0556	**0.08**
Family salary (Compared to 'no salary')			
Missing data	0.3405*	0.1097	**0.39**
2,500-17,499	-0.0243	0.0656	**-0.03**
17,500-29,499	0.2051*	0.0699	**0.24**
30,000-37,499	0.1564*	0.0798	**0.18**
37500-67,499	*0.1274*	0.0738	**0.15**
67,500-132000+	0.1206	0.1007	**0.14**
Key Stage 1 HLE			
Home computing (compared to very high)			
Missing data	-0.2732*	0.1249	**-0.32**
Low	0.1906*	0.0726	**0.22**
Moderate	0.1441*	0.0663	**0.17**
High	0.1048#	0.0622	**0.12**
Expressive Play (compared to very high)			
Low	-0.2109*	0.0741	**-0.24**
Moderate	-0.0344	0.0632	**-0.04**
High	0.0075	0.0609	**0.01**

Table A.6.4
'Anti-social' Contextualised Model (impact of child, parent, Home Learning Environment (HLE) and other measures on Year 5 standardised Mathematics attainment)

*Statistically significant at 0.05 level
Just failed to reach statistical significance at 0.05 level

'Antisocial'	Estimate	SE	Effect Size
Age	0.0058	0.0054	**0.01**
Gender (Compared to girls)	-0.2946*	0.0408	**-0.32**
Ethnic group (compared to White UK Heritage)			
White European Heritage	-0.1207	0.1133	**-0.13**
Black Caribbean Heritage	0.0455	0.1085	**0.05**
Black African Heritage	0.3555*	0.1450	**0.38**
Indian Heritage	-0.0024	0.1362	**0.00**
Pakistani Heritage	-0.2423	0.1480	**-0.26**
Bangladeshi Heritage	-0.1313	0.1069	**-0.14**
Mixed Race Heritage	-0.1104	0.1924	**-0.12**
Any other ethnic minority Heritage	-0.0094	0.0880	**-0.01**
Behavioural problems (compared to none) 1	0.1717*	0.0676	**0.19**
2+	0.2079	0.1350	**0.22**
Free School Meal Eligibility (FSM) (compared to not eligible)			
Eligible for FSM	0.2168*	0.0553	**0.23**
Mother's highest level of qualification (compared to no qualifications)			
Vocational	0.0766	0.0728	**0.08**
Academic age 16	-0.0981	0.0605	**-0.11**
Academic age 18	-0.0851	0.0884	**-0.09**
Degree and Higher degree	-0.1499*	0.0827	**-0.16**
Other	-0.1684	0.2146	**-0.18**
Family SES (compared to professional non-manual)			
Other professional non-manual	-0.0043	0.0552	**0.00**
Skilled non manual	0.1864	0.0701	**0.20**
Skilled manual	-0.0161	0.0763	**-0.02**
Semi-skilled manual	0.1929#	0.1423	**0.21**
Unskilled manual	0.1865	0.1401	**0.20**
Unemployed / Never worked	0.0217	0.0784	**0.02**
Absent father (Compared to non absent fathers)	0.1423*	0.0508	**0.15**
Key Stage 1 HLE			
One to one Interactions (compared to very high) Missing data	0.1446	0.0916	**0.16**
Low	0.1678*	0.0797	**0.18**
Moderate	0.0738	0.0681	**0.08**
High	0.0764	0.0641	**0.08**
Expressive Play (compared to very high)			
Low	0.0203	0.0773	**0.02**
Moderate	-0.1557*	0.0655	**-0.17**
High	-0.11778	0.0632	**-0.13**

Appendix 7: Effect Sizes

To illustrate the impact of different factors on attainment or social behaviour in Year 1 effect sizes (ES) were calculated. Effect sizes are most commonly used in experimental studies and essentially measure the strength of mean differences. Glass et al., (1981) define ES as:

ES = (mean of experimental group)-(mean of control group)/pooled standard deviation

Or $\Delta = \frac{X_{Exp} - X_{Cont}}{SD_{pooled}}$

Effect sizes were calculated for different child outcomes, using both the child level variance and coefficients for predictors included in the multilevel statistical models adopting the formulae outlined by Tymms et al., (1997).

For categorical predictors (e.g. gender or ethnicity) the effect size was calculated as:

ES = categorical predictor variable coefficient / √child level variance

Or

$\Delta = \frac{\beta_1}{\sigma_e}$

For continuous predictor variables (e.g. child age in months), the effect size describes the change on the outcome measure produced by a change of +/-one standard deviation on the continuous predictor variable, standardised by the within school SD, adjusted for covariates in the model – the level 1 SD:

$\Delta = \frac{2\,\beta_1 * SD_{x1}}{\sigma_e}$ where $_{x1}$=continuous predictor variable

Effect sizes can be useful for comparisons between different studies but interpretations must be made with caution and with reference to the outcomes concerned and controls used in models (Elliot & Sammons, 2004). For further discussion of effect sizes see Coe (2002). Effect sizes for some categorical measures in the EPPE research are large but apply to small numbers of children (e.g. the very low birth weight group or specific ethnic groups).

Appendix 8: Glossary of terms

Activity Level (Child code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the observed child is physically active, restless, or fidgety during the observation.

Age standardised scores Assessment scores that have been adjusted to take account of the child's age at testing. This enables a comparison to be made between the performance of an individual pupil, and the relative achievement of a representative sample of children in the same age group throughout the country or, in this case, the relative achievement of the EPPE sample.

'***Anti-social' behaviour*** At the end of Year 5 teachers rated the social behaviour of EPPE children using a*n extended version of the strength and difficulties questionnaire*. A factor analysis of the 56 items resulted in the extraction of 7 underlying factors. Year 5 factor 7 measures the child's tendency to show behaviour that is aggressive, destructive or deviant.

'at risk' The ETYSEN report acknowledges that the term 'at risk' is a complex one which will differ depending on the particular criteria used. In the ETYSEN study cognitive risk is defined as 1 sd below national average and strong cognitive risk as 1 sd below sample average. These provide definitions of children who may be seen to be 'at risk' on the basis of their cognitive attainment at entry to pre-school.

Attendance The number of sessions attended at the target centre by an EPPE child from entry to study (BAS assessment) to leaving the target pre-school (based on pre-school centre registers). This measure provides a crude indicator of amount of target pre-school experience.

Attention (Child code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The observed child's level of sustained focused or direct attention to ongoing classroom activities.

Baseline measures Assessments taken by the EPPE child at entry to the study. These assessment scores are subsequently employed as prior attainment measures in a value added analysis of pupils' cognitive progress.

Basic skill development in the context of problem solving (Mathematical Instructional Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent to which students learn basic skills in the context of problem solving.

Basic skill development in the context of reading (Reading Instructional Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent to which students learn basic reading skills within the context of reading for meaning.

Birth weight Babies born weighing 2500 grams (5lbs 8oz) or less are defined as below normal birth weight, foetal infant classification is below 1000 grams, very low birth weight is classified as 1001-1005 grams and low birth weight is classified as 1501-2500 grams (Scott and Carran, 1989).

British Ability Scales (BAS) This is a battery of assessments specially developed by NFER-Nelson to assess very young children's abilities. The assessments used at entry to the EPPE study and entry to reception were:
Block building - Visual-perceptual matching, especially in spatial orientation (only entry to EPPE study)
Naming Vocabulary - Expressive language and knowledge of names
Pattern construction - Non-verbal reasoning and spatial visualisation (only entry to reception)
Picture Similarities - Non-verbal reasoning
Early number concepts - Knowledge of, and problem solving using pre-numerical and numerical concepts (only entry to reception)

Copying - Visual-perceptual matching and fine-motor co-ordination. Used specifically for children without English
Verbal comprehension - Receptive language, understanding of oral instructions involving basic language concepts.

Centre/School level variance The proportion of variance in a particular child outcome measure (i.e. Pre-reading scores at start of primary school) attributable to differences between individual centres/schools rather than differences between individual children.

Chaos (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the children in the class are ineffectively controlled or chaotic.

***Child background* factors** Child background characteristics such as age, gender, and ethnicity.

Child-Teacher Relationship (Child code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the child is positively socially connected to their primary teacher.

Classroom Climate (General Classroom Management and Climate Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent classroom is a place pupil's feel safe and respected.

Classroom Routines (General Classroom Management and Climate Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The use of instructional time, how transitions are managed both within and between lessons, structure/organisation of the day, pace of the lessons, level of preparation of materials, how children are involved in the routine business of the day (including start of day, taking register, collecting money), do children manage materials etc.

Compositional effects The impact of peer group measures on a child's individual outcomes. For example, when the characteristics of children in a centre (measured as a centre level aggregated variable) show a significant relationship with outcomes at the individual child level, after controlling for the same variable at the individual level. For further details see Harker (2001).

***Confidence intervals at the 95%* level** A range of values which can be expected to include the 'true' value in 95 out of 100 samples (i.e. if the calculation was repeated using 100 random samples).

Contextualised models Cross-sectional multilevel models exploring children's cognitive attainment at entry to primary school, controlling for child, parent and Home Learning Environment (HLE) characteristics (but not prior attainment).

Controlling for Several variables may influence an outcome and these variables may themselves be associated. Multilevel statistical analyses can calculate the influence of one variable upon an outcome having allowed for the effects of other variables. When this is done the net effect of a variable upon an outcome controlling for other variables can be established.

Correlation A correlation is a measure of statistical association that ranges form + 1 to -1.

Cross-Disciplinary Connections (General Instruction Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent to which lesson/activity is connected to multiple subject areas.

Detachment/Teacher (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the teachers (all adults in classroom) are detached from the children's activities, understanding or level of interest.

Depth of knowledge and student understanding (Mathematical Instructional Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The Extent to which Maths knowledge is treated deeply in class.

Disruptive (Child code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the observed child's behaviour has disrupted others (both children and adults).

Duration In terms of the value added models, the duration of pre-school covers the time period between date of BAS assessment at entry to the EPPE study until entry to primary school. Note that the number of months of pre-school attended before the child entered the EPPE study is not included in this duration measure. A separate 'duration' measure of amount of time in pre-school prior to entering the study was tested but was not found to be significant (note that this 'duration' measure is confounded with prior attainment). In the contextualised models, duration of pre-school refers to the time period between entry to the target pre-school until entry to primary school. These duration measures provide a crude indication of length of pre-school experience.

ECERS-R and ECERS-E The American Early Childhood Environment Rating Scale (ECERS-R) (Harms et al., 1998) is based on child centred pedagogy and also assesses resources for indoor and outdoor play. The English rating scale (ECERS-E) (Sylva et al., 2003) was intended as a supplement to the ECERS-R and was developed specially for the EPPE study to reflect the Desirable Learning Outcomes (which have since been replaced by the Early Learning Goals), and more importantly the Curriculum Guidance for the Foundation Stage which at the time was in trial stage.

Educational effectiveness Research design which seeks to explore the effectiveness of educational institutions in promoting a range of child/student outcomes (often academic measures) while controlling for the influence of intake differences in child/student characteristics.

Effect sizes (ES) Effect sizes (ES) provide a measure of the strength of the relationships between different predictors and the child outcomes under study. For further discussion see Appendix 5 and Elliot & Sammons (2004).

Evaluative Feedback (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the teacher provides children with information on their performance that is intended to improve that performance.

Family factors Examples of family factors are mother's qualifications, father's employment and family SES.

General Cognitive Ability (GCA) A measure of children's overall cognitive ability, incorporating non-verbal and verbal BAS sub-scales.

Hierarchical nature of the data Data that clusters into pre-defined sub-groups or levels within a system (i.e. young children, pre-school centres, LAs).

Home Learning Environment (HLE) factors Measures derived from reports from parents (at interview) about what children do at home, for example, playing with numbers and letters, singing songs and nursery rhymes.

'Hyperactivity' At the end of Year 5 teachers rated the social behaviour of EPPE children using a*n extended version of the strength and difficulties questionnaire*. A factor analysis of the 56 items resulted in the extraction of 7 underlying factors. Year 5 factor 1 measures the child's tendency to show inattentive and distracted behaviour.

Intervention study A study in which researchers 'intervene' in the sample to control variables i.e. control by setting, the adult:child ratios in order to compare different specific ratios in different settings. EPPE is not an intervention study in that it investigates naturally occurring variation in pre-school settings.

Intra-centre/school correlation The intra-centre/school correlation measures the extent to which the scores of children in the same centre/school resemble each other as compared with those from children at different centres/schools. The intra-centre/school correlation provides an indication of the extent to which unexplained variance in children's progress (i.e. that not accounted for by prior attainment) may be attributed to differences between centres/schools. This gives an indication of possible variation in pre-school centre/school effectiveness.

Linkage to life beyond the classroom (General Instruction Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent to which lesson/activity is connected to competencies or concerns beyond the classroom.

Locus of Maths authority (Mathematical Instructional Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent to which the lesson supports a shared sense of authority and responsibility for validating students' Maths reasoning.

Maths discourse and communication (Mathematical Instructional Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent to which classroom discourse in Maths is devoted to creating or negotiating shared understandings of Maths.

Multiple Disadvantage Based on three child variables, six parent variables, and one related to the Home Learning Environment (HLE) which were considered 'risk' indicators when looked at in isolation. A child's 'multiple disadvantage' was calculated by summing the number of indicators the child was at risk on.

Multilevel modelling A methodology that allows data to be examined simultaneously at different levels within a system (i.e. young children, pre-school centres, LAs), essentially a generalisation of multiple regression.

Multiple regression A method of predicting outcome scores on the basis of the statistical relationship between observed outcome scores and one or more predictor variables.

Negative Classroom Climate (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent the overall emotional and social tone of the classroom is hostile, angry and punitive.

Net effect The unique contribution of a particular variable upon an outcome while other variables are controlled.

Outliers Pre-school centres where children made significantly greater/less progress than predicted on the basis of prior attainment and other significant child, parent and Home Learning Environment (HLE) characteristics.

Over-Control (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the classroom is rigidly structured or regimented and appears to be driven by the teacher's agenda regardless of the students needs and interests.

Pedagogical strategies Strategies used by the educator to support learning. These include the face to face interactions with children, the organisation of the resources and the assessment practices and procedures.

Positive Affect (Child code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the observed child appears in a happy mood and pleasant state during interactions-personal contentment.

Positive Classroom Climate (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent the overall emotional and social tone of the classroom is respectful, safe, welcoming, friendships, happy place.

Pre-reading attainment Composite formed by adding together the scores for phonological awareness (rhyme and alliteration) and letter recognition.

Prior attainment factors Measures which describe pupils' achievement at the beginning of the phase or period under investigation (i.e. taken on entry to primary or secondary school or, in this case, on entry to the EPPE study).

Productive Use of Instructional Time (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) How well the classroom manages time and activities to insure productivity, engagement and efficient use of instructional time.

'Pro-social' behaviour At the end of Year 5 teachers rated the social behaviour of EPPE children using a*n extended version of the strength and difficulties questionnaire*. A factor analysis of the 56 items resulted in the extraction of 7 underlying factors. Year 5 factor 2 measures the child's ability to work well with as well as show empathy to other children.

Quality Measures of pre-school centre quality collected through observational assessments (ECERS-R, ECERS-E and CIS) made by trained researchers.

Reading as meaning making (Reading Instructional Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent to which students try to derive meaning from the texts they read.

Richness of Instructional Methods (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The variety and depth of strategies the teacher employs to present a particular lesson and to promote the children's thinking and understanding at higher levels of complexity, integration or meaning.

Residuals Residuals associated with a particular pre-school centre or school derive from the differences between the expected and observed levels of development for children. The expected level of development would be an estimate of developmental level based upon existing child, family and other characteristics. The difference between the *expected* developmental level and the *observed* (or *actual)* level for children at a centre or school is the 'residual' and is measure of the contribution of centre or school characteristics to children's development. If the residual is based on the predicted level after controlling for assessments earlier in time, this is a residual measure for progress. Where the average of all pupils in a centre or school is better than expected, residuals are positive and if worse than expected residuals are negative.

Resilience The capacity of individuals to develop and thrive despite risks to their optimal development.

Sampling profile/procedures The EPPE sample was constructed by:
– Five regions (six LAs) randomly selected around the country, but being representative of urban, rural, inner city areas.
– Pre-schools from each of the 6 types of target provision (nursery classes, nursery schools, local authority day nurseries, private day nurseries, play groups and integrated centres) randomly selected across the region.

'Self-regulation' At the end of Year 5 teachers rated the social behaviour of EPPE children using a*n extended version of the strength and difficulties questionnaire*. A factor analysis of the 56 items resulted in the extraction of 7 underlying factors. . Year 5 factor 2 is a measure of pupil's autonomy, confidence and self-sufficiency specifically related to behaviour in a *learning*, rather than a *social*, context.

Self-Reliance (Child code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the observed child displays autonomy, responsibility and personal initiative in the classroom.

Significance level Criteria for judging whether differences in scores between groups of children or centres might have arisen by chance. The most common criteria is the 95% level ($p<0.05$) which can be expected to include the 'true' value in 95 out of 100 samples (i.e. the probability being one in twenty that a difference might have arisen by chance).

Sociable/Co-operative with Peers (Child code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent to which the observed child displays positive engagement with and interest in peers as well as willingness/ability to get along with others in play and work situations.

Social/behavioural development A child's ability to 'socialise' with other adults and children and their general behaviour to others.

Social support for student learning (General Instruction Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent classroom learning environment is characterised by an atmosphere of high academic expectations for all students coupled with mutual respect and support among teacher and pupils.

Socio Economic Status (SES) Occupational information was collected by means of a parental interview when children were recruited to the study. The Office of Population Census and Surveys OPCS (1995) Classification of Occupations was used to classify mothers and fathers current employment into one of 8 groups: professional I, other professional non manual II, skilled non manual III, skilled manual III, semi-skilled manual IV, unskilled manual V, never worked and no response. Family SES was obtained by assigning the SES classification based on the parent with the highest occupational status.

Standard deviation (sd) A measure of the spread around the mean in a distribution of numerical scores. In a normal distribution, 68% of cases fall within one standard deviation of the mean and 95% of cases fall within two standard deviations.

Student engagement (General Instruction Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent students are engaged in lessons.

Target centre A total of 141 pre-school centres were recruited to the EPPE research covering 6 types of provision. The sample of children were drawn from these target centres.

Teacher Sensitivity (Classroom code definition from the Classroom Observation System for Fifth Grade - COS-5, Pianta) The extent that child-centred behaviour is demonstrated by the teacher designated as the *primary teacher* for the observation cycle.

Total BAS score By combining 4 of the BAS sub-scales (2 verbal and 2 non-verbal) a General Cognitive Ability score or Total BAS score at entry to the study can be computed. This is a measure of overall cognitive ability.

Use of Maths analysis (Mathematical Instructional Scales definition from the Instructional Environment Observation Scale - IEO, Stipek) The extent children use Maths analysis.

Value added models Longitudinal multilevel models exploring children's cognitive progress over the pre-school period, controlling for prior attainment and significant child, parent and Home Learning Environment (HLE) characteristics.

Vulnerability The level of risk to optimal development that is present for any individual as a result of their individual, family and social situation.

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