Research Brief

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EFFECTIVE PRE-SCHOOL AND PRIMARY EDUCATION 3-11 PROJECT (EPPE 3-11)

INFLUENCES ON CHILDREN'S COGNITIVE AND SOCIAL DEVELOPMENT IN YEAR 6

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The Effective Pre-School and Primary Education 3-11 project (EPPE 3-11) investigates the impact of background factors, pre-school and school experiences on a national sample of young children in England between the ages of 3 and 11 years. This Research Brief focuses on the relationships between various child, family, home, pre-school and primary school characteristics and children's subsequent cognitive (English and Mathematics) and social/behavioural outcomes ('Self-regulation', 'Pro-social' behaviour, 'Hyperactivity' and 'Anti-social' behaviour) at age 11 in Year 6 of primary school. It also investigates children's academic and developmental progress across Key Stage 2 (between Year 2 and Year 6). The brief explores the continuing influence of pre-school and the combined influence of pre-school and primary school experience on children's cognitive and social/behavioural outcomes. These findings update and extend earlier analyses of pupils' outcomes in Year 2 and 5 (see Sammons et al., 2004; 2007a; 2007b) and form the end point of the primary phase of the research.

Key findings

Child and Family Background characteristics

- The most important background predictors of English and Mathematics attainment and Self-regulation in Year 6 are: mothers' highest qualification levels, the Early years Home Learning Environment (HLE) measured at age 3-4 and continued need for support with English as an Additional Language (EAL).
- Gender has a strong effect on both 'Pro-social' behaviour and 'Hyperactivity', a moderate effect on Anti-social behaviour (girls have more favourable scores on all) but weaker effects on English (girls have higher attainment) and Maths (boys have higher attainment).
- Background factors are generally more important for academic than social/behavioural outcomes. Taken together, the combined influence of child, family and background factors on children's outcomes is weaker at age 11 than it is at age 7.
- The influence of neighbourhood disadvantage as a predictor of children's cognitive and social behavioural outcomes is non-significant after taking into account child and family characteristics, particularly HLE.

Continuing Pre-school effects

- Pre-school quality and effectiveness remain statistically significant predictors of attainment and social/behavioural outcomes in Year 6 and of progress across Key Stage 2, after the influence of background factors has been taken into account.

department for children, schools and families

- Children gained most benefit from having attended high quality pre-school provision, but medium quality provision also led to better Mathematics and social/behavioural outcomes in Year 6 than low quality or no pre-school (the 'home' group).
- Children who had attended low quality pre-school did no better in Mathematics and English than those who had not attended a pre-school, and showed slightly higher levels of Hyperactivity in Year 6, whereas children who had not attended pre-school continued to show poorer Pro-social behaviour compared to those who had gone to pre-school.
- Although having attended any pre-school versus none shows positive benefits for a range of educational outcomes in Year 6, the impact is carried mainly by the pre-school quality and effectiveness effects, except for Pro-social behaviour where attending any provision shows sustained benefits compared with none.
- Comparing the size of various influences for children's outcomes, early HLE and support with EAL are twice as strong as the influence of pre-school quality on English attainment, and mother's highest qualification (degree versus none) is twice as strong as the influence of pre-school quality for Mathematics and Self-regulation.
- For academic outcomes, particularly Mathematics, and for all social/behavioural outcomes, having attended a high quality pre-school is found to be of particular benefit for boys, children with special educational needs (SEN) and disadvantaged children. While higher quality pre-school benefits all children, the benefits are greater for these groups. The difference between attending a high quality or high effectiveness pre-school and attending a low quality or effectiveness pre-school is larger for children who come from more disadvantaged backgrounds than the difference of attending high versus low quality or effectiveness pre-school for children who come from less disadvantaged backgrounds.

Primary school academic effectiveness

- Attending a more academically effective primary school (measured by value-added)[1] had a significant positive influence on EPPE children's English and particularly Mathematics attainment in Year 6. The impact of attending a highly academically effective school versus a low one is on a par with the impact of family income for English and as strong as that for Early years HLE for Mathematics, and it is stronger than the influence of pre-school quality.
- By contrast, the academic effectiveness of the primary school did not show a statistically significant relationship with social/behavioural outcomes across the whole sample. However it was important for particular sub-groups of children; those identified as having SEN in primary school and those with mothers who had low qualification levels showed better Self-regulation and reduced scores for Anti-social behaviour if they attended highly academically effective primary schools.

Combined pre-school quality and primary school academic effectiveness

- Although pre-school and primary school effects are moderate when studied separately, further analyses of their combined influence show stronger positive effects on a range of educational outcomes.

- The experience of high quality pre-school continues to provide some protection against the disadvantage of later attending a less academically effective primary school in terms of subsequent cognitive attainment (particularly for Mathematics), and Self-regulation. Similarly attending a highly academically effective primary school helps to compensate for the disadvantage of not attending pre-school or attending a low quality pre-school in terms of later cognitive attainment and Self-regulation. Moreover, both the experience of high quality pre-school and highly academically effective primary schools offer similar degrees of protection in terms of promoting better outcomes in Year 6 individually, and in combination for academic outcomes and Self-regulation.

[1] The contextualised value added analyses have been undertaken independently of the EPPE 3-11 research for three full cohorts of pupils (2002 – 2004) in all primary schools in England, in order to create a value added measure of academic effectiveness of for every school attended by an EPPE child (Melhuish et al., 2006).

Academic and social behavioural Progress over Key Stage 2

- In addition to attainment in Year 6, EPPE also measures progress over Key Stage 2 (from age 7-11). Pupils' academic and social/behavioural progress over Key Stage 2 is also influenced by background factors such as gender, mother's qualifications and Early years HLE, although the effects are much weaker than those found for attainment.

- Educational influences related to pre-school quality and primary school academic effectiveness show a stronger impact on cognitive progress over Key Stage 2 than most background factors. The impact of attending a high academically effective primary school versus a low effective primary is on a par with the effect of a mother having a degree versus no qualification (slightly stronger for Maths, slightly weaker for English). The pre-school quality influence on progress is also still evident, although not as strong as that of the primary school academic effectiveness. The effect of a high quality experience versus none is on a par with the influence of a child's eligibility (or not) for free-school meals.

- High quality and highly effective pre-schools have a similar positive impact on social/behavioural progress across Key Stage 2 as they do on developmental levels in Year 6. Similar to progress in cognitive outcomes, the effect of a high quality pre-school experience versus none is comparable with the effect of a child's eligibility (or not) for free-school meals (FSM) for all social/behavioural outcomes, except for Pro-social behaviour, for which there was no FSM effect, but pre-school quality remains significant. However primary school academic effectiveness had no significant influence on social/behavioural progress, just as it showed no significant effect for social/behavioural developmental levels.

The EPPE 3-11 Research: Background

The original EPPE study investigated children's intellectual and social/behavioural development between the ages of 3-7 years (Sylva et al., 2004). The EPPE 3-11 extension follows up the sample to the end of primary school (age 11 years, the end of Key Stage 2). The EPPE technical reports and the website: www.ioe.ac.uk/projects/eppe provides further details about the study and the sample.
This Research Brief summarises the main results of analyses of children's cognitive and social/behavioural development for the EPPE 3-11 sample in Year 6. The study investigates the long term impact of child, family, the Early years Home Learning Environment (HLE) and pre-school on children's English and Mathematics outcomes at age 11 (Year 6) as well as four dimensions of social/behavioural development: 'Self-regulation', 'Pro-social' behaviour, 'Hyperactivity' and 'Anti-social' behaviour.

In addition, we explore the influence of the academic effectiveness of the primary school attended, and the combined impact of pre-school and primary school on children's developmental outcomes.

For further details see the two full Research reports: 'Influences on Children's Attainment and Progress in Key Stage 2: Cognitive Outcomes in Year 6' and 'Influences on Children's Development and Progress in Key Stage 2: Social/behavioural outcomes in Year 6' (Sammons et al., 2008b; 2008c).[2]

Data and Analysis Strategy

The findings reported here are based on analyses of data on children's cognitive and social/behavioural outcomes and relationships with a range of child, family and home learning environment (HLE) characteristics and the characteristics of the pre-schools and schools attended.

Children's National Assessment scores in English and Mathematics in Year 6 (age 11) were standardised and used as outcome measures (English and Mathematics). In addition, earlier measures of cognitive attainment in National assessments in Year 2 (age 7) in Reading and Mathematics were collected and standardised to explore progress across Key Stage 2. The sample included 2701 children in over 950 primary schools.

Individual measures of social/behavioural development in Year 6 were obtained from class teachers' assessments using an extended version of Goodman's *Strengths and Difficulties Questionnaire* (1997). Four dimensions of social/behavioural development: 'Self-regulation', 'Pro-social' behaviour, 'Hyperactivity' and 'Anti-social' behaviour were identified and reported here.

[2] For information on outcomes at age 10 (Year 5) and information on variations in teacher and pupils behaviours (Year 5) and their impact on child outcomes see www.ioe.ac.uk/projects/eppe

Pre-school quality was measured using two internationally recognised observation instruments: ECERS-R (Harms et al., 1998); focuses on emotional and social care and ECERS-E (Sylva et al., 2006); focuses on the pre-school curriculum.

Effectiveness indicators for individual pre-school settings were also calculated using value added models of children's progress during the pre-school period (age 3 to 5). These included several aspects covering cognitive and social/behavioural outcomes during pre-school (Pre-reading, Early number concepts, 'Independence & Concentration', 'Peer sociability', 'Co-operation and Conformity' and reducing 'Anti-social' behaviour).

Additional value added measures of overall primary school academic effectiveness in English and Mathematics were derived from independent statistical analyses of National assessment data sets for all primary schools in England in 3 successive years (2002-2004) (Melhuish et al., 2006). These school level value added results were incorporated into the EPPE 3-11 data sets to provide independent indicators of the quality of the primary school attended by children in this sample (measured in terms of academic progress of pupils in three successive national cohorts 2002-2004).

Statistical analyses (using multilevel models) investigated the influence of different child, family and HLE background factors as predictors of children's attainment and development at age 11 and progress over Key Stage 2 from age 7 to 11. These analyses identify the unique (net) contribution of particular factors to variations in children's outcomes, while other background influences are controlled. For example, the impact of family socio-economic status (SES) is established while taking into account the influence of mothers' qualification levels, low income, ethnic group, age, gender, HLE, etc. This is important because much of the apparent difference in children's outcomes associated with certain characteristics, for example, income is attributable to the impact of other factors such as HLE and parents' qualification levels. It also means that analyses of any continuing pre-school effects and primary school influences on children's outcomes (as well as their joint effects) include appropriate control for different background influences. Further value added multilevel analyses were conducted, to investigate EPPE 3-11 children's progress over Key Stage 2 in each of the outcomes studied by controlling for earlier attainment or earlier prior social behaviour.

The analyses presented here have used age standardised tests when measuring cognitive attainment and progress. Findings on the influence of season of birth will be presented in the final report which summarises the 3-11 findings (Sylva et al, 2008 forthcoming).

The Findings

Child, Family and Background effects

Child, family and Early HLE factors remain significant predictors of children's cognitive and social/behavioural development at age 11 (although their combined influence is generally weaker than when children were age 7). This may reflect the growing importance of primary school and peer influences. The influence of Early years HLE, for example, reduced between age 7 (ES=0.56) and age 11 (ES=0.42) for Mathematics.

At age 11, girls' attainment is significantly higher than that of boys in English (ES=0.29) but boys attainment is better in Mathematics (ES=-0.19). This is in contrast to findings on gender differences at earlier time points where girls showed higher attainment than boys in both subjects. Parents' (especially mothers') highest qualification levels remains a key predictor of attainment (ES=0.76 for English and 0.71 for Maths), as does low birth weight (ES=-0.47 for English and ES=-0.48 for Maths), continued need for support with English as an additional language (EAL) (ES=-0.64 for Maths), early developmental problems (as reported by parents at the start of the study; ES=-0.24 for English), family socio-economic status (SES) (ES=-0.36 for Maths) and fathers' qualification level (ES=0.39 for English). See Table 1 at the end of the Research Brief for all the effect sizes.

The strongest background predictors of social/behavioural development in Year 6 are: gender, early development/behaviour problems, higher parental qualification levels and income, all associated with 'Self-regulation' outcome in Year 6. Girls (ES=0.30) and those children whose parents have higher qualification levels (ES=0.55) have better outcomes for 'Self-regulation'. Girls (ES=0.71) and children with highly qualified mothers (ES from 0.36 to 0.53) also show better 'Pro-Social' behaviour and lower 'Hyperactivity'. Gender also predicted 'Anti-social' behaviour, with girls showing significantly lower scores (ES=0.38).

The Early years home learning environment (HLE) is still one of the most important predictors of later attainment in English (ES=0.69) and Mathematics (ES=0.42) in Year 6 as well as 'Self-regulation' (ES=0.42). Experiencing a better Early years HLE shows a significant positive long term impact after controlling for other influences such as parents'

qualification levels, family SES and income. A measure of Key Stage 1 HLE (age 5-7) has a weaker impact (only a third to a quarter of the influence) but still has some predictive power over and above the Early years HLE. High levels of 'Home Computing' (probably on computer games), is linked with poorer attainment in English (ES=0.23).

'Neighbourhood' influence, measured in terms of the Index of Multiple Deprivation (IMD), was non-significant after taking into account child and family characteristics, particularly HLE.

Continuing Pre-school effects

Pre-school quality and effectiveness

Attending a pre-school compared with not attending one (the 'home' group) shows a positive effect on children's later outcomes in English (ES=0.22), Mathematics (ES=0.26) and 'Pro-social' behaviour (ES=0.19) at the end of Year 6. Although having attended any pre-school versus none continues to show positive benefits for a range of later educational outcomes in Year 6, the impact is carried mainly by the pre-school quality and effectiveness effects except for Pro-social behaviour where attending any provision shows sustained benefits.

The quality of the pre-school attended is important with high quality leading to a stronger and more enduring effect on outcomes for attainment in both English and Mathematics (ES=0.29 & ES=0.34).

Similarly, pre-school effectiveness (defined as the promotion of Early number concepts) still showed a positive influence on later attainment, particularly for better outcomes in Mathematics (ES=0.40).

Disadvantaged pupils (and those with less well qualified parents) show higher attainment in Year 6 if they had previously attended a high quality or highly effective pre-school. Nonetheless the results suggest that it is the more advantaged pupils (and those with more highly qualified parents) who still continue to show better Year 6 outcomes in relation to pre-school experience.

Children who had attended low quality pre-schools no longer show a significant cognitive benefit in attainment after six years in primary school, i.e. their scores are not significantly different from the 'home' group. The same is found in English for those who had previously attended medium quality pre-schools.

High and medium quality pre-school still shows a lasting benefit on children's social behaviour for most outcomes in Year 6, being particularly important for boys (ES from 0.28 to 0.45 depending on the social/behavioural outcome), those children later identified as having SEN in primary school (ES from 0.23 to 0.39) and the more disadvantaged (ES from 0.29 to 0.34). By Year 6 the children who attended low quality pre-school show very little difference to the 'home' group, except in terms of 'Pro-social' behaviour where outcomes were significantly better (ES from 0.16 to 0.28). By contrast, the 'home' children had significantly lower levels of 'Hyperactivity' compared to children who only attended low quality pre-school (ES=0.24). There were no significant differences between the 'home' group and others in terms of 'Anti-social' behaviour except for children who attended a pre-school identified as being more effective in reducing 'Anti-social' behaviour (ES=0.25). These still showed long term benefits with reduced 'Anti-social' behaviour at age 11.

Significant differences were found when the combined interaction of pre-school and Early years HLE was studied. Having previous experience of a high quality Early years HLE appears to act as a protective factor for children who had not attended pre-school (the 'home' group) in terms of promoting higher levels of 'Self-regulation' (still evident at age 11; ES=0.42). Similarly past experience of high quality pre-school is predictive of later improved 'Self-regulation' for children who had only experienced a low Early years HLE (ES=0.29). Thus the disadvantage of not attending pre-school is countered if children have good early years learning experiences at home. Similarly, the disadvantage of poor Early years HLE is ameliorated by high quality pre-school. Both aspects of early influence still show an impact on longer term development up to age 11.

Similar to findings for Year 5 (see Sammons et al., 2007a), at the end of Year 6 there are no longer statistically significant net effects for type of pre-school attended, duration in attending pre-school or age of starting pre-school on all outcomes.

Primary school academic effectiveness

The academic effectiveness[3] of the primary school EPPE 3-11 children went on to attend had a positive influence on their later attainment in English and Mathematics in Year 6, taking account of the influence of other background influences.

[3] The analyses of the National Pupil Database have been undertaken independent of the EPPE 3-11 research for three full cohorts of pupils (2002–2004) and were used to establish academically less or more effective schools (Melhuish et al., 2006).

For English, attending a high academically effective primary school was associated with a moderate boost to attainment (ES=0.24). Moreover, results show that previously attending a high quality pre-school still offered some compensation/protection for those who went on to attend an academically less effective primary school.

For Mathematics the quality and effectiveness of the pre-school still predicted later attainment controlling for other factors. However, the academic effectiveness of the primary school is also an important predictor of better outcomes. Mathematics (ES=0.38) in Year 6 appears to be especially sensitive to the academic effectiveness of the primary school attended more so than English in Year 6. This is in line with findings from other school effectiveness research which indicates that school effects tend to be stronger for outcomes such as Mathematics and Science.

Attending a highly academically effective primary school is a predictor of better cognitive outcomes particularly for disadvantaged pupils when compared to those disadvantaged pupils who attend academically less effective primary schools (English ES=0.25; Mathematics ES=0.43) It is a predictor of better Mathematics outcomes for children with low qualified parents. Such children who attend a high or medium academically effective primary school have significantly better scores in Mathematics than those who attend a low effectiveness primary school.

Primary school academic effectiveness did not show a statistically significant relationship with social/behavioural outcomes across the whole sample. However, it was important for particular sub-groups of children: children identified as having SEN in primary school and children with mothers who have low qualification levels. Attending a highly academically effective primary school is a predictor of increased 'Self-regulation' and reduced 'Anti-social' behaviour for children with SEN in primary school (ES=0.37) and those with mothers who had a low qualification level (ES=0.33) compared to those who attend academically low effective primary school.

The combined impact of pre-school and primary school

For English the quality of the pre-school helps protect against the disadvantage of moving on to a less academically effective primary school (ES=0.12). Similarly for Mathematics, a better quality pre-school reduces the disadvantage of attending a less academically effective primary school (ES=0.61).

Attending a highly effective pre-school and primary school is the most advantageous combination of educational experiences (English ES=0.22; Mathematics ES=0.83). Going to an academically effective primary school also helped compensate for the disadvantage of not going to pre-school or attending a low quality pre-school.

Attending a highly academic effective primary school is also important for the 'home' group for predicting better 'Self-regulation' (ES=0.51). Attending high quality pre-school appears to act as a protective factor for children who subsequently attend a less academically effective primary school for 'Self-regulation' (ES=0.41).

Mobility during primary school

Mobility is defined here as a change of primary school that does not result from a school closure, amalgamation, or transfer across phases of schooling, and about a fifth of the sample were mobile in this way during KS2. Analysis indicated mobility in the KS2 period is predictive of less progress in Mathematics after controlling for background characteristics (ES=-0.27), but not significantly so with English.

In addition, KS2 mobility and particularly if a child changed schools during both KS1 and KS2, is associated with poorer social/behavioural development across Key Stage 2: less progress in 'Self-regulation' (ES=-0.28) and 'Pro-social' behaviour (ES=-0.35) and less reduction in 'Hyperactivity' (ES=0.32) and 'Anti-social' behaviour (ES=0.48).

The results show that mobility during primary school is predictive of poorer child outcomes. However, these results do not show whether or not KS1 and/or KS2 mobility causes poorer progress in Mathematics and social/behavioural development; it may be instead that children with poorer outcomes are more likely to change schools.

For a detailed description on mobility during pre-school, KS1 and KS2 please refer to the separate technical report (Melhuish et al., 2008).

Pupils' progress across Key Stage 2

Children's academic and developmental progress over Key Stage 2 was measured using contextualised value added approaches and takes account of prior attainment at age 7.

Like Year 6 outcomes, pupils' academic and social/behavioural progress is also influenced by background factors, such as gender, mother's qualifications and Early years HLE, although effects on progress are much weaker than those on outcomes.

By contrast, educational influences related to pre-school quality and primary school academic effectiveness show a rather stronger impact on progress during KS2 than on Year 6 outcomes (Pre-school quality for English ES=0.05–0.23; Mathematics ES=0.05–0.20; Pre school effectiveness for English ES=0.09–0.27; Mathematics ES=0.10–0.32) suggesting that pre-school not only provides an initial boost to attainment levels, but also helps promote later progress (possibly by fostering children's capacity to learn and their motivation). Similarly children attending more academically effective primary schools make significantly more progress during KS2 than those at less academically effective schools (English ES=0.37; Mathematics ES=0.52).

For progress over Key Stage 2, the impact of attending a high academically effective primary school versus a low effective primary is on a par with the effect of a mother having a degree versus no qualification (slightly stronger for Maths, slightly weaker for English, in line with findings in other educational effectiveness studies, see Teddlie & Reynolds 2000). This indicates the importance of the primary school as an influential factor for children's educational progress as well as their attainment levels, net of background factors and prior attainment.

The pre-school quality influence on progress was also still evident, although not as strong as that of the primary school academic effectiveness. The effect of a high quality experience versus none is on a par with the influence of a child's eligibility for free-school meals (a measure of low family income) versus none.

In terms of progress in social/behavioural outcomes, pre-school quality and effectiveness had a significant impact on social/behavioural progress, which was similar to the effect of pre-school on social/behavioural developmental levels in Year 6. High quality and highly effective pre-schools, therefore, have a similar positive impact on social/behavioural developmental progress as well as on social/behavioural developmental level. Similar to the progress in cognitive outcomes, the effect of a high quality pre-school experience versus none is comparable with the effect of a child's eligibility for free-school meals versus none. However, there were no significant influences of primary school academic effectiveness on social/behavioural progress just as there was no influence on social/behavioural developmental levels.

The present findings accord with previous EPPE research on the same pupils in Year 5, although by Year 6 effects such as the influence of pre-school tend to be stronger.

Implications

The findings of this Year 6 follow up are broadly in line with those identified when the EPPE 3-11 sample were age 10 (Sammons et al, 2007b). At age 10 standardised assessments (NFER tests) were adopted to measure children's attainments in Year 5. In both years teachers' assessments of social behaviour were collected. The consistency in findings for the academic as well as those for social/behavioural outcomes provides greater confidence in the robustness of the results (since Year 5 was not a National assessment year and the NFER tests are constructed differently).

EPPE 3-11 demonstrates the extent to which individual child, family and home learning environment (HLE) background factors continue to predict children's academic outcomes (attainment/progress) and social/behavioural development in Key Stage 2. Longitudinal studies are able to monitor this over time which is relevant to the debate on equity in education, and to policies that seek to raise standards, reduce the equity gap and promote inclusion.

High (and in some cases medium) quality pre-school still benefits children's cognitive and social/behavioural outcomes at age 11. 'Home' children do less well on most outcomes compared to those who attended medium or higher quality pre-school. They also show a continued disadvantage in terms of 'Pro-social' behaviour but better outcomes for 'Hyperactivity', which is consistent with Year 5 findings, but the effects are stronger in Year 6. Low quality pre-school has little enduring benefit in terms of academic and social/behavioural outcomes in the longer term and was even associated with some poorer social outcomes in comparison with the 'home' group, although not for 'Pro-social' behaviour.

A high Early years HLE seems to be a protective factor for children who did not attend pre-school promoting better 'Self-regulation' in Key Stage 2. Similarly, previous experience of attending high quality pre-school ameliorates the negative impact of a low Early years HLE fostering relatively better 'Self-regulation' at age 11.

Children's academic outcomes in English and particularly Mathematics are boosted by attending an academically more effective primary school, while there is no evidence of negative influence on social/behavioural outcomes. This has important implications for the Every Child Matters agenda by showing that promoting better academic outcomes does not compete with better social/behavioural development. The finding that primary school academic effectiveness is a particularly significant influence for disadvantaged pupils (especially those who did not have the

advantage of attending a medium or better pre-school, those with low qualified parents, and those with SEN) is relevant to policy aims to encourage social inclusion as well as raising standards.

The results indicate that the combination of different influences at home and in education (of a high Early years HLE along with a higher quality, more effective pre-school and a more academically effective primary school) can give a significant boost to children's outcomes at age 11 years.

These findings add to the debate about reducing the achievement gap for disadvantaged groups.

Concerted action to improve the Early years HLE, and both pre-school and primary school experiences (reducing variation in quality and effectiveness) is needed to make a difference to outcomes for the most disadvantaged children (and has been a focus in more recent policy development). In addition, the present findings suggest that there may be a need for specially targeted interventions for those children who are identified as being well behind their peers in cognitive and social/behavioural profiles at the start of primary school, particularly since many of these children are likely to have missed the benefit of a good pre-school experience or a good Early years HLE. This may go some way to narrowing the achievement gap during KS1 and KS2 since early intervention has a better chance of improving such pupils' learning trajectories (Sammons & Sylva, 2004b; Hurry & Sylva, 2007; Sylva et al., 2008).

In terms of mobility schools need to pay attention to continuity of education, given mobile children's higher risk of poorer outcomes.

Efforts to improve the quality of pre-schools and schools over the last decade are likely to be of benefit in combating disadvantage (Sammons, 2008 forthcoming). It should be noted that since the EPPE sample were in pre-school (1997-2000) there has been a major expansion of pre-school and significant additional investment in early years.

A final report summarising all the EPPE 3-11 findings is in preparation (Sylva et al., 2008-forthcoming). The research continues to follow the pupil sample up to the end of Key Stage 3 under the new title Effective Pre-school, Primary and Secondary Education (EPPSE 3-14).

Methodology

The EPPE 3-11 research contains a series of three 'nested' sets of analyses which help answer specific research questions.

The first set investigates the academic effectiveness of the approximately 950 primary schools in 155 local authorities the EPPE 3-11 children attended. It used statistical data (matched KS1 and KS2 National assessment results) for successive pupil cohorts derived from every primary school in the country (over three consecutive years 2002-2004) for English and Mathematics to provide value added estimates of the academic effectiveness of each school in these subjects and matched the resulting value added measures to the EPPE 3-11 child data set (Melhuish et al., 2006).

The second set of analyses involved the collection of information on academic and social/behavioural development for every child in the sample. The sample of 2701 pupils originated from 141 pre-school centres covering six types of provision (nursery classes, nursery schools, integrated settings, playgroups, private day nurseries and local authority day nurseries) in six local authorities and included a group of 'Home' pupils who had not attended pre-school. Multilevel analyses investigated the effects of child, family and HLE, and pre and primary schooling on children's developmental outcomes.

The third analyses explored classroom practice in a sample of 125 Year 5 classes through two different but complementary classroom observations. These analyses showed the variation in teachers and pupils behaviours and the impact of this on children's outcomes (see Sammons et al., 2006; 2008a).

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Additional Information

Copies of the full reports (DCSF-RR048 - Cognitive Outcomes and DCSF-RR049 – Social/Behavioural Outcomes) are available by phoning the DCSF Publications Orderline on 0845 60 222 60. Reports are priced at £4.95.

Research Briefs and Research Reports can also be accessed at www.dcsf.gov.uk/research/

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Table 1: Summary of background factors and pre- and primary school influences on cognitive attainment and social behaviour at Year 6

(Only the largest effect sizes are reported; comparison group in brackets)

	English	Mathematics	'Self-regulation'	'Pro-social' behaviour	'Hyperactivity'	'Anti-social' behaviour
Child Factors						
Gender (boys)	0.29	-0.19	0.30	0.71	-0.71	-0.38
Ethnicity (White UK heritage)	0.17	0.45	0.37	-0.28	-0.55	-0.27
Early Developmental problems (none)	-0.24	-0.15	-0.47			
Early Behavioural problems (none)			-0.25	-0.24	0.31	0.24
Need of EAL support (none)	-0.59	-0.64	-0.65		0.46	
Birth weight (normal)	-0.47	-0.48				
Family factors						
Free school meals (FSM) (non-FSM)	-0.23	-0.15	-0.23		0.21	0.27
Family earned income (none)	0.26	0.25	0.38	0.25	-0.24	
Mother's qualification level (none)	0.76	0.71	0.55	0.36	-0.53	-0.27
Father's Qualification level (none)	0.39	0.34	0.29		-0.30	
Family SES (professional non-manual)	-0.26	-0.36				0.28
Marital Status (married)				-0.18		
Change in Marital Status (couple-couple)					0.24	0.25
Home Learning Environment						
Early years HLE (low)	0.69	0.42	0.42	0.22	-0.23	
Key Stage 1 HLE (low)	0.18	0.17				
Pre-school*						
Attending (not attending)	0.22	0.26		0.19		
Pre-school quality*						
ECERS-E	0.29	0.34	0.25	0.23	0.22 (Low quality)**	-0.22
ECERS-R			0.24	0.28	0.22 (Low quality)**	-0.23
Pre-school effectiveness*						
Early number concepts		0.40	0.29	0.27		
Pre-reading	0.25			0.22		
'Co-operation and Conformity'			0.20	0.21		
'Independence & Concentration'			0.19	0.26	0.24 (Low effectiveness)**	
'Peer Sociability'			0.21	0.21	0.20 (Low effectiveness)**	
'Anti-social' behaviour			0.24	0.38		-0.25
Primary School Effectiveness***						
English	0.24					
Mathematics		0.38				

*The reference group for all pre-school quality and effectiveness comparisons is the 'home' group. The effect sizes represent differences between the 'home' group and the 'high quality/effectiveness' group unless stated otherwise.

**The effect sizes represent differences between the 'home' group and the 'low quality/effectiveness' group.

*** The reference group for primary school is 'low effectiveness'. The effect sizes represent differences between the 'low effectiveness' group and the 'high effectiveness' group. *** The reference group for primary school is 'low effectiveness'. The effect sizes represent differences between the 'low effectiveness' group and the 'high effectiveness' group.

RESEARCH

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EFFECTIVE PRE-SCHOOL AND PRIMARY EDUCATION 3-11 PROJECT (EPPE 3-11)
INFLUENCES ON CHILDREN'S ATTAINMENT AND PROGRESS IN KEY STAGE 2: COGNITIVE OUTCOMES IN YEAR 5

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Effective Pre-School and Primary Education 3-11 (EPPE 3-11) (2003-2008) builds on the work of the earlier Effective Provision of Pre-School Education (EPPE) project (1996-2003) which investigated the impact of pre-school provision on a national sample of young children in England between the ages of 3 and 7 years. EPPE 3-11 is following the same sample of around 2,500 children to age 11, the end of Key Stage 2. This Research Brief focuses on the relationships between various child, family, home, pre-school and primary school characteristics and measures of children's cognitive attainment in Year 5 of primary school (age 10). It compares these findings to the impact of the same factors when the children were in Year 1 (age 6). The brief also reports findings about the combined influence of pre-school and primary school experience on children's cognitive attainment in Year 5.

Key Findings

The key findings are reported in terms of the three main sets of influences studied: child/family; evidence of continuing pre-school influence; and the contribution of the primary school attended.

Child, Family and Background effects

- The quality of the early years home learning environment (HLE) and parents' (especially mothers') qualification levels are the most important background factors relating to a child's attainment in reading and mathematics at Year 5, followed by low birth weight, need for support with English as an additional language (EAL), early health or developmental problems and socio-economic status.
- Taken together, child, family and home influences on children's attainment in reading and mathematics in Year 5 are weaker predictors than they were in Year 1. This is likely to indicate the increased primary school and peer group influence.

Pre-school effects

- There is evidence of a continuing positive effect of attending higher quality or more effective pre-school settings on children's subsequent outcomes in mathematics and reading at the end of Year 5, once the influence of background factors has been taken into account.
- Those children who attended low quality pre-school no longer show cognitive benefits by Year 5; their results are not significantly different from the children who did not attend pre-school. This is a change in comparison to earlier findings at age 5 (the start of primary school) when all pre-school experience was found to be beneficial.

Primary school effects

- The academic effectiveness of the primary school a child attends (as measured by independently conducted value added analyses of national assessment results for 2002-2004) was a significant factor in accounting for variation in EPPE children's reading and mathematics attainment in Year 5. Children who attended a primary school identified as academically more effective had better outcomes at age 10 than children who

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- attended a less effective primary school, after allowing for the influence of child, home and pre-school factors.
- Attending a more academically effective primary school was more important for the later attainment of children who had not attended pre-school or who had attended a low quality pre-school than to those children who had attended a more effective or higher quality pre-school.
- Equally, early experience of attending a better quality or more effective pre-school appeared to act as a protective factor against the limitations of later moving to a less academically effective primary school, in terms of fostering better reading and mathematics outcomes in Year 5.
- Overall the results indicate that the combined influence of attending a better pre-school and a more academically effective primary school can give a significant boost to children's later cognitive outcomes at age 10, especially for mathematics. This effect is similar in size to the impact of having a high rather than a low Home Learning Environment or a mother with the highest level of educational qualifications (a degree or above) rather than none.

The EPPE 3-11 Research: Background

The original EPPE study monitored children's intellectual and social behavioural development between the ages of 3–7 years. The EPPE 3-11 extension follows up the sample to the end of primary school (age 11 years). The EPPE website: www.ioe.ac.uk/projects/eppe gives further details about the study and the sample.

This Research Brief reports on a range of analyses related to the cognitive progress of all children in the EPPE3-11 sample. The focus is on exploring the factors that predict children's reading and mathematics attainment in Year 5 (age 10 years).

In addition to exploring background and continuing pre-school effects, the study investigates the influence of primary school on children's outcomes and the way primary school and pre-school influences jointly affect children's attainment.

This Research Brief outlines the analysis strategy used to examine the relationships between child, family and home learning environment factors and children's cognitive attainment at the end of Year 5. Changes in the effects of these factors on attainment between Year 1 and Year 5 are compared. The additional effects of pre-school and primary school experience are then explored.

For further details on the research and analyses used in this study see the Summary report and full Technical report (Sammons et al., 2007a,b). A separate report will provide equivalent information about important social/behavioural outcomes for the same child sample in Year 5.

Analysis Strategy

The findings reported here are based on analyses of a wide range of quantitative data about children's development, child, family and home learning environment (HLE) characteristics and the characteristics of the pre-schools attended. It is important to consider the influence of background on attainment outcomes in order to investigate net pre-school and primary school effects, because pre-schools and primary schools differ considerably in the characteristics of their child/pupil intakes.

Additional 'value added' measures of overall primary school academic effectiveness have been derived from independent statistical analyses of national data sets conducted for all primary schools in England based on successive (2002-2004) pupil cohorts (Melhuish et al., 2006) as part of this study. These have been incorporated into the child databases to provide indicators of the academic effectiveness of the primary school attended by each child in the EPPE3-11 sample to complement the measures on pre-school settings collected previously.

Standardised NFER tests of reading and mathematics were administered to provide measures of children's educational outcomes in Year 1 and again in Year 5. Primary Reading NFER Nelson Level 1 and 2 were appropriate for the age range of the sample. Tests were administered to relevant cohorts in the spring term of 2003-2006[1].

Statistical analyses (using multilevel models) investigated the influence of different child, family and HLE background factors on children's

[1] The EPPE sample was recruited at entry to the pre-school study and covered four age cohorts reflecting differences in their ages. This means that the NFER tests were administered in four successive years when pupils were in Year 5 of primary school.

attainment at the end of Year 5. These analyses identify the unique (net) contribution of particular factors to variations in children's outcomes, while other background influences are controlled for. For example, the impact of family socio-economic status (SES) is established while taking into account the influence of mother's qualification levels, low income, ethnic groups etc. This is important because the research shows that much of the apparent difference in attainment associated with certain characteristics, for example, ethnic group membership, is attributable to the impact of other socio-economic and demographic factors (e.g. birth weight, income, language, family SES, parents' qualification levels and HLE). It also means that analyses of any continuing pre-school effects and primary school influences on children's outcomes in Year 5 as well as their joint effects, include control for the influence of background factors.

Similar analyses were conducted when the children were in Year 1 (age 6) enabling comparisons to be made with the latest results in Year 5. We investigated the progress made by different pupil groups during Key Stage 2, and sought to establish the changing impact of individual background factors on attainment as children move through primary school.

The Findings

Background and home learning factors

The impact of background characteristics was explored to identify the size of the equity gap in attainment for different demographic factors and whether the influence of demographic factors had increased or decreased across Key Stage 2 between Years 1 and 5.

Child characteristics - At the end of Year 5, gender differences were identified, with girls doing better than boys in reading. Boys tended to show higher attainment than girls in mathematics. Children with very low birth weight had significantly lower attainment in both reading and mathematics. Children from larger families (with 3 or more siblings) and those with early developmental problems, showed significantly lower attainment in reading.

Children who needed support for English as an Additional Language (EAL) showed lower average attainment in reading and mathematics (with stronger effects for mathematics than reading). For ethnic groups, reading attainment for Bangladeshi and White European children was significantly lower whilst in mathematics, Indian children showed particularly high attainment by Year 5. It should be stressed that differences relating to ethnic groups and mother tongue identified here are net of the influences of all other factors including SES and mother's qualification level in which there are also significant differences between ethnic groups.

Family characteristics - Being from a family with low income (measured by entitlement to free school meals [FSM]) showed a negative relationship with attainment.

Mother's education level shows significant positive effects that were stronger than found at earlier time points, especially for reading. Although father's highest qualification also has a statistically significant effect on attainment, mother's highest qualification showed a stronger link to children's attainment at Year 5, again in line with earlier findings.

All socio-economic groups (SES) that were lower than 'professional non-manual' were associated with lower attainment levels for both reading and mathematics with significantly lower attainment for children whose parents belong to the groups 'skilled non-manual', 'skilled manual' and 'semi-skilled' in mathematics. In reading, the category 'unskilled' was also associated with significantly lower attainment.

The Early Years Home Learning Environment (HLE) - The early years HLE is a measure of the quality of the home learning environment during the pre-school period, made up of parents' reports of specific learning activities undertaken in the home. Sammons et al., (2002; 2003) gives more details on the items in this index and reports on its impact on children when they started primary school. In these Year 5 analyses, the early years HLE is found to be a powerful predictor of better cognitive attainment at age 10 even after 5 years in primary school. It had a slightly stronger effect on reading and mathematics (and had a similar effect size as for a mother with a degree compared to a mother with no qualification). There are only modest correlations between HLE and parents' highest qualification levels.

The most important background, child and family factors - The influence of different single predictors was evaluated in terms of net effect sizes (ES). This provides a measure of relative strength of association for a single predictor while simultaneously controlling for the influence of other significant factors. An ES of size 0.5 can be viewed as a fairly strong predictor, one of size 0.2 as moderate.

The most important background predictors for reading and mathematics were mother's highest level of qualification (reading: ES = 0.64, mathematics: ES = 0.54, for children whose mother had a degree compared to no qualification) and early years HLE (reading: ES = 0.61, mathematics: ES = 0.57 for the highest HLE-category compared to the lowest HLE-category). For comparison: The effect size of the statistically significant gender effect in reading was weaker at 0.10.

Changes in the impact of family background (from Year 1 to Year 5)

Child characteristics - Girls still showed higher attainment than boys in reading in Year 5 (as they did in Year 1). The results for boys in mathematics show a reversal at Year 5 compared to Year 1; as a group they had not only caught up with, but had overtaken, the girls.

At Year 1 and Year 5, children with very low birth weight showed lower cognitive scores but the strength of the effect decreased for both reading and mathematics by Year 5. Family size has also lost some of its impact on attainment in reading. Being identified as having early developmental problems has increased in its impact on attainment in reading but slightly decreased for mathematics. Although children who needed EAL support were still showing lower attainment in reading, the relative attainment 'gap' compared with other children decreased.

Given the relatively small sizes of some ethnic groups in the EPPE 3-11 sample the results by ethnicity should be interpreted with caution. The results show the importance of taking account of other demographic influences that affect attainment for all children as they account for much of the differences in average attainment level found for different ethnic groups. However, having taken account of these factors some ethnic groups still show lower or higher attainments in reading and mathematics than White UK children.

Comparisons between the White UK children and other ethnic groups reveal the following: Black African children had slightly higher attainment in reading in Year 1 but have fallen behind at the end of Year 5. Other ethnic groups have stayed at the same level in reading (see Sammons et al., 2007b for full details). For mathematics in Year 1 Indian children had relatively lower scores than White UK children, whereas by Year 5 they have not only closed the gap but had significantly higher scores. Black African children have fallen further behind in mathematics, whereas Pakistani and Bangladeshi children have improved their attainments relative to White UK children during Key Stage 2.

Family characteristics - The impact of mother's highest qualification on cognitive outcomes show that this had become even stronger at the end of Year 5 than it was at Year 1, especially for reading. The father's highest qualification (although relatively less important than the mother's) had become stronger for attainment in mathematics.

For attainment in reading, the SES gap between Year 1 and Year 5 has become slightly wider but this is not the same for mathematics, where the pattern is more inconsistent with an overall slight decrease. The impact of low income (measured by eligibility for free school meal status FSM) though remaining moderate has become slightly stronger for attainment in reading (ES 0.27) but is little changed for attainment in mathematics (ES 0.22).

The Early Years Home Learning Environment (HLE)

The quality of the early years HLE a child experienced during the pre-school period was still found to be a very important factor for academic outcomes in Year 5, controlling for all the other background variables. In fact it was one of the strongest predictors of cognitive outcomes in the analyses. For attainment in reading the influence of HLE seems to be of the same strength as in Year 1 (change in ES approximately 0.05) but in mathematics the impact has slightly decreased (change in ES between 0.06 and 0.14).

The impact of pre-school

Given previous findings that pre-school experience gave children a better start to school (see Sammons et al., 2002; 2003), an important aim of the analyses was to establish whether there was any longer term continuing pre-school influence in Year 5 and to explore the influence of primary

school. Earlier follow ups to Year 2 had found continuing pre-school effects across Key Stage 1.

In contrast to findings at entry to primary school (age rising 5 years) and at age 7, two of the four pre-school measures used no longer showed a statistically significant relationship with reading or mathematics attainment at age 10. These two were whether or not a child had simply attended any pre-school centre or not, and the duration of time in months in pre-school where they had. The two other indicators - related to the *quality* and the *effectiveness* of the particular pre-school attended - were still found to be predictors of better cognitive outcomes in Year 5.

Quality[2] *and effectiveness*[3] *of pre-school* - There were small but significant differences in attainment in reading associated with pre-school quality. Children who attended a low quality as opposed to a high quality pre-school setting (ES 0.15) had significantly lower attainment, this was similar in size to the effect of gender. At 10 years old, children who had not attended any pre-school also showed no worse outcomes in reading than those children who had attended a low quality pre-school, but poorer results than those who had attended a medium or high quality pre-school. The results on quality of pre-schooling for mathematics were weaker. Attending a high quality pre-school appears to be relatively more important in long term reading achievement than in mathematics, where attending a medium quality pre-school also provided a small boost.

Similarly the effectiveness of the pre-school attended still showed a modest positive impact on children's subsequent attainment in both reading and mathematics in Year 5. Children who had attended a more effective pre-school showed significantly better attainment in Year 5 than children who had attended no or only a low effective pre-school. These results were somewhat stronger for mathematics (ES between 0.20-0.25 for the highly effective pre-school categories).

Pre-school quality was more influential in shaping later reading outcomes while pre-school effectiveness in promoting early number concepts was more influential for later outcomes in mathematics in Year 5.

The combined impact of pre-school and early years HLE - Children who had experienced a high early years HLE and also went to a medium or high quality pre-school showed the strongest positive long term benefit in reading by Year 5. Children who did not attend pre-school also benefit particularly from high early years HLE and interestingly, they show higher reading achievement than high early years HLE children who went to low quality pre-schools. But for children who had low early years HLE, those who went to a high quality pre-school showed better attainment at Year 5 than children with similar characteristics who did not attend pre-school. These findings underline the positive benefits both of high quality pre-school and of good early home learning environment, in line with findings for the same children at younger ages. They also illustrate the way the two combine to influence children's development in the longer term.

Different pre-school effects for less and more disadvantaged children

Higher quality and more effective pre-school appears to give a long term boost for all children but for the most disadvantaged children only high quality is associated with a significant long term boost. Lower quality pre-school appears to offer no long term attainment benefit in Year 5, this was more apparent for disadvantaged children. Again, this highlights the importance of quality in pre-school intervention, especially for the most vulnerable groups of young children.

The impact of primary school academic effectiveness

Children in the EPPE3-11 sample who went on to attend a very high, high or medium academically effective primary school (in terms of value added progress in national assessment results) were found to obtain significantly better scores in NFER tests of mathematics in Year 5 than children who had attended a low effective primary school. The ES was 0.29 - stronger than the effect of FSM (ES 0.22 for mathematics, for example).

Likewise, EPPE3-11 children who went on to attend a very high or highly academically effective primary

[2] *Quality* of pre-school was based on observations in each centre, using rating scales (see Sylva et al., 2004).

[3] *Effectiveness* of pre-school was derived from a 'value added' model of EPPE children's progress across 141 pre-school settings (after controlling for prior attainment and background factors). Pre-school centres where children made more progress in pre-reading or early number concepts were classified as more effective (see Sammons et al., 2002).

school (in value added terms in national assessments of English) were also found to have significantly better reading skills by Year 5 in NFER tests than children who had attended a low effective primary school. The ES was somewhat weaker than that found for mathematics, however at 0.19.

These results indicate that the variations in academic effectiveness identified between primary schools, as measured by our independently derived value added indicators, have a significant influence on children's attainment in other measures and at other time points (standardised NFER tests), over and above the influence of child and family background and HLE. Children who attend a less academically effective school are likely to do significantly less well by Year 5, especially in mathematics, taking other factors into account. For disadvantaged children, attending a less academically effective primary school is likely to further increase the achievement gap.

The combined impact of pre- and primary school effectiveness

Further analyses investigated the joint influences of pre-school and primary school on attainment outcomes in Year 5. The research provides new evidence concerning the *combined* effects of pre-school and primary school in shaping children's educational outcomes. These analyses sought to establish whether going to a high quality or more effective pre-school had a protective impact if a child subsequently went on to a less academically effective primary school (in value added terms). We also investigated whether home children or those who went to a less effective or low quality pre-school did better later if they went to a more academically effective primary school.

For reading: at Year 5, children who did not attend pre-school achieved better reading outcomes if they went to a medium/high academically effective primary school than a low effective one (ES 0.17). Children who did not attend pre-school and went to a low effective primary school had the lowest reading outcomes. Children who attended a low quality pre-school centre also showed little extra benefit in reading in Year 5 even if they went on to attend a medium or highly effective primary school compared with home children who went to a low effective primary. Children who attended a medium or high quality pre-school centre showed better reading attainment outcomes in Year 5 and were less affected by the academic effectiveness of the primary school. We conclude, therefore, that attending a higher quality pre-school seems to have some protective effect in terms of later reading outcomes for children who go on to less academically effective primary schools.

For mathematics: at Year 5, results on continued pre-school effects are stronger than for reading. Children who did not go to pre-school and who attended a low effectiveness primary school had significantly lower attainment than all other pupil groups by Year 5. In all groups, including children who did not go to pre-school, there was a strong benefit from attending a more academically effective primary school compared with the home group (ES in range 0.47-0.53). Nonetheless, children who went to a low or medium quality pre-school centre and low effective primary school later on were still doing better than those children who did not have any pre-school experience and went to a low effective primary school. Children who went to high quality pre-school were doing particularly well, even if they went on to attend a low academically effective primary school (again indicative of a protective benefit of pre-school). Children who went to a high quality pre-school centre and a medium/high effective primary school, showed the most positive effect (ES 0.53) in Year 5 controlling for the impact of all other background factors.

Implications

The results show that the relative advantage of attending good quality and highly effective pre-school on cognitive outcomes persists to Year 5. However this advantage reduces over time and is less at Year 5 than at entry to primary school. Although the effects of pre-school are generally stronger for more advantaged children, it is important to note that children from more disadvantaged backgrounds are still attaining higher scores by Year 5 compared to their peers with similar backgrounds who did not have the benefit of high quality pre-school experience.

The research also reveals the strong influence of the early years HLE but also highlights interesting interactions. An important finding is that the effects of pre-school are, in part, influenced by the child's home experiences – particularly the HLE. Raising the quality of learning in *both* the home and pre-school are likely to be more successful in improving children's developmental trajectories,

especially for disadvantaged groups, than concentrating on either in isolation.
In addition the research points to the important influence of the academic effectiveness of the primary school that children go on to attend, particularly in fostering better mathematics attainment in Year 5.

No one factor is the key to raising children's attainment and promoting cognitive progress – it is the *combination* of experiences over time that matters. The child who has a better early years HLE, experiences a high quality, more effective pre-school setting and who then goes on to attend a more academically effective primary school has a combination of 'protective' experiences that benefit current and future educational attainment. They are unlikely to overcome all the powerful effects related to child and family background, but their collective contribution can substantially moderate them (see EPPE Team Report, 2007 for further discussion of equity implications).

The results demonstrate that primary schools that are successful in 'value added' terms offer benefits to children's longer term attainments in reading and maths. This is likely to be particularly beneficial for more disadvantaged groups of pupils given evidence of a significant attainment gap from age 3+ years at the start of the EPPE research. In addition, they also indicate that the quality of the pre-school environment (at home and in pre-school settings) has long term implications for children's later outcomes. The findings suggest that interventions to improve the pre-school and home learning experiences of children are likely to offer some protection against ineffective primary schooling. Similarly, attending an academically more effective primary school offers benefits to children, particularly those who did not attend pre-school and those who attended low quality pre-school.

Methodology

The EPPE 3-11 project contains a series of three 'nested' studies or 'tiers' which help answer specific research questions (www.ioe.ac.uk/projects/eppe).

Tier 1 answers the research question about the effectiveness of the 950+ primary schools the EPPE 3-11 children attended. It used statistical data (matched KS1 and KS2 national assessment results) for successive pupil cohorts derived from every primary school in the country (over three consecutive years 2002-2004) for English and mathematics to provide value added estimates of the academic effectiveness of each school. Further information on Tier 1 can be found in Melhuish et al., (2006a, b).

Tier 2, on which this research brief is based, involved collection of information on academic and social behavioural development for every child in the sample in spring term of Year 5, during 2003-2006. The analyses involved a sample of 2556 pupils from the original longitudinal EPPE research study tracked from pre-school entry to the end of Year 2 of primary school (age 3+ to 7 years) for whom reading and mathematics data were collected in the spring term of Year 5 (age 10). The sample were originally drawn from 141 pre-school centres covering 6 types of provision (nursery classes, nursery schools, integrated settings, playgroups, private day nurseries and local authority day nurseries) and included a group of home pupils who had not attended pre-school. The research included independent measures of the academic effectiveness of the primary school attended by children in the sample (based on the Tier 1 analyses described above).

The full report (Sammons et al., 2007b, EPPE 2007) on which this research brief is based can be found on the EPPE website. A summary version is available from the DfES - Sammons et al., 2007a.

Tier 3 explored classroom practice through two different but complementary classroom observations. This addresses the question of what constitutes good classroom practice in Year 5 and what makes effective primary schooling. The results show that, over and above background factors, school matters in shaping children's developmental trajectories. See Sammons et al., (2006).

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Additional Information

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The views expressed in this report are the authors' and do not necessarily reflect those of the Department for Education and Skills.

RESEARCH

RESEARCH BRIEF

Brief No: RBX15-03

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THE EFFECTIVE PROVISION OF PRE-SCHOOL EDUCATION (EPPE) PROJECT: FINDINGS FROM THE PRE-SCHOOL PERIOD

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What is EPPE?

The Effective Provision of Pre-School Education (EPPE) project is the first major European longitudinal study of a national sample of young children's development (intellectual and social/behavioural) between the ages of 3 and 7 years. To investigate the effects of pre-school[1] education for 3 and 4 year olds, the EPPE team collected a wide range of information on over 3,000 children, their parents, their home environments and the pre-school settings they attended. Settings (141) were drawn from a range of providers (local authority day nursery, integrated[2] centres, playgroups, private day nurseries, maintained nursery schools and maintained nursery classes). A sample of 'home' children (who had no or minimal pre-school experience) was recruited to the study at entry to school for comparison with the pre-school group. In addition to investigating the effects of pre-school provision on young children's development, EPPE explores the characteristics of effective practice (and the pedagogy which underpin them) through twelve intensive case studies of settings with positive child outcomes. EPPE has demonstrated the positive effects of high quality provision on children's intellectual and social/behavioural developmental. This brief on the main findings of the research related to the pre-school period (for children aged 3 or 4 years of age to entry into primary school).

Key findings

Impact of attending a pre-school centre

- Pre-school experience, compared to none, enhances children's development.
- The duration of attendance is important with an earlier start being related to better intellectual development and improved independence, concentration and sociability.
- Full time attendance led to no better gains for children than part-time provision.
- Disadvantaged children in particular can benefit significantly from good quality pre-school experiences, especially if they attend centres that cater for a mixture of children from different social backgrounds.

[1] Pre-school centres in this document means those centres that included 3 and 4 year olds.
[2] 'Integrated' settings fully combines education and care and is referred to as 'combined' centres in EPPE Technical Papers.

The quality and practices in pre-school centres

- The quality of pre-school centres is directly related to better intellectual/cognitive and social/behavioural development in children.
- Good quality can be found across all types of early years settings. However quality was higher overall in integrated settings, nursery schools and nursery classes.
- Settings which have staff with higher qualifications, especially with good proportion of trained teachers on the staff, show higher quality and their children make more progress.
- Where settings view educational and social development as complementary and equal in importance, children make better all round progress.
- Effective pedagogy includes interaction traditionally associated with the term "teaching", the provision of instructive learning environments and 'sustained shared thinking' to extend children's learning.

Type of pre-school

- There are significant differences between individual pre-school settings in their impact on children. Some settings are more effective than other in promoting positive child outcomes.
- Children tend to make better intellectual progress in fully integrated centres and nursery schools.

The importance of home learning.

- The quality of the learning environment of the home (where parents are actively engaged in activities with children) promoted intellectual and social development in all children. Although parent's social class and levels of education were related to child outcomes the quality of the home learning environment was more important. The home learning environment is only moderately associated with social class. What parents do is more important than who they are.

The Aims of EPPE

EPPE set out to investigate:

What is the impact of pre-school on young children's intellectual and social/behavioural development? Can the pre-school experience reduce social inequalities?

Are some pre-schools more effective than others in promoting children's development?

What are the characteristics of an effective pre-school setting?

What is the impact of the home and childcare history (before aged 3) on children's intellectual and behavioural development?

EPPE studied a range of different types of pre-school settings and 3,000 children from differing social backgrounds. An important element in the study has been to ensure that fair comparisons can be made between individual settings and types of provision. To do this, full account needs to be taken of differences in the characteristics of the children attending different settings and types of provision. Similarly, the study has taken into account the contribution to children's progress and development of background factors such as birth weight, gender, parental qualifications/occupations, home language and the home learning environment. The pre-school effects reported in this paper are therefore net of child and family factors. Only by using such 'value added' methods can appropriate comparisons be made across settings.

The impact of pre-school provision

EPPE researchers assessed children individually at three/four years old when they joined the study. Assessments were undertaken to create a profile of each child's intellectual and social/behavioural development (their attainment) using standardised assessments and reports from the pre-school worker who knew the child best. Children were assessed again at entry to primary school (usually reception) and analyses were carried out to compare children's progress, taking into account the range of background factors referred to above. Many EPPE findings point to the importance of attending pre-school centres for 3 and 4 year olds.

From analyses of children's development during pre-school compared with 'home' children, EPPE found that pre-school attendance improves all children's cognitive development and aspects of social behaviour, such as independence, concentration, cooperation, conformity and relationships with other children (peer sociability). Moreover, individual settings vary in their effectiveness with some settings fostering better child outcomes than others.

Children with no (or limited) pre-school experience (the 'home group') had poorer cognitive attainment, sociability and concentration when they start school. These differences show even when we take account of differences between the pre-school and home groups in child, family and home environment characteristics.

A number of factors associated with attendance at pre-school were also explored. EPPE shows that how long a child attended pre-school (duration measured in months from entry to the study to the start of primary school) was related to positive intellectual gains. An early start at pre-school (under 3 years) was also linked with better intellectual attainment and children having better relationships with other children (peer sociability) at age 3 years. These benefits continue when children start primary school. However, there was no evidence that full day attendance led to better development than half-day attendance.

In addition to studying the overall impact on all children's development the research explored whether pre-school had an impact on the progress of different kinds of children. For instance, was pre-school particularly beneficial to children who are more disadvantaged? EPPE shows that one in three children were 'at risk' of developing learning difficulties at the start of pre-school. However, this proportion fell to one in five by the time they started primary school[3]. This suggests that pre-school can be an effective intervention for the reduction of special educational needs (SEN), especially for the most disadvantaged and vulnerable children.

Disadvantaged children are more likely to have adverse social profiles at age 3 and school entry. The increased risk of anti-social/worried behaviour can be reduced by high quality pre-school when they were aged 3 and 4.

Different groups of children have different needs. Results imply that specialised support in pre-schools, especially for language and pre-reading skills, can benefit children from disadvantaged backgrounds and those for whom English is an additional language.

It is also interesting to note that there is evidence of significant gender differences in young children's intellectual and social behavioural development. At entry to pre-school, girls generally show better social development than boys, especially in co-operation/conformity and independence and concentration. Girls also show higher attainment on all cognitive outcomes. These differences persist to the start of primary school.

EPPE has shown that pre-school has an important impact on children's development. Whilst not eliminating disadvantage, it can help to ameliorate the effects of social disadvantage and can provide children with a better start to school. Investing in good quality pre-school provision is therefore likely to be an effective means of achieving targets concerning social exclusion and breaking cycles of disadvantage.

Are some pre-schools more effective than others in promoting children's development?

Even after taking account of a child's background and prior intellectual skills, the type of pre-school a child attends has an important effect on their developmental progress.

It was found that integrated centres (these are centres that fully combine education with care) and nursery schools tend to promote better intellectual outcomes for children. Similarly, integrated centres and nursery classes tend to promote better social development even after taking account of children's backgrounds and prior social behaviour.

Disadvantaged children do better in settings with a mixture of children from different social backgrounds rather than in settings containing largely disadvantaged groups. This has implications for the sighting of centres in areas of social disadvantage.

What are the characteristics of an effective pre-school?

Statistical analysis of the progress of children during the pre-school period enabled the researchers to identify settings which promoted children's developmental outcomes beyond what could be expected given the child's overall profile and social background. These were the most 'effective' centres; settings where children made more progress than could be expected given their intellectual and social/behavioural assessments at entry to pre-school.

A focus on effective centres illustrated some key characteristics that seemed to promote developmental gains in children. These clustered around the ***quality*** of the centres and the ***practices*** within the centres. Although there was significant variation between the types of centres in the study, there was no tendency for centres that were more effective in promoting children's intellectual development to be less effective at promoting social/behavioural development (or vice versa). In other words the most effective centres promoted both.

Pre- school 'Quality'

An important question for the EPPE research was whether higher quality pre-school provision makes a difference to the intellectual and social behavioural development of young children, and if so, what is essential in ensuring quality?

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[3] See the Early Transition and Special Education Needs (EYTSEN) Report for more detail on SEN in the early years. Published by Institute of Education

Information from observations to assess the quality of each setting, using standardised rating scales[4] showed a significant links between higher quality and better child outcomes. Children in pre-school centres of high quality show reduced anti-social/worried behaviour by the time they get to school.

EPPE findings on quality are consistent with other large-scale longitudinal research including the NICHD (National Institute of Child Health and Development) and CQO (Childcare Quality and Outcomes) studies in the US.

Good quality pre-school education can be found in all kinds of settings irrespective of type of provider. However, the EPPE data indicates that integrated centres and nursery school provision have the highest scores on pre-school quality, while playgroups, private day nurseries and local authority centres have lower scores.

The quality of the interactions between children and staff were particularly important; where staff showed warmth and were responsive to the individual needs of children, children showed better social behavioural outcomes. Several features of the quality rating scale were also related to increased intellectual progress and attainment at entry to school.

What improves 'quality'?

There was a significant relationship between the quality of a centre and improved outcomes for children. There was also a positive relationship between the qualification levels of the staff and ratings of centre quality. The higher the qualification of staff, particularly the manager of the centre, the more progress children made. Having qualified trained teachers working with children in pre-school settings (for a substantial proportion of time, and most importantly as the pedagogical leader) had the greatest impact on quality, and was linked specifically with better outcomes in pre-reading and social development.

Pre-school 'Practices'

The rating scales used to assess quality showed an impact on children's development. For instance, centres which put particular emphasis (as described in the rating scale) on the development of literacy, maths and catering for children's individual needs promoted better outcomes for children in the subsequent development of reading and mathematics. Similarly, high scores on some aspects of the rating scale which focus on promoting positive 'social interactions' were linked with better sociability in children.

In addition to the rating scale measurements of quality, EPPE conducted individual intensive case studies in 12 centres identified in the upper range of effectiveness based on the amount of progress their children made while attending them. The purpose of the case studies was to explore the practices in these centres that might help explain their greater effectiveness. This has important implications for all those working directly with young children as it describes practices linked to children making better progress.

The case studies identified five areas that are particularly important when working with children aged 3 to 5 years. These were the quality of adult-child verbal interactions; staff knowledge and understanding of the curriculum; knowledge of how young children learn; adult's skill in supporting children in resolving conflicts and helping parents to support children's learning in the home.

The quality of adult-child verbal interactions

'Sustained shared thinking' is where two or more individuals 'work together' in an intellectual way to solve a problem, clarify a concept, evaluate an activity, extend a narrative etc. Both parties must contribute to the thinking and it must develop and extend the understanding. It was found that the most effective settings encourage 'sustained shared thinking' which was most likely to occur when children were interacting 1:1 with an adult or with a single peer partner. It would appear that periods of 'sustained shared thinking' are a necessary pre-requisite for the most effective early years practice.

Interestingly, information from interviews with parents suggests that in some of the very middle class case study settings (notably the private day nurseries), parents who were pro-active towards their children's learning engaged in 'sustained shared thinking' with their children at home. In more disadvantaged settings staff had to be pro-active in supporting parents to develop the home learning environment.

Knowledge and understanding of the curriculum

Pre-school workers' knowledge of the particular curriculum area that is being addressed is vital. A good grasp of the appropriate curriculum content linked to strategies for promoting learning in that content area is a vital component of pedagogy and it is shown to be just as important in the early years as at any later stage of education. The research found that, even in these effective settings, there were examples of inadequate knowledge and understanding of curriculum areas,

[4] The Early Childhood Environment rating scales: Revised (ECERS-R) and Extension(ECERS-E)

especially in the teaching of the sound patterns of word e.g. rhymes. The study shows that early years staff may need support in developing their knowledge of curriculum content and ways of introducing it to children especially in the domains of the Early Learning Goals.

Knowledge on how young children learn
There has been a long debate about the extent to which pre-school education should be formal or informal, often summarised by the extent to which the curriculum is or is not 'play' based. EPPE concludes that in the most effective centres, 'play' environments were used to provide the basis of instructive learning. The most effective pedagogy is both 'teaching' and providing freely chosen yet potentially instructive play activities.

In effective settings, the balance of who initiated the activities, staff or child, was about equal, Children were encouraged to initiate activities as often as the staff. Similarly in effective settings the extent to which staff extended child-initiated interactions was important. Almost half of the child-initiated episodes which contained intellectual challenge, included interventions from a staff member to extend the child's thinking. The evidence also suggests that adult 'modelling' is often combined with sustained periods of shared thinking, and that open-ended questioning is also associated with better cognitive achievement. However, open-ended questions made up only around 5% of the questioning used in even the 'effective' settings. Greater use of such open ended questions by staff is likely to benefit better intellectual and social development for pre-school children.

In all of the case study settings, the research found that the children spent most of their time in small groups. Freely chosen play activities often provided the best opportunities for adults to extend children's thinking. It may be that extending child-initiated play, coupled with the provision of teacher-initiated group work, improves opportunities for learning.

Qualified staff in the most effective settings provided children with more experience of curriculum-related activities (especially language and mathematics) and they encouraged children to engage in activities with higher intellectual challenges. While the research found that the most highly qualified staff also provided the most direct teaching, they were also the most effective in their interactions with the children, using the most sustained shared thinking. Further, the research found that less qualified staff were significantly better as pedagogues when they worked with qualified teachers.

How adults support children in resolve conflicts
The most effective settings adopted discipline/behaviour policies in which staff supported children in being assertive, while simultaneously rationalising and talking through their conflicts. In settings that were less effective in this respect, observations showed that there was often no follow up on children's misbehaviour and, on many occasions, children were 'distracted' or simply told to stop.

Supporting children's learning at home.
The most effective settings shared child-related information between parents and staff, and parents were often involved in decision making about their child's learning programme. There were more intellectual gains for children in centres that encouraged high levels of parental involvement. More particularly, children did better where the centre shared its educational aims with parents. This enabled parents to support children at home with strategies that complemented those being undertaken in the pre-school. In more disadvantaged areas, staff in effective settings had to be proactive in influencing and supporting the home learning with the kind of activities described later in this briefing.

What improves 'practice'?
The case studies reveal the practices that appear to contribute to better outcomes for children. The following factors should be considered when trying to improve the pre-school experiences of very young children.

The settings that view cognitive and social development as complementary achieve the best all round outcomes.

Pre-school workers need good curriculum knowledge as well as knowledge and understanding of child development. In addition, increasing formative feedback to children during activities will aid a child's understanding.

The most effective settings provide both adult-initiated group work and freely chosen yet potentially instructive play activities. Children's cognitive outcomes appear to be directly related to the quantity and quality of the teacher/adult planned and initiated focused group work for supporting children's learning.

Behaviour policies in which staff support children in being assertive, at the same time as rationalising and talking through their conflicts lead to better socialisation for children.

Improving practices in sharing educational aims with parents would benefit children.

Trained teachers were most effective in their interactions with children, engaging more often in sustained shared thinking. Less well-qualified staff demonstrated significantly better practices when they were led by qualified teachers. The research findings support the general approach taken in Curriculum Guidance for the Foundation Stage (CGFS).

What is the impact of the home and childcare history on children's development?

In addition to the child assessments and pre-school centre information, interviews were conducted with parents when their child entered the study (with follow-up questionnaires when the children were in school). These were used to collect detailed information about childcare histories, characteristics of children, their families and home environments. This wealth of information has enabled the research study to investigate some of the influences affecting young children that have a significant relationship with their intellectual and social/behavioural development. These factors clustered around demographic influences, patterns of childcare before entering the study and the home learning environment.

Demographic influences
Research has consistently indicated that there are strong associations between certain factors (such as low socio-economic status [SES], low income, mother's educational levels) and children's poor intellectual attainment at school. However, relatively few large-scale research studies have been able to explore the range of background factors considered in the EPPE study.

The parent, family and home characteristics of children are inter-related and causal attributions cannot be made. For instance the higher incidence of lower attainment amongst children with young mothers is also likely to reflect other factors, including lower qualification levels and reduced employment levels for this group. Bearing this in mind, the findings indicate that there is a strong relationship between a child's intellectual skills and their family background characteristics at entry to pre-school. However, this reduces (though is still strong) by the time children enter primary school. This indicates that pre-school whilst not eliminating differences in social backgrounds, can help to promote better development and can thus help to combat social exclusion.

These findings are consistent with findings from the NICHD study, where family characteristics have a greater impact on outcomes for children than pre-school factors. However, the effect of attending pre-school (versus not) on developmental progress is greater than the effect of measure of social disadvantage (qualification level of family, SES etc.). In addition, for children attending pre-school, the effect of attending a specific centre is about half that of all social background factors (bearing in mind individual settings vary in their impact).

Patterns of childcare before entering the study
Our parental interviews discussed with parents the 'history' of their children before they entered the study. Data were collected on the number of hours and type of childcare before aged three but not on the quality of the childcare before aged three. This revealed that non-parental child care before three years of age had several effects:

High levels of 'group care' before the age of three (and particularly before the age of two) were associated with higher levels of anti-social behaviour at age 3. This effect was largely restricted to children attending Local Authority and Private Day nurseries where substantial numbers of children attended from infancy onwards. When children who show anti-social behaviour at age 3, attend a high quality setting between the ages of 3 and 5 years, their level of anti-social behaviour decreased. Children with high levels of group care before the age of three, by contrast, showed better cognitive attainment.

Where there was substantial individual care from a relative (usually grandmothers) there was less anti-social behaviour in children. Although moderate levels of childminder care were not associated with increased anti-social behaviour, extremely high levels were.

The home learning environment.
What parents and carers do makes a real difference to young children's development. The EPPE project developed an index to measure the quality of the home learning environment (HLE). This measures a range of activities that parents undertake with pre-school children that are related to improvements in children's learning and have a positive affect on their development. For example, reading to child, teaching songs and nursery rhymes, painting and drawing, playing with letters and numbers, visiting the library, teaching alphabet, teaching numbers, taking children on visits and creating regular opportunities for them to play with their friends at home were all associated with higher intellectual and social/behavioural scores.

The HLE can be viewed as a 'protective' factor in reducing incidence of SEN. It is interesting to note that the HLE was only moderately associated with mother's educational level. In other words what parents do with

their children is more important than who parents are. Young mothers, with few qualifications can improve their children's progress, and give them a better start at school by engaging in those activities at home that foster children's learning. This has important implications for programmes such as Sure Start (local programmes) that target areas of high social exclusion.

Methodology

EPPE used the following sources of information: standardised child assessments taken over time, child profiles completed by pre-school staff, parental interviews, interviews with pre-school centre staff, quality rating scales and case study observations and interviews. The case studies included detailed documentation of naturalistic observations of staff pedagogy, and systematic structured target child observations of children's learning. Information was also gathered and analysed using interviews with parents, staff and managers and through intensive and wide ranging documentary analysis and a literature review of pedagogy in the early years.

These sources of data have been used in statistical analyses including multilevel modelling to explore the 'value added' by pre-school after taking account of a range of child, parent and home background factors to produce rigorous and persuasive data for policy makers and provided practical guidance on quality for practitioners.

Summary

This study has demonstrated the positive effects of high quality pre-school provision on children's intellectual and social behavioural development up to entry to primary school. The EPPE research indicates that pre-school can play an important part in combating social exclusion and promoting inclusion by offering disadvantaged children, in particular, a better start to primary school. The findings indicate pre-school has a positive impact on children's progress over and above important family influences. The quality of the pre-school experience as well as the quantity (more terms but not necessarily more hours per day) are both influential. The results show that individual pre-school centres vary in their effectiveness in promoting intellectual progress over the pre-school period, and indicate that better outcomes are associated with some forms of provision. Likewise, the research points to the separate and significant influence of the home learning environment. These aspects (quality and quantity of pre-school and home learning environment) can be seen as more susceptible to change through policy and practitioner initiatives than other child or family characteristics, such as SES. Further analyses will explore the progress of the children who attended a pre-school centre as well as the home group over Key Stage 1. Such analyses will help to establish whether the positive impact of pre-school on young children's development remains significant as children progress through their first years at primary school.

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