INSTITUTE OF EDUCATION
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The Effective Provision of Pre-School Education (EPPE) Project

*Technical Paper 11*

# The Continuing Effects of Pre-School Education at Age 7 Years

*A Longitudinal Study funded by the DfES*
*1997-2003*

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# Technical Paper 11
## THE CONTINUING EFFECTS OF PRE-SCHOOL EDUCATION AT AGE 7 YEARS

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# Executive Summary

The Effective Provision of Pre-school Education (EPPE) project explores the impact of pre-school centre provision on young children's cognitive and social/behavioural development. The study has tracked 3000 young children during their time in pre-school from age 3 years plus to the end of Key Stage 1 (age 7 years plus). Previous EPPE Technical Papers (see Appendix 7) have examined patterns of cognitive attainment and social/behavioural development over the pre-school period and in Year 1. This paper investigates children's attainment, progress and social/behavioural development from entry to reception classes (age rising 5 years) until the end of Year 2 in primary school.

## Main Findings

Findings at the end of Key Stage 1 (Year 2) are generally in line with those found in Year 1 (see Technical Paper 9 for details). The results confirm the important impact of background influences on young children, including the importance of the home learning environment. They also provide additional evidence concerning the impact of pre-school and show that positive pre-school effects related to duration, quality and effectiveness are not 'washed out' for cognitive outcomes by the end of Year 2 in primary school, although effects are not as large as those identified earlier in the study when children started primary school. For social behaviour, by contrast, the evidence of a continuing positive pre-school impact is weak by Year 2. There is little evidence of significant differences related to duration and quality of pre-school provision, but the effectiveness of the pre-school centre attended, in promoting social/behavioural development during the pre-school period, shows small but significant positive benefits in terms of teachers' ratings of for children's Self-regulation and reductions in Anxious behaviour. However, for Anti-social behaviour very long duration (i.e. starting group care under the age of 2 years and continuing) is related to slightly raised scores at the end of Key Stage 1 (although most children, including early starters were positively rated).

### The impact of a child's background

The results indicate that background characteristics continue to show a significant relationship with attainment in both reading and mathematics. Child and family factors that were important in pre-school continue to show consistent effects. Taken together a child's background characteristics are weaker predictors of social behaviour than of academic outcomes in Year 2. The impact of English as an Additional Language (EAL) is reduced. Girls show significantly better results for reading but not for mathematics at the end of Key Stage 1. This contrasts with entry to primary school where significant differences for attainment in early number concepts were found in favour of girls. Mother's education remains very influential, with children whose mothers have a degree or higher degree showing much higher attainment levels. Likewise, family socio-economic status (SES) is significant, with those children whose parents are in semi- or unskilled occupations or whose parents had never worked showing relatively lower attainment, and children whose parents are in professional occupations having higher results in national assessments. Low income, as indicated by free school meals, also has a moderate impact, with children from poor families having lower attainments.

Taken together, background characteristics are weaker predictors of reading and mathematics attainment at age 7 years than of General Cognitive Ability (GCA) at age 3 years, or of attainment in pre-reading, early number or language at entry to primary school. In particular, the impact of EAL status has reduced, probably reflecting improvements in fluency in English as children move through pre-school and primary school. Age differences are still significant, with younger children for their year group (Summer born) having lower attainment in national assessments than older children (Autumn born).[1] More Summer born, than Autumn born children, were identified as having a special educational need (SEN) in Key Stage 1. This is of

[1] It should be noted that national assessments are not age standardised.

some concern as it suggests that teachers or schools do not fully take account of the impact of a child's age (particularly being young for their year) in assessing SEN.

Both pre-school and school influences may be acting together to help reduce the power of background influences on attainment in subjects such as reading and mathematics, in comparison with earlier cognitive assessments. Background factors were weaker predictors of children's social behaviour than cognitive attainment at all earlier time points. While this pattern is again evident at the end of Key Stage 1, background influences are relatively stronger influences on Positive social behaviour and Anti-social behaviour as children move through Key Stage 1 than they were during the pre-school period. In general, older children, those whose mothers are more highly qualified and girls show somewhat better social behaviour at the end of Key Stage 1, especially for Self-regulation. Self-regulation shows a significant association with better attainment.

**Home learning environment**

The home learning environment (HLE), as reported by parents in the pre-school period, exerted a strong and significant positive impact on cognitive development, and a weaker positive impact on social behaviour at earlier time points (entry to the pre-school study, entry to primary school and in Year 1), even when other important factors including parental education, family SES and income are controlled.[2] The home learning environment experienced by children during the pre-school period continues to show significant positive effects on attainment and social behaviour at age 7 years plus, net of the influence of other background influences (such as family SES and mothers' qualification levels). Boys and girls have significant differences in HLE, with boys tending to have lower scores on HLE. Such differences in parenting may account for some of the gender differences in cognitive attainment and social behaviour evident from age 3 years onwards. The results on HLE confirm that such pre-school experiences remain significant predictors of later educational outcomes at the end of Key Stage 1.

**The continued impact of pre-school – Quantity, quality and effectiveness**

Analyses explored children's cognitive attainment at the end of Year 2 and whether this relates to attending a pre-school centre or not, as well as, duration (in terms of number of months) of time in pre-school, the observed quality of the centre attended and the effectiveness of pre-school centre attended. Taken together, in all comparisons the attainment of the 'home' group was found to be significantly poorer than that of children who had attended a pre-school centre. It is not possible to separate fully the influence of quality, duration and effectiveness of pre-school attended in comparisons of the pre-school and 'home' sample, since, in practice, pre-school is experienced as a 'package' combining these different features. However, the findings support the conclusion that these three features generally remain predictors of better cognitive attainment during Key Stage 1. Also, measures of the effectiveness of the pre-school attended, in promoting cognitive progress before children started primary school, continue to show a significant positive impact on young children's subsequent attainments at the end of Year 2 in analyses that focus just on the pre-school sample. Thus it can be concluded that the benefits of pre-school on attainment in reading and mathematics reflect variation in pre-school experience and not just whether children receive pre-school or not.

While attending a pre-school, rather than none, has a positive impact on reading and mathematics attainment, experiencing a longer duration of time in pre-school, attending a centre with higher quality and attending a more effective pre-school centre were all related to significant attainment benefits in the mid-term (still evident at age 7 years plus). This is related to pre-

[2] There are theoretical reasons in favour of testing the pre-school home learning environment measures at the end of Key Stage 1 because the EPPE research seeks to explore pre-school influences, and identify whether the pre-school attended continues to show a positive relationship with subsequent outcomes. The pre-school period is generally seen to be of crucial importance to many aspects of child development. Thus, the home environment during these formative years is of particular interest to the research for comparison with the strength of other family measures and with pre-school experience.

school's positive influence in preparing young children for a better start to school. These Year 2 results are net of other background influences.

For social/behavioural outcomes in Year 2, children who attended a pre-school centre no longer showed significantly different outcomes at the end of Key Stage 1, in comparison with those who had not. Although both duration and quality of pre-school showed significant positive impacts at the end of Year 1 at age 6 years plus (reported in Technical Paper 9), these were not maintained at age 7 years plus. Nonetheless, one aspect of pre-school remained significant and positive, indicating that the pre-school influence had not washed out. Measures of effectiveness in promoting better outcomes over the pre-school period continue to show a positive impact in terms of improved Self regulation and reduction in Anxiety in Year 2. In line with findings at the start of pre-school, there remained evidence that an early start (under two years of age) was related to increased scores for Anti-social behaviour. This was mainly related to a very early start in group care (under age 12 months) yet most children, including the majority of early starters, showed very positive behaviour in teacher ratings for this measure.

**Children who do not experience pre-school**

Data were collected for a group of 'home' children with none or only minimal pre-school centre experience. Comparison of the 'home' sample with children who had attended a pre-school centre showed that both the characteristics and attainments of 'home' children vary significantly from those who had been in pre-school. It is not possible to conclude with certainty that the much lower attainments of the 'home' group are directly due to lack of pre-school experience.[3] Nonetheless, previously reported statistical analyses of attainment and social behaviour at primary school entry strongly suggest that pre-schooling provided a significant cognitive boost at entry to reception and had benefits on most areas of social behaviour, particularly Peer sociability.

Analyses of attainments at the end of Year 1 and Year 2 explored the impact of child, parent and home environment factors. Even when these important influences are controlled, 'home' children's cognitive attainments are poorer than those of children who had attended a pre-school centre. These findings, combined with those on the advantages of an early start date reported previously (EPPE Technical Paper 8a & 8b), add weight to conclusions that pre-schooling has a beneficial impact on young children's cognitive attainment. 'Home' children remain at a disadvantage during Key Stage 1 and evidence of a significant attainment gap remains in Year 2.

By contrast, the differences between the 'home' group and the pre-school group for the four measures of social behaviour no longer remained significant. This is in contrast to findings for the 'home' group at entry to primary school and in Year 1. It appears therefore that the beneficial impact of pre-school on cognitive attainment is more long lasting than that on social behaviour. The latter may be more influenced by interactions within the primary school peer group and aspects of school and classroom climate. Also many items in the scales used, specifically seek to measure the child's interactions with peers in school. As noted above, for Anti-social behaviour very long durations, associated with starting in the first year, showed a link with slightly raised scores in Year 2 compared with the 'home' group (though it is important to note the small numbers involved). Most children including early starters showed very good behaviour.

Overall, the Year 2 analyses show the early cognitive boost given by pre-school provides children with a good foundation for later learning. This impact on reading and mathematics attainment has not washed out by the end of Key Stage 1, although the effect has reduced somewhat by Year 2 compared with that identified at the start of primary. Although 'home' children have made some gains from their low starting points, they have not caught up with other children who share similar background characteristics but had attended a pre-school centre. Thus the absence of pre-school, can be seen to disadvantage later levels of cognitive attainment. The benefits of pre-school are greater if children attended a more effective setting.

[3] A controlled experiment (which would not be feasible on either ethical or practical grounds) would be needed to draw firm conclusions.

The longitudinal follow up of EPPE children supports the main conclusion of the first phase of the EPPE research, 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. It is argued that pre-school experience is best viewed as a 'package' with various important attributes relating to quality, effectiveness and duration that are inter-related and influence children's subsequent educational outcomes. The analyses reported in this paper indicate that these aspects continue to influence child outcomes at the end of Key Stage 1 although the effects tend to be weaker than those evident at entry to primary school (age rising 5 years) and for social behaviour are no longer statistically significant in comparisons with the 'home' group.

Additional results for analyses based just on children who attended a pre-school show that the effectiveness of the pre-school centre continues to show significant positive impact on attainment at the end of Key Stage 1 and promotes better outcomes in terms of Self-regulation and reductions in Anxious behaviour.

The research again points to the continuing, significant and positive influence of parents' activities, as measured by the home learning environment, and of child and family characteristics. In addition, the Year 2 analyses, in line with those in Year 1, indicate that there are significant primary school differences in children's progress and social/behavioural development during Key Stage 1. These will be explored in the EPPE 3-11 continuation study, which is following the same group of pupils up to the end of Key Stage 2. This continuation phase of the research will investigate how pre-school and school influences interact and, combined with background influences, continue to shape children's developmental trajectories up to age 11 years.

**Summary of Research Design and Methodology**

An educational effectiveness design was adopted which explores the impact of different child, family, and home learning environment factors on a range of child outcomes measured in national assessments and by teacher completed social/behavioural questionnaires at the end of Key Stage 1. The research explores whether pre-school influences, found to be important in accounting for variations in children's progress and development up to the time they started primary school, continue to show relationships with later educational outcomes. The analyses explore whether 'home' children (those who had very little or no pre-school centre experience) continue to lag behind other children, and whether duration of time, quality and effectiveness of the pre-school attended still show significant positive effects on attainment and social behaviour in Year 2, as they were found to up to the end of Year 1.

EPPE collected a wide range of data about children, their parents and home environments and the pre-school settings (individual pre-school centres) they attended. The research seeks to establish whether different types of pre-school settings differ in their impact and effectiveness. Measures of the quality of centres were collected from observations by trained researchers and were found to be important in accounting for young children's progress and development from age 3 to 5 years.[4] In total, 141 target pre-school centres were drawn randomly from within each of the five regions across England included in the study. Centres were sampled from six types of provision: nursery classes, playgroups, local authority day nurseries, private day nurseries, nursery schools and integrated centres (i.e. centres that combine education and care). The research sought to draw approximately equal numbers of target centres from each of the main type of provisions, with the exception of integrated centres which are a relatively recent innovation and of which only a small number existed at the start of the research.[5] The five regions were chosen to cover a range of socio-economic and geographical areas including rural,

[4] Centre quality was measured using the Caregiver Interaction Schedule (CIS), and the Early Childhood Environment Record (ECERS-R and ECERS-E) scales, details of which are provided in the Glossary.

[5] At the time of the EPPE study, integrated centres were an innovative form of provision, which combined care and education for a wide range of age groups and they offered a range of services to support families.

metropolitan, shire county and inner city. The regions were selected to include ethnically diverse and socio-economically disadvantaged communities.

This paper focuses on two measures of cognitive attainment assessed at the end of Year 2, reading and mathematics (using decimalised level measures based on results for national assessments in reading and mathematics). These measures combine data for both, levels achieved and test scores within levels, to create more finely differentiated measures of attainment (see Appendix 3 for details). Social/behavioural development was assessed by teachers using an extended version of the Goodman (1997) Strengths and Difficulties Questionnaire. A range of statistical methods was used to analyse data for 2793 children for whom attainment and/or social/behavioural outcome data was collected in Year 2. This represents 91.6 per cent of the total child sample assessed at entry to primary school (n=3048 children with equivalent entry to primary school cognitive and/or social behaviour measures). Four measures of social behaviour are reported: Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour.

EPPE uses multilevel models, a form of hierarchical regression, to explore the influence of different background factors on young children's attainments at different time points. These contextualised multilevel analyses are equivalent to those conducted during the first phase of the research when children entered pre-school and again when they started primary school (see EPPE Technical Papers 2, 7 8a & 8b), and subsequently at the end of Year 1 (see Technical Paper 9). A comparison of the results of the analyses at different time points allows us to establish whether background influences change (reduce or increase) over the first years of school. Contextualised analyses are used to identify the unique (net) contribution of particular characteristics to variation in children's outcomes, in this instance their attainments in national assessments or social/behavioural outcomes, while other influences are controlled. Thus, for example, the impact of family SES was established while taking into account the influence of mother's qualification levels, low income, ethnicity, birth weight, home learning environment etc. The nature and strength of such background influences have been explored, individually and in total, because they are relevant to issues of equity and social inclusion. The influence of pre-school is likewise calculated net of the influence of background factors.

Value-added multilevel models have already investigated children's progress over their time in pre-school school (start of pre-school to start of primary school in reception/Year1) by controlling for a child's age at assessment, background factors and prior attainment at entry to the study (or prior social behaviour where applicable). These analyses were used to create value-added indicators of each pre-school centre's effectiveness in promoting progress in a given outcome (e.g. pre-reading skills, early number concepts, language, and different aspects of social behaviour such as Peer sociability, Independence and Concentration etc.) during the first phase of the study. Centres where children had made significantly greater progress than predicted on the basis of prior attainment and intake characteristics can be viewed as *more effective* (positive outliers in value-added terms). Centres where children made less progress than predicted can be viewed as *less effective* (negative outliers in value-added terms).

The multilevel value-added analyses over the pre-school period showed that variations in quality and extent of time in pre-school had an impact on children's cognitive gains and social/behavioural gains. They indicated that higher quality and longer pre-school experience were predictors of significantly better child outcomes measured at entry to primary school. Further analyses found evidence of continuing positive effects on children's cognitive and social/behavioural development at the end of Year 1 (EPPE Technical Paper 9). This paper extends the earlier findings on the pre school period, by investigating the extent to which the positive impacts of pre-school are still evident in child outcomes measured at the end of Key Stage 1 (age 7 years). This is an important milestone because past research has shown that attainment at age 7 years remains a good predictor of long-term educational outcomes as measured by public examination results at age 16 years (see Sammons et al., 1995).

Findings for a sample of 'home' children, who had no pre-school centre experience before starting primary school, are also reported for comparison with the pre-school sample. The contextualised multilevel analyses explore whether 'home' children are still at a disadvantage in terms of cognitive attainments at the end of Year 2 (reflecting differences evident when they started primary school) and the extent to which any attainment gap can be attributed to the absence of pre-school experience, rather than such differences in background characteristics. These analyses strengthen the evidence concerning the impact of pre-school provision or lack of it. In addition, results from analyses which focus just on the sample of children who attended pre-school are reported to further explore any continuing pre-school impact related to quantity, effectiveness and quality of pre-school centre provision on reading and mathematics outcomes. Equivalent analyses of four social/behavioural measures (Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour) are also reported. In this way, it is possible to establish whether pre-school influences on social/behavioural outcomes differ or broadly mirror those found for reading and mathematics.

## Introduction

EPPE is a large-scale longitudinal study funded by the Department for Education and Skills (DfES). It began in 1996 with the aim of investigating what kinds of Early Childhood provision are most 'effective' in promoting young children's progress and development during their time at pre-school, and to explore whether any pre-school effects continue to influence children after they start primary school up until the end of Key Stage 1 (age 7 plus years). The EPPE research is the first study of pre-schools in Europe to use an educational effectiveness design based on sampling children in a range of different pre-school settings and uses statistical approaches (multilevel modelling) that enable the identification of individual centre effects. Beginning around the age of 3 years (at entry to a target pre-school in the centre sample or at their third birthday for children who had already entered provision at a younger age), children were assessed and then followed up at entry to primary school. In this way it has been possible to explore variations between centres in the 'value added' in terms of impact on children's cognitive progress and social/behavioural development.

The study follows children from the start of pre-school (at age 3 years plus) through to primary school entry and across the infant period of primary education. It explores the impact of a wide variety of child, parent and family factors, including aspects of the home learning environment provided by parents.[6] The first phase of the research explored whether different types of pre-school settings differed in their impacts and effectiveness. It also identified variations between individual pre-school centres, in children's cognitive progress and social/behavioural development. Measures of the quality of pre-school settings (pre-school centres) were collected from observations by trained researchers. In total, 141 pre-school centres drawn from five regions across England formed the focus of the EPPE pre-school research. Centres were drawn from six types of provision (nursery classes, playgroups, local authority day nurseries, private day nurseries, nursery schools and integrated centres [i.e. combined centres that integrate education and care).

The EPPE study uses a mixed methods approach, including detailed statistical analyses of effectiveness and in-depth case studies of individual centres. Full details of the EPPE study have been provided in a series of 12 Technical Papers (see Appendix 7). This paper is based on statistical analyses for a sample of 2793 children for whom valid cognitive and/or social/behavioural data was collected at the end of Year 1. This represents 91.6 percent of the children in the EPPE sample for whom valid baseline data had been collected on attainment and/or social behaviour at entry to primary school.[7] The paper focuses on children's attainment, progress and social/behavioural development from entry to primary school (age rising 5 years) to the end of Year 2 (age 7 years plus). A wide range of information has been drawn on, including individual assessments of children's attainments at entry to school and again at the end of Year 2, as well as teachers' assessments of social/behavioural development and information about child, family and home learning environment characteristics collected from parental interviews when children were recruited to the study.

[6] There are theoretical reasons in favour of testing the pre-school home learning environment measures at the end of Year 1 because the EPPE research seeks to explore pre-school influences, and identify whether the pre-school attended also shows a positive relationship with subsequent outcomes. If the pre-school period is seen to be of crucial importance to child development, the home environment during these formative years is of particular interest. Although additional data on the child's activities in Key Stage 1 were collected again from parents via a questionnaire during Year 1, the lower response rate (80% rather than 97%) would lead to a reduction in sample size in the analysis. Such measures will be tested in later papers as part of the EPPE 3-11 follow up study of primary school effects.

[7] Appendix 1 gives details of the entry to primary school reception assessments and Appendix 2 shows the distribution of the EPPE sample at the primary school level at entry to school.

## Aims

The aims of the multilevel analyses are:

- To model young children's cognitive attainment, progress and social/behavioural development over Key Stage 1
- To explore the impact of child, parent and home characteristics on children's attainment and their social/behavioural development
- To investigate any continuing impact of pre-school, including any variations in children's outcomes for those who attended different types of pre-school (and those who received no pre-school provision, the 'home' sample)
- To explore the impact of measures of pre-school process, particularly measures of duration of pre-school (in months), quality and effectiveness, on later child outcomes.

## Methods

The analyses employ a range of statistical techniques from descriptive and correlation analysis to multilevel (hierarchical) regression methods to examine children's attainment, progress and social/behavioural development. Multilevel models provide more accurate assessments of the impact of different child or centre-level characteristics, and enabled the calculation of value-added estimates (residuals) of individual centre level effects for the EPPE child sample that attended a pre-school centre (see EPPE Technical Papers 8a & 8b for details). These value-added measures of centre effectiveness have been included in subsequent analyses of children's educational outcomes, at the end of Year 2 in primary school, to establish whether the effectiveness of the pre-school attended continues to show an impact on later cognitive attainment or social behaviour at the end of Key Stage 1.

Background information about child, parent and family characteristics, was obtained through parent interviews conducted soon after children were recruited to the study. It should be noted, that most interviews were with children's mothers and usually took place at the child's pre-school centre, although for some working parents telephone interviews were found to be more convenient. All parents gave signed consent. The parent interviews were designed to obtain information about a child's health and care history, details of family structure and parent's own educational and occupational backgrounds as well as some indications of parent-child activities and routines. Parents were assured of confidentiality and anonymity in presenting results. An excellent response rate (97%) to the interview was achieved, although in some instances particular questions had a slightly lower rate of response (e.g. related to occupations). In most cases the parent interviews were conducted within 10 weeks of recruiting a child to the study, though for a small number of children in 'hard to reach' groups a longer time gap sometimes occurred.

This report describes the results of analyses of young children's cognitive attainment and social/behavioural development during Key Stage 1. Progress has also been measured from entry to primary school (usually measured at entry to reception classes at rising 5 years, though in some regions children are enrolled directly into Year 1 classes and do not join a reception class). This paper focuses on two measures of cognitive attainment measured by national assessments taken towards the end of Year 2 in reading and mathematics. In addition to information about the levels achieved by children, the research team collected details of test scores within levels so that more finely differentiated measures of outcome were available. By combining details of levels and test scores (collected directly from schools), it was possible to create 'decimalised levels' for both reading and mathematics (for further details see Appendix 3).

Social/behavioural development was assessed by a teacher completed instrument, an extended version of the Goodman (1997) Strengths and Difficulties Questionnaire. Four measures of social behaviour were identified using Principal Components Analyses of teachers' ratings of individual children on this instrument. These cover Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour. Multilevel models analysed data for 2793 children for whom cognitive and/or social/behavioural outcome measures were collected at the end of Year 2, linking this with data on child, family and home environment, and on duration of time in

pre-school and quality and effectiveness of pre-school centres. The 'home' group (314 children recruited at entry to primary school) are included in models to enable comparison of outcomes for children who had not attended a pre-school centre, other analyses focus just on the main pre-school sample (to explore variation amongst those who attended a pre-school centre).

## Structure of Report and Analyses

This report is divided into five sections. The first provides some detailed descriptive statistics concerning the characteristics of the sample and investigates whether particular groups of pupils show differences in their attainment and social/behavioural development at the end of Year 2.

The second section addresses the question of the extent to which different child, family and home environment background characteristics account for variation in these children's reading and mathematics attainments at age 7 years plus. This section uses multilevel modelling techniques so that the net influence of different background factors on children's attainments at different ages can be ascertained. These contextualised analyses are equivalent to those conducted at entry to primary school and in Year 1 (reported in EPPE Technical Paper 9). A comparison of the results of the analyses at different time points allows us to establish whether background influences change (reduce or increase) over Key Stage 1. Contextualised analyses are used to identify the unique (net) contribution of particular characteristics to variation in children's outcomes, in this instance their attainments in different cognitive assessments, while other influences are controlled. Thus, 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, ethnicity, birth weight, home learning environment, etc.

The third section describes the results of similar analyses of four different aspects of social behaviour development, as assessed by teacher ratings of items in an expanded version of the Goodman (1997) Strengths and Difficulties Questionnaire. Once again, the influences of different child, family and home environment characteristics are explored. Measures of pre-school centre influence including duration of pre-school attended (ranging from none for the 'home' group to over 3 years for early starters), observed quality of pre-school provision (measured by the ECERS-E & ECERS-R scales) and centre effectiveness (based on value-added residual estimates measuring cognitive progress or social/behavioural gains during the pre-school period) are also tested.

The inclusion of a sample of 'home' children enables the study to provide further information about the impact of pre-school provision as a whole (rather than just examining variations amongst children who attended different settings and types of provision). 'Home' children were found to be at a significant cognitive disadvantage when they started primary school (age rising 5 years). They also showed poorer social/behavioural development at entry to primary school and were more likely to be identified as 'at risk' for special educational needs (SEN) than other children. These differences were not fully accounted for by differences in background (see EPPE Technical Papers 8a & 8b and, for details on SEN, see EYTSEN Technical Paper 2). The comparisons based on the first phase of the EPPE research which focussed on the pre-school period, indicated that pre-school centre experience gave children a significantly better start to school. Lack of pre-school experience was an additional disadvantage, particularly for more vulnerable groups of young children. Further analyses of outcomes at the end of Year 2 explore whether there is evidence of a continuing attainment gap at age 7 years plus, when differences in the characteristics of 'home' children, compared with the main pre-school sample, are controlled. In addition, differences in social behaviour are also investigated.

Section 4 presents the results of value-added analyses of children's cognitive progress and social/behavioural developmental gains across Key Stage 1 during their time in primary school from reception entry to the end of Year 2. These analyses control for prior attainment or prior social behaviour (at reception entry) in analysing progress and developmental changes over time. The results do not suggest that pre-school has any additional impact on progress

development during Key Stage 1, rather that the main pre-school influence lies in the impact on child attainment and social behaviour at reception entry.

Section 5 summarises the results drawing together the main findings and conclusions.

## Section 1: Characteristics of the sample at the end of Year 2

The research design used to recruit the sample for the EPPE study is described in detail in EPPE Technical Paper 1. In summary, six English Local Authorities (LAs) in five regions participated in the research with children recruited from six main types of provision (nursery classes, playgroups, private day nurseries, local authority day nurseries, nursery schools and integrated centres [that combine education and care]). In order to enable comparison of centre and type of provision effects the project recruited 500 children, 20 in each of 20-25 centres, from the various types of provision. In some LAs certain forms of provision are less common and others more typical. Within each LA, centres of each type were selected by stratified random sampling and, due to the small size of some centres in the project (e.g. rural playgroups), more of these centres were recruited than originally proposed, bringing the sample total to 141 centres. [8] In all 2857 children in the pre-school sample were tracked to entry to reception (over 90% of those originally recruited). An additional sample of 314 'home' children (those who had not attended a pre-school setting) was recruited at entry to primary school, for comparison with those who had attended a pre-school centre, bringing the total sample to 3171. Of the total number of children in the sample at entry to reception, 3048 (96.1%) had valid assessment data (for one or more cognitive and or social/behavioural measure) at this point in time. By the of Key Stage 1 a total of 2793 children were tracked representing 91.6 per cent of those for whom equivalent primary school entry measures were obtained in reception, and 88% of the total sample at entry to reception.[9]

This paper provides descriptive statistics for the sample at the end of Key Stage 1 (Year 2). Technical Paper 9 details the main findings of the analyses conducted on children's attainment and progress up to the end of Year 1 (aged 6 years plus) when they were assessed on NFER-Nelson standardised assessments in reading and mathematics, as well as teacher reports on their social/behavioural development.

Table 1.1 provides a brief summary of the characteristics of children in the EPPE sample tracked to the end of Year 2, for whom any national assessment or social/behavioural outcome data were collected at the end of Year 2. Only a small proportion of cases had missing data (up to 6% for some measures such as mother's social class of current or previous occupation or the HLE measure which was based on responses to a series of questions). A significant minority of single parent families where the father was absent (representing 20.5%) of the sample had no occupational data for the father. Family SES was calculated by combining mother's and father's occupational categories and recording the higher of the two (family SES data were missing for 5.2% of the sample).

[8] Only a small number of integrated centres were recruited because nationally there were few examples of this relatively recent form of pre-school provision in existence at the start of the project. For further details see EPPE Technical Papers 5 and 6.

[9] The actual number of children in any one analysis varies somewhat depending on the predictor measures included, because cases with any item of missing data are excluded.

**Table 1.1: Characteristics of children who have valid cognitive or social/behavioural data at entry to reception and also have valid cognitive or social/behavioural data at Year 2**

| | n | % |
|---|---|---|
| **Gender:** | | |
| Male | 1442 | 51.6 |
| Female | 1351 | 48.4 |
| **Ethnicity:** | | |
| White UK Heritage | 2076 | 74.3 |
| White European Heritage | 99 | 3.5 |
| Black Caribbean Heritage | 101 | 3.6 |
| Black African Heritage | 50 | 0.8 |
| Black Other | 19 | 0.7 |
| Indian | 58 | 2.1 |
| Pakistani | 148 | 5.3 |
| Bangladeshi | 29 | 1.0 |
| Chinese | 4 | 0.1 |
| Other | 50 | 1.8 |
| Mixed Heritage | 155 | 5.5 |
| White Non European Heritage | 2 | 0.1 |
| **English an Additional Language** | 279 | 10.0 |
| **Number Of Siblings:** | | |
| 0 - 3 | 2568 | 91.9 |
| 4+ | 161 | 5.7 |
| **Home Learning Environment Index:** | | |
| 0 –13 | 256 | 9.2 |
| 14 –19 | 596 | 21.3 |
| 20 – 24 | 640 | 22.9 |
| 25 – 32 | 872 | 31.2 |
| 33 - 45 | 315 | 11.3 |
| **Type Of Pre-School:** | | |
| Nursery Class | 551 | 19.7 |
| Playgroup | 523 | 18.7 |
| Private Day Nursery | 467 | 16.7 |
| Local Authority | 373 | 13.4 |
| Nursery Schools | 443 | 15.9 |
| Integrated (Combined) Centres | 149 | 5.3 |
| Home | 287 | 10.3 |
| **Social Class Mother:** | | |
| Professional Non Manual | 109 | 3.9 |
| Other Professional Non Manual | 538 | 19.3 |
| Skilled Non-Manual | 940 | 33.7 |
| Skilled Manual | 187 | 6.7 |
| Semi Skilled | 548 | 19.6 |
| Unskilled | 131 | 4.7 |
| Never Worked | 224 | 8.0 |

| | | |
|---|---|---|
| **Social Class Father:** | | |
| Professional Non Manual | 210 | 7.5 |
| Other Professional Non Manual | 500 | 17.9 |
| Skilled Non-Manual | 344 | 12.3 |
| Skilled Manual | 683 | 24.5 |
| Semi Skilled | 326 | 11.7 |
| Unskilled | 76 | 2.7 |
| Never Worked | 33 | 1.2 |
| Father Absent | 573 | 20.5 |
| **Family Highest SES:** | | |
| Professional Non Manual | 224 | 8.0 |
| Other Professional Non Manual | 655 | 23.5 |
| Skilled Non-Manual | 867 | 31.0 |
| Skilled Manual | 410 | 14.7 |
| Semi Skilled | 354 | 12.7 |
| Unskilled | 67 | 2.4 |
| Never Worked | 72 | 2.6 |
| **Income indicator:** | | |
| Free school meals | 620 | 22.2 |
| No Free school meals | 2012 | 72.0 |
| **Employment status of mother during pre-school period:** | | |
| Not working | 1344 | 48.1 |
| Working part-time | 795 | 28.5 |
| Working full-time | 405 | 14.5 |
| Self-employed/combination part-time & self employed | 105 | 3.8 |

Total n = 2793, figures not shown for missing/not known categories. Missing data ranged between 1 and 6% for different measures.

## Cognitive Assessments

This paper examines child outcomes in both cognitive and social/behavioural assessments made at the end of Key Stage 1. National assessment data (SATs) were collected for the sample at the end of Year 2. In addition to test levels, data were collected from schools on test scores within levels. This allowed the creation of more finely differentiated outcome measures (which are referred to here as decimalised levels) for the multilevel analysis. This was important because the national assessment levels are fairly broad and thus, on their own, only categorise children into a relatively small number of attainment groups (6 groups from working towards level 1, level 1, through 2c, 2b, 2a to level 3). Within each level there can be quite a range of attainment. Appendix 3 provides further details about the creation of decimalised measures in more detail. Because EPPE did not use a birth cohort design (due to the different ages at which young children entered the 141 pre-schools in the study), the following process was completed separately for each of the four EPPE cohorts (who took national assessments during the period 2000 to 2003):

For children who scored highly enough to attain a valid level for the SATs test taken, i.e. a child whose raw test score was equivalent to level 2 on a level 2 test, their decimalised score was calculated as follows:

> Decimalised score = level of test achieved + {(raw score - lowest valid raw score for corresponding level) / highest valid raw score possible for the level}

The sample with national assessment outcome data for Year 2 totals 2722 children drawn from 812 primary schools (for a small number of the 2793 pupils tracked to the end of Key Stage 1 only social/behavioural data were available in Year 2). It should be noted that the analyses reported in this report, focus on the end of Key Stage 1 National Tasks and Tests results. At Key Stage 1 the Qualification and Curriculum Authority (QCA) also collect data on achievement levels as assessed by teachers (Teacher Assessments). EPPE has not used Teacher Assessments for the following reasons:

- Teacher Assessments provide only 'level' information and are therefore much less fine grained than the 'raw' scores collected for the tasks and tests.
- Analyses indicate that, when compared with test results, Teacher Assessments tend to under estimate attainment for particular groups of children, such as EAL children and those from low family income groups (i.e. those receiving Free School Meals [FSM]).

Correlations can be used to explore associations between children's attainments in different outcomes and over time.[10] Children's attainments in the Year 2 national assessments decimalised scores were positively correlated (r =0.70), indicating that those who have higher reading scores also tend to do well in mathematics at age 7 years plus. The correlations were somewhat stronger than those found in the NFER standardised tests used in Year 1. Table 1.2 shows the correlations between children's scores on the Key Stage 1 decimalised tests and their prior attainment in the different primary school reception entry assessments. All the correlations are moderately high. The measure of General Cognitive Ability (GCA) includes a language and non-verbal component. This shows a slightly stronger association than other entry to primary school measures with later attainment in both reading (r =0.59) and mathematics (r =0.55) in Year 2. While the correlations are all moderate to strong, prior attainment measures at entry to primary school, although significant predictors, only account for between a fifth to a third of the variation in later attainment at the end of Key Stage 1.[11]

**Table 1.2: Correlations between Children's Primary School Entry Assessments and Key Stage 1 decimalised reading and mathematics scores in Year 2**

| Entry to Primary School<br>Year 2 | Pre-reading | Early number concepts | Language | GCA |
|---|---|---|---|---|
| **Decimalised reading score** | **0.553** | **0.539** | **0.441** | **0.587** |
| **Decimalised mathematics score** | **0.456** | **0.521** | **0.402** | **0.549** |

All correlations are significant at the 0.01 level

## Differences in Attainment for Different Groups of Children

Previously reported analyses at entry to pre-school and later at entry to primary school had revealed significant differences in cognitive attainment related to various child, family and home learning environment characteristics. Such characteristics were much more weakly associated with different aspects of young children's social/behavioural development. This section shows differences in children's national assessment results at age 7 years plus in reading and mathematics levels evident at the end of Year 2. The findings are broadly in line with those

[10] A correlation is a measure of statistical association that ranges from +1 to -1.

[11] The square of the correlation coefficient provides an indication of the percentage of total variance which can be accounted for by a given predictor.

reported at the end of Year 1 (see EPPE Technical Paper 9). Section 2 of this report provides more detailed statistical analyses of these patterns using multilevel models to explore the net contribution of different factors and reports the relevant effect sizes. The multilevel analyses investigate differences using the more finely differentiated decimalised scores described on the previous page. Gender had been found to be significantly related to children's attainment scores at younger ages, with girls, as a group showing higher average attainment scores in most cognitive measures. In the Key Stage 1 assessments, it can be seen for reading, proportionately more boys were working below level 1 or at level 1 than girls (nearly two thirds of those at level 1 were boys). By contrast, rather more girls were in the highest attaining group, level 3. Age in months shows a statistically significant association with national assessment attainment levels. The average age of children, achieving level 1 was 1.7 months younger than the age of children who achieved level 3 for reading. For mathematics the difference in average age for children who achieved level 1 in comparison with those who achieved level 3 was slightly larger, a difference of 2.5 months. This indicates that the absence of age standardisation in national assessments means these may not provide an accurate picture of attainment for the youngest pupils (usually summer born).

**Table 1.3: Key Stage 1 Attainment Levels in Year 2 and Gender and age**

| Year 2 | Level Achieved | All | Mean age in months | Girls | | Boys | |
|---|---|---|---|---|---|---|---|
| | | N | | N | % | N | % |
| **Reading** | **w*** | 73 | 85.5 | 24 | 32.9 | 49 | 67.1 |
| | **1** | 315 | 85.1 | 116 | 36.8 | 199 | 63.2 |
| | **2c** | 342 | 85.7 | 154 | 45.0 | 188 | 55.0 |
| | **2b#** | 528 | 86.0 | 270 | 51.1 | 258 | 48.9 |
| | **2a** | 681 | 85.9 | 334 | 49.0 | 347 | 51.0 |
| | **3** | 783 | 86.8 | 428 | 54.7 | 355 | 45.3 |
| | **Total** | 2722 | 86.0 | 1326 | 48.7 | 1396 | 51.3 |
| **Year 2** | **Level Achieved** | **All** | **Mean age in months** | **Girls** | | **Boys** | |
| | | **N** | | **N** | **%** | **N** | **%** |
| **Mathematics** | **w*** | 69 | 85.0 | 29 | 42.0 | 40 | 58.0 |
| | **1** | 149 | 84.6 | 63 | 42.3 | 86 | 57.7 |
| | **2c** | 426 | 85.3 | 206 | 48.4 | 220 | 51.6 |
| | **2b#** | 601 | 85.8 | 331 | 55.1 | 270 | 44.9 |
| | **2a** | 654 | 86.1 | 339 | 51.8 | 315 | 48.2 |
| | **3** | 770 | 87.1 | 331 | 43.0 | 439 | 57.0 |
| | **Total** | 2527 | 86.0 | 1245 | 49.3 | 1282 | 50.7 |

***** working towards level 1
# Nationally expected level of achievement at Key Stage 1

For mathematics, however, the picture is somewhat different. There is greater variation in attainment levels. In particular, significantly more boys obtain the highest level of attainment (level 3) than girls (57percent of level 3 children are boys).

Free school meals provide an indicator of low family income (although it is recognised that not all children take up their entitlement, especially at Key Stage 1 when home dinners are relatively more likely to be eaten than is the case for older age groups). Table 1.4 shows that children who receive free meals have lower attainment levels in Key Stage 1 assessments compared with children from relatively more socio-economically advantaged families. Again, this pattern is in line with that found at younger ages, confirming that social disadvantage continues to show a statistically significant association with attainment. Using reading as the example, overall, the FSM group includes 23.5 percent of pupils, but only 10.3 percent of level 3 pupils receive FSM. By contrast, nearly 38 percent of level 1 pupils receive FSM. For mathematics, the differences are somewhat less stark but nonetheless large. In all FSM pupils make up nearly 46 percent of pupils at level 1, more than twice the expected figure given the proportion of FSM pupils in the sample. By contrast, only around 12 per cent obtain level 3 in mathematics, just under half the proportion expected.

**Table 1.4: Key Stage 1 Attainment Levels in Year 2 and Low Income (Free school meals) Indicator**

| Year 2 | Level Achieved | All | Receive FSM | | Do not Receive FSM | |
|---|---|---|---|---|---|---|
| | | N | N | % | N | % |
| **Reading** | **w*** | 70 | 42 | 60.0 | 28 | 40.0 |
| | **1** | 307 | 116 | 37.8 | 191 | 62.2 |
| | **2c** | 331 | 107 | 32.3 | 224 | 67.7 |
| | **2b#** | 506 | 141 | 27.9 | 365 | 72.1 |
| | **2a** | 657 | 135 | 20.5 | 522 | 79.5 |
| | **3** | 760 | 78 | 10.3 | 682 | 89.7 |
| | **Total** | 2631 | 619 | 23.5 | 2012 | 76.5 |
| **Year 2** | **Level Achieved** | **All** | **Receive FSM** | | **Do not Receive FSM** | |
| | | **N** | **N** | **%** | **N** | **%** |
| **Mathematics** | **w*** | 66 | 33 | 50.0 | 33 | 50.0 |
| | **1** | 142 | 65 | 45.8 | 77 | 54.2 |
| | **2c** | 414 | 132 | 31.9 | 282 | 68.1 |
| | **2b#** | 577 | 151 | 26.2 | 426 | 73.8 |
| | **2a** | 633 | 130 | 20.5 | 503 | 79.5 |
| | **3** | 747 | 92 | 12.3 | 655 | 87.7 |
| | **Total** | 2443 | 540 | 22.1 | 1903 | 77.9 |

***** working towards level 1

# Nationally expected level of achievement at Key Stage 1

## Language

The attainments of children for whom English was an additional language (EAL) were lower than those for children for whom English was the first language. Proportionately more EAL pupils had lower levels of reading attainment than other children. The trend was similar for mathematics levels but less marked.

**Table 1.5: Key Stage 1 Attainment Levels in Year 2 and Language**

| Year 2 | Level Achieved | All | English as Mother Tongue | | English as an Additional Language | |
|---|---|---|---|---|---|---|
| | | N | N | % | N | % |
| **Reading** | **w*** | 72 | 52 | 72.2 | 20 | 27.8 |
| | **1** | 315 | 259 | 82.2 | 56 | 17.8 |
| | **2c** | 340 | 306 | 90.0 | 34 | 10.0 |
| | **2b#** | 528 | 464 | 87.9 | 64 | 12.1 |
| | **2a** | 681 | 612 | 89.9 | 69 | 10.1 |
| | **3** | 783 | 753 | 96.2 | 30 | 3.8 |
| | **Total** | 2719 | 2446 | 90.0 | 273 | 10.0 |
| **Year 2** | **Level Achieved** | **All** | **English as Mother Tongue** | | **English as an Additional Language** | |
| | | **N** | **N** | **%** | **N** | **%** |
| **Mathematics** | **w*** | 69 | 53 | 76.8 | 16 | 23.2 |
| | **1** | 149 | 121 | 81.2 | 28 | 18.8 |
| | **2c** | 424 | 358 | 84.4 | 66 | 15.6 |
| | **2b#** | 600 | 536 | 89.3 | 64 | 10.7 |
| | **2a** | 654 | 605 | 92.5 | 49 | 7.5 |
| | **3** | 770 | 729 | 94.7 | 41 | 5.3 |
| | **Total** | 2524 | 2297 | 91.0 | 227 | 9.0 |

***** working towards level 1

# Nationally expected level of achievement at Key Stage 1

**Mother's qualification level**

Mother's highest qualification level was shown to be a powerful predictor of attainment levels at earlier time points in the EPPE research (entry to pre-school, at entry to primary school and end of Year 1). Once again, this measure was found to be significant at the end of Key Stage 1. Table 1.6 summarises attainment levels for the main qualification groups. As during the pre-school phase, children whose mothers have no formal qualifications were more likely to show achievement at lower levels and less likely to be classified as attaining at the highest level (level 3). By contrast, children whose mothers have degrees or higher degrees showed proportionately higher attainment levels at the end of Key Stage 1.

**Table 1.6: Key Stage 1 Attainment Levels in Year 2 and Mother's Qualification Level**

| Year 2 | Level Achieved | All | No Qualifications | | Vocational Qualification | | Academic Qualification at 16 years | |
|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % |
| **Reading** | **w*** | 67 | 34 | 50.7 | 9 | 13.4 | 20 | 29.9 |
| | **1** | 292 | 115 | 39.4 | 48 | 16.4 | 101 | 34.6 |
| | **2c** | 315 | 117 | 37.1 | 39 | 12.4 | 122 | 38.7 |
| | **2b#** | 508 | 133 | 26.2 | 83 | 16.3 | 197 | 38.8 |
| | **2a** | 662 | 108 | 16.3 | 104 | 15.7 | 275 | 41.5 |
| | **3** | 773 | 59 | 7.6 | 104 | 13.5 | 277 | 35.8 |
| | **Total** | 2617 | 566 | 21.6 | 387 | 14.8 | 992 | 37.9 |
| **Year 2** | **Level Achieved** | **All** | **Academic qualification at 18 years** | | **Degree or equivalent** | | **Higher degree** | |
| | | **N** | **N** | **%** | **N** | **%** | **N** | **%** |
| **Reading** | **w*** | 67 | 2 | 3.0 | 2 | 3.0 | 0 | - |
| | **1** | 292 | 14 | 4.8 | 10 | 3.4 | 3 | 1.0 |
| | **2c** | 315 | 19 | 6.0 | 14 | 4.4 | 2 | 0.6 |
| | **2b#** | 508 | 39 | 7.7 | 36 | 7.1 | 15 | 3.0 |
| | **2a** | 662 | 65 | 9.8 | 78 | 11.8 | 18 | 2.7 |
| | **3** | 773 | 82 | 10.6 | 168 | 21.7 | 63 | 8.2 |
| | **Total** | 2617 | 221 | 8.4 | 308 | 11.8 | 101 | 3.9 |

| Year 2 | Level Achieved | All | No Qualifications | | Vocational Qualification | | Academic Qualification at 16 years | |
|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % |
| **Mathematics** | **w*** | 63 | 26 | 41.3 | 6 | 9.5 | 25 | 39.7 |
| | **1** | 138 | 66 | 47.8 | 23 | 16.7 | 40 | 29.0 |
| | **2c** | 406 | 126 | 31.0 | 52 | 12.8 | 168 | 41.4 |
| | **2b#** | 571 | 148 | 25.9 | 87 | 15.2 | 228 | 39.9 |
| | **2a** | 631 | 106 | 16.8 | 104 | 16.5 | 248 | 39.3 |
| | **3** | 758 | 81 | 10.7 | 102 | 13.5 | 270 | 35.6 |
| | **Total** | 2437 | 487 | 20.0 | 356 | 14.6 | 939 | 38.5 |
| **Year 2** | **Level Achieved** | **All** | **Academic qualification at 18 years** | | **Degree or equivalent** | | **Higher degree** | |
| | | **N** | **N** | **%** | **N** | **%** | **N** | **%** |
| **Mathematics** | **w*** | 63 | 4 | 6.3 | 1 | 1.6 | 1 | 1.6 |
| | **1** | 138 | 6 | 4.3 | 3 | 2.2 | 0 | - |
| | **2c** | 406 | 26 | 6.4 | 22 | 5.4 | 6 | 1.5 |
| | **2b#** | 571 | 41 | 7.2 | 49 | 8.6 | 13 | 2.3 |
| | **2a** | 631 | 49 | 7.8 | 88 | 13.9 | 22 | 3.5 |
| | **3** | 758 | 90 | 11.9 | 142 | 18.7 | 56 | 7.4 |
| | **Total** | 2437 | 212 | 8.7 | 304 | 12.5 | 97 | 4.0 |

***** working towards level 1

# Nationally expected level of achievement at Key Stage 1

Categories not known and 'other professional' and 'miscellaneous' excluded due to the small numbers

## Family SES

As found in the study of cognitive attainment measures at previous time points (pre-school entry, start of primary school and Year 1), family SES, measured by the highest of father or mother's current or most recent employment status, showed a significant association with children's attainment levels at the end of Key Stage 1. For example, although only 8.5 percent of children were from the Professional non-manual group, they represented 17.8 percent of children who gained a level 3 in reading, but under 3 percent of those who achieved a level 2c or level 1 in reading. By contrast, those from semi-skilled manual family SES represented 13.4 percent of the total sample, but under 7 percent of those who gained level 3, and 22 percent of those who were at level 1 in reading.

**Table 1.7: Key Stage 1 Attainment Levels in Year 2 and Family SES**

| Year 2 | Level Achieved | All | Professional non-manual | | Intermediate non-manual | | Skilled non-manual | |
|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % |
| Reading | w* | 70 | 0 | - | 8 | 11.4 | 15 | 21.4 |
| | 1 | 300 | 8 | 2.7 | 35 | 11.7 | 92 | 30.7 |
| | 2c | 319 | 6 | 1.9 | 62 | 19.4 | 100 | 31.3 |
| | 2b# | 514 | 24 | 4.7 | 111 | 21.6 | 173 | 33.7 |
| | 2a | 671 | 48 | 7.2 | 175 | 26.1 | 246 | 36.7 |
| | 3 | 774 | 138 | 17.8 | 264 | 34.1 | 241 | 31.1 |
| | Total | 2648 | 224 | 8.5 | 655 | 24.7 | 867 | 32.7 |

| Year 2 | Level Achieved | All | Skilled manual | | Semi-skilled manual | | Unskilled manual | | Never worked | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % | N | % |
| Reading | w* | 70 | 19 | 27.1 | 21 | 30.0 | 3 | 4.3 | 4 | 5.7 |
| | 1 | 300 | 68 | 22.7 | 66 | 22.0 | 18 | 6.0 | 13 | 4.3 |
| | 2c | 319 | 65 | 20.4 | 63 | 19.7 | 10 | 3.1 | 13 | 4.1 |
| | 2b# | 514 | 90 | 17.5 | 81 | 15.8 | 19 | 3.7 | 16 | 3.1 |
| | 2a | 671 | 105 | 15.6 | 71 | 10.6 | 12 | 1.8 | 14 | 2.1 |
| | 3 | 774 | 62 | 8.0 | 52 | 6.7 | 5 | 0.6 | 12 | 1.6 |
| | Total | 2648 | 409 | 15.4 | 354 | 13.4 | 67 | 2.5 | 72 | 2.7 |

| Year 2 | Level Achieved | All | Professional non-manual | | Intermediate non-manual | | Skilled non-manual | |
|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % |
| Mathematics | w* | 67 | 0 | - | 5 | 7.5 | 20 | 29.9 |
| | 1 | 142 | 1 | 0.7 | 23 | 16.2 | 51 | 35.9 |
| | 2c | 410 | 11 | 2.7 | 78 | 19.0 | 123 | 30.0 |
| | 2b# | 576 | 28 | 4.9 | 114 | 19.8 | 214 | 37.2 |
| | 2a | 637 | 62 | 9.7 | 171 | 26.8 | 212 | 33.3 |
| | 3 | 763 | 118 | 15.5 | 256 | 33.6 | 233 | 30.5 |
| | Total | 2457 | 22 | 9.0 | 635 | 25.8 | 803 | 32.7 |

***** working towards level 1

# Nationally expected level of achievement at Key Stage 1

| Year 2 | Level Achieved | All | Skilled manual | | Semi-skilled manual | | Unskilled manual | | Never worked | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % | N | % |
| **Mathematics** | **w*** | 67 | 21 | 31.3 | 16 | 23.9 | 3 | 4.5 | 2 | 3.0 |
| | **1** | 142 | 21 | 14.8 | 32 | 22.5 | 6 | 4.2 | 8 | 5.6 |
| | **2c** | 410 | 89 | 21.7 | 76 | 18.5 | 16 | 3.9 | 17 | 4.1 |
| | **2b#** | 576 | 100 | 17.4 | 85 | 14.8 | 18 | 3.1 | 17 | 3.0 |
| | **2a** | 637 | 98 | 15.4 | 71 | 11.1 | 11 | 1.7 | 12 | 1.9 |
| | **3** | 763 | 72 | 9.4 | 61 | 8.0 | 9 | 1.2 | 14 | 1.8 |
| | **Total** | 2457 | 368 | 15.0 | 313 | 12.7 | 57 | 2.3 | 61 | 2.5 |

***** working towards level 1
# Nationally expected level of achievement at Key Stage 1

There is also evidence of SES differences in mathematics attainment levels at the end of Key Stage 1. For example, proportionately twice as many pupils from the Professional non-manual group attained a level 3, (nearly 16 percent of level 3 pupils were from the highest occupational group) while amongst level 1 pupils they were under represented (under 1 percent). Of the pupils attaining a level 3 in mathematics, 8 percent were from semi-skilled manual backgrounds, whereas the equivalent figure for pupils attaining at level 1 was just under 23 percent.

## Pre-school type

Differences in the cognitive attainments of children who were attending different forms of pre-school centre were found at the start of the EPPE study. In particular children from private day nurseries had higher mean scores on the measure of General Cognitive Ability (GCA) reflecting higher levels of advantage amongst this group, while centres that catered for proportionately more children from disadvantaged backgrounds showed relatively lower mean scores at age 3 years plus. At entry to primary school, a 'home' sample of children that had not attended a pre-school centre, was recruited to the study for comparison. These children were found to have much lower attainments than those who had attended pre-school. At the end of Year 2 'home' children still showed relatively low levels of attainment, for example 30 percent of children classified as working towards level 1 were 'home' children, although 'home' children represented only 10.5 percent of the total sample for whom Year 2 national assessment data were collected.

There were marked differences in the intake characteristics of those attending different types of pre-school (see EPPE Technical paper 4 and 8a) and between 'home' children and those who had attended a pre-school centre. For example, significantly more 'home' children were EAL. More of the 'home' children had mothers who were not working and had no qualifications in comparison to children who attended pre-school. Many more 'home' children were identified as 'at risk' of SEN when they started primary school than children who had attended a pre-school setting. Children who attended integrated settings also experienced significantly more disadvantage than those from any other type of pre-school, and more were 'at risk' of SEN at entry to pre-school, age 3 years plus. Local Authority day nurseries also served relatively high numbers of disadvantaged children, while private day nurseries served children from more socio-economically advantaged backgrounds.

Table 1.8 gives the percentage of children at each attainment level by type of pre-school provider. The findings show that proportionately more children who had attended private day nurseries went on to attain a level 3 in reading and a similar pattern emerged for mathematics in Year 2, compared with children who had attended local authority day nurseries.

**Table 1.8: Key Stage 1 Attainment Levels in Year 2 and Type of Pre-school Provider**

| Year 2 | Level Achieved | All | Nursery Class | | Playgroup | | Private Day Nursery | |
|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % |
| Reading | w* | 73 | 12 | 16.4 | 10 | 13.7 | 5 | 6.8 |
| | 1 | 315 | 68 | 21.6 | 39 | 12.4 | 22 | 7.0 |
| | 2c | 342 | 75 | 21.9 | 70 | 20.5 | 37 | 10.8 |
| | 2b# | 528 | 113 | 21.4 | 102 | 19.3 | 73 | 13.8 |
| | 2a | 681 | 139 | 20.4 | 126 | 18.5 | 100 | 14.7 |
| | 3 | 783 | 136 | 17.4 | 169 | 21.6 | 195 | 24.9 |
| | Total | 2722 | 543 | 19.9 | 516 | 19.0 | 432 | 15.9 |

| Year 2 | Level Achieved | All | Local Authority | | Nursery School | | Integrated Centre | | Home children | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % | N | % |
| Reading | w* | 73 | 15 | 20.5 | 6 | 8.2 | 3 | 4.1 | 22 | 30.1 |
| | 1 | 315 | 41 | 13.0 | 49 | 15.6 | 30 | 9.5 | 66 | 21.0 |
| | 2c | 342 | 45 | 13.2 | 50 | 14.6 | 14 | 4.1 | 51 | 14.9 |
| | 2b# | 528 | 77 | 14.6 | 73 | 13.8 | 33 | 6.3 | 57 | 10.8 |
| | 2a | 681 | 90 | 13.2 | 134 | 19.7 | 38 | 5.6 | 54 | 7.9 |
| | 3 | 783 | 97 | 12.4 | 119 | 15.2 | 31 | 4.0 | 36 | 4.6 |
| | Total | 2722 | 365 | 13.4 | 431 | 15.8 | 149 | 5.5 | 286 | 10.5 |

| Year 2 | Level Achieved | All | Nursery Class | | Playgroup | | Private Day Nursery | |
|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % |
| Mathematics | w* | 69 | 19 | 27.5 | 7 | 10.1 | 1 | 1.4 |
| | 1 | 149 | 27 | 18.1 | 29 | 19.5 | 6 | 4.0 |
| | 2c | 426 | 79 | 18.5 | 70 | 16.4 | 44 | 10.3 |
| | 2b# | 601 | 142 | 23.6 | 111 | 18.5 | 85 | 14.1 |
| | 2a | 654 | 144 | 22.0 | 127 | 19.4 | 103 | 15.7 |
| | 3 | 770 | 127 | 16.5 | 164 | 21.3 | 183 | 23.8 |
| | Total | 2527 | 503 | 19.9 | 486 | 19.2 | 417 | 16.5 |

***** working towards level 1
# Nationally expected level of achievement at Key Stage 1

| Year 2 | Level Achieved | All | Local Authority | | Nursery School | | Integrated Centre | | Home children | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | N | % | N | % | N | % | N | % |
| **Mathematics** | **w*** | 69 | 16 | 23.2 | 9 | 13.0 | 3 | 4.3 | 14 | 20.3 |
| | **1** | 149 | 19 | 12.8 | 24 | 16.1 | 9 | 6.0 | 35 | 23.5 |
| | **2c** | 426 | 59 | 13.8 | 64 | 15.0 | 29 | 6.8 | 81 | 19.0 |
| | **2b#** | 601 | 92 | 15.3 | 81 | 13.5 | 27 | 4.5 | 63 | 10.5 |
| | **2a** | 654 | 84 | 12.8 | 112 | 17.1 | 32 | 4.9 | 52 | 8.0 |
| | **3** | 770 | 86 | 11.2 | 138 | 17.9 | 39 | 5.1 | 33 | 4.3 |
| | **Total** | 2527 | 335 | 13.3 | 409 | 16.2 | 133 | 5.3 | 244 | 9.7 |

***** working towards level 1
# Nationally expected level of achievement at Key Stage 1

## Multiple disadvantage

Table 1.9 summarises intake differences using an index of multiple disadvantage (for details of the calculation of this index, based on a combination of child, family and home learning environment factors associated with low attainment at age 3 years plus, see Appendix 1).[12] Multiple disadvantage showed a significant relationship with children's cognitive attainment during the pre-school period, at entry to primary school and in Year 1. It continues to show a significant negative correlation with attainment in national assessments at the end of Key Stage 1. The correlations with decimalised reading ( r = -0.37) and decimalised mathematics (r = -0.31) scores are relatively moderate but are highly significant. Writing level also shows a significant negative correlation with multiple disadvantage (r = -0.33). It can be seen that the mean decimalised reading and decimalised mathematics scores of children with a multiple disadvantage score of zero (0) are significantly higher than those scoring on 5 or more factors. The difference in mean scores is slightly larger for reading than for mathematics in Year 2.

**Table 1.9: Key Stage 1 decimalised reading and mathematics scores by multiple disadvantage index**

| Multiple Disadvantage Index | Reading Decimalised score | | | Mathematics Decimalised score | | |
|---|---|---|---|---|---|---|
| | N | mean | sd | N | mean | sd |
| **0 (low disadvantage)** | **569** | **2.66** | **0.59** | **560** | **2.66** | **0.48** |
| **1** | **674** | **2.60** | **0.60** | **659** | **2.57** | **0.56** |
| **2** | **531** | **2.37** | **0.73** | **526** | **2.48** | **0.60** |
| **3** | **337** | **2.23** | **0.75** | **328** | **2.30** | **0.67** |
| **4** | **219** | **2.01** | **0.82** | **215** | **2.19** | **0.73** |
| **5 plus (high disadvantage)** | **180** | **1.75** | **0.89** | **172** | **1.99** | **0.83** |
| **All** | **2510** | **2.40** | **0.74** | **2460** | **2.46** | **0.64** |

Cases with any missing data excluded

[12] A home learning environment (HLE) index was created based on parents' self reported involvement in different activities during the pre-school period. Children with the lowest scores on this index were found to show poorer cognitive development at entry to pre-school, and again at entry to primary school. Low scores on this index were included in calculating the multiple disadvantage index.

During the pre-school period, analyses showed that the quality of the home learning environment (measured by parents' self-reported engagement in activities such as reading to the child, teaching songs & nursery rhymes, playing with letters and numbers etc.) was related to significantly better cognitive development, even when the impact of other factors is controlled. When the HLE index is examined separately from multiple disadvantage it continues to show a significant positive correlation with both decimalised reading (r = 0.33) and decimalised mathematics scores (r = 0.26) at the end of Key Stage 1.

The extent of variation in the characteristics of children who had different types of pre-school experience is illustrated in Table 1.10 below. This shows the percentages of children from different types of pre-school settings according to their scores on the index of multiple disadvantage.

**Table 1.10: Multiple Disadvantage by Type of Pre-school Experience**

| Multiple Disadvantage Index | Nursery class | | Playgroup | | Private day nursery | | Integrated Centre | | Nursery school | | Local authority day nursery | | Home children | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % |
| 0 | 107 | 19.0 | 111 | 19.0 | 219 | 44.2 | 21 | 12.4 | 109 | 22.9 | 68 | 17.7 | 9 | 4.1 |
| 1 | 165 | 29.4 | 166 | 17.2 | 168 | 34.0 | 33 | 19.4 | 138 | 29.1 | 87 | 22.7 | 23 | 10.6 |
| 2 | 110 | 19.6 | 154 | 28.5 | 75 | 15.1 | 38 | 22.4 | 121 | 25.4 | 80 | 20.8 | 35 | 16.1 |
| 3 | 74 | 13.2 | 87 | 6.4 | 26 | 5.2 | 34 | 20.0 | 67 | 14.0 | 60 | 15.6 | 43 | 19.7 |
| 4 | 66 | 11.7 | 41 | 7.0 | 4 | 0.8 | 27 | 15.9 | 28 | 5.9 | 47 | 12.2 | 44 | 20.2 |
| 5 plus | 40 | 7.1 | 24 | 4.1 | 4 | 0.8 | 17 | 10.4 | 13 | 2.7 | 42 | 10.9 | 64 | 29.4 |

Cases with any missing data excluded

Due to the very different characteristics of children who had attended different types of pre-school provision (illustrated in terms of levels of multiple disadvantage in the Table 1.10) it is not appropriate to explore any continuing influence of pre-school on subsequent educational outcomes at the end of Key Stage 1 unless proper statistical control is made of the impact of intake differences in terms of significant child, family and home learning environment influences. Multilevel statistical analyses presented in subsequent sections of the report explore these influences in more depth and investigate the continuing impact of pre-school, net of the influence of child, parent and home environment influences.

## Social/behavioural Assessments

Young children's social/behavioural development is treated as an important feature of the EPPE research, in addition to cognitive attainment and progress. The Adaptive Social Behavioural Inventory (ASBI, Hogan et al., 1992) was used to measure different features of children's social behaviour at entry to the pre-school study (age 3 years plus). This checklist was completed by a pre-school worker who knew the child well (for details see EPPE Technical Papers 4 & 7). During the first few weeks of primary school, (age rising 5 years) the child's class teacher completed the Child Social Behaviour Questionnaire (CSBQ), an expanded form of the ASBI. Principal Components Analysis was used to identify the main underlying dimensions of social behaviour for each of these time points. Young children's developmental gains (changes in social behaviour) were analysed over the pre-school period and details are reported in EPPE Technical Paper 8b. The four main aspects of social behaviour identified at entry to primary school were Independence & Concentration, Cooperation & Conformity, Peer Sociability, and

Anti-social/Worried behaviour (Details of social/behavioural development in Year 1 are reported in EPPE Technical Paper 9).

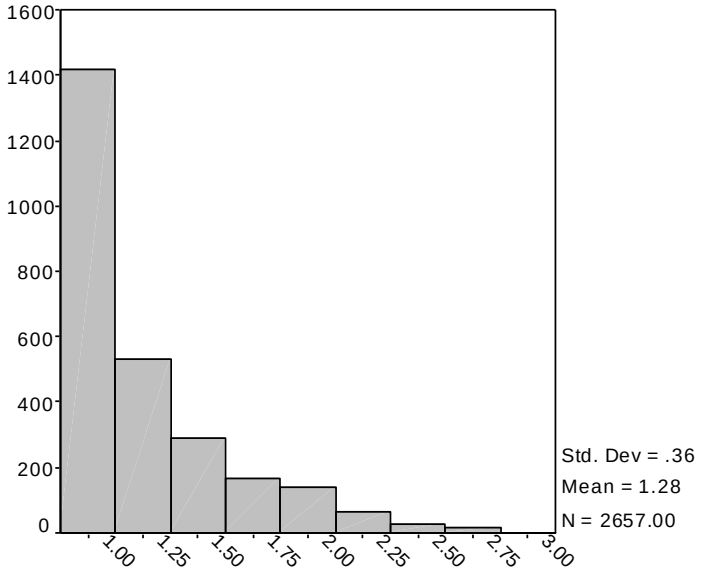
In Years 1 and 2 class teachers completed an extended version of the Strengths and Difficulties Questionnaire (Goodman, 1997). This instrument consists of a wide range of items rated on a 3-point scale: (1 = not true 2 = somewhat true 3 = certainly true). Principal Components Analysis identified a number of underlying dimensions (see Appendix 6) of social behaviour. These included four main factors that were used as outcomes for Year 2 in this paper: Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour.

## Characteristics of children by mean social/behavioural Factor Scores

Social behaviour was found to show only relatively small differences related to child, family and home environment factors at younger ages (entry to pre-school and entry to primary school). This sub-section explores differences in the teacher measures of social behaviour in Year 2 and selected background characteristics of the sample. In comparison with the relationships for reading and mathematics outcomes described in tables earlier in this paper, associations between background characteristics and social/behavioural outcomes are still relatively weak. However, there is evidence that specific factors may be relatively more important for social behaviour at age 7 years plus than at younger ages.

Overall, higher mean scores indicate better behaviour for the factors Self-regulation and Positive social behaviour. By contrast, lower mean scores indicate better behaviour (in terms of lower incidence reported by teacher ratings) for the factors Anti-social behaviour and Anxious behaviour. It should be noted that, as during the pre-school period and in Year 1, scores on all social behaviour measures are skewed towards the positive end of the scale. This is especially marked for Anti-social and Anxious behaviour where teacher ratings indicate that raised scores (indicating poorer behaviour) are only evident for a small minority of children (5.7 percent had raised scores on the Anti-social measure and 4.5 percent raised scores on the Anxious measure). Figure 1 illustrates the highly skewed distribution of scores for the Anti-social measure in Year 2 (see Appendix 6 for other measures).

Figure 1: Distribution of mean scores for Anti-social behaviour[13] in Year 2




[13] Please note that a lower score indicates better behaviour (in terms of lower incidence reported by teacher ratings) on this measure.

## Gender

The figures in Table 1.11 show that the mean factor scores for girls are somewhat higher for Self-regulation and Positive social behaviour. By contrast, as a group girls showed slightly lower scores for Anti-social behaviour than boys. Such behavioural differences, especially in Self-regulation may be associated with girls' somewhat higher attainment levels in Key Stage 1.

**Table 1.11: Gender differences in measures of social behaviour at the end of Year 2**

| | Self-regulation | | | Positive social behaviour | | | Anti-social Behaviour | | | Anxious behaviour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | mean | sd | n | mean | sd | n | mean | sd | n | mean | sd |
| Male | 1357 | 2.26 | 0.54 | 1359 | 2.38 | 0.49 | 1359 | 1.36 | 0.41 | 1359 | 1.28 | 0.38 |
| Female | 1297 | 2.46 | 0.46 | 1298 | 2.62 | 0.41 | 1298 | 1.20 | 0.30 | 1297 | 1.32 | 0.39 |
| Total | 2654 | 2.36 | 0.51 | 2657 | 2.50 | 0.47 | 2657 | 1.28 | 0.36 | 2656 | 1.30 | 0.39 |

## Low income

The free school meals indicator of low income shows a weak association with each of the four dimensions of behaviour collected in Year 2 as can be seen in Table 1.12. For each factor, children recorded as having free meals, have relatively poorer behaviour ratings than other children. This is in line with findings in Year 1. Such behaviour differences may be related to differences in attainment levels reported earlier for those from more disadvantaged backgrounds.

**Table 1.12: Differences in measures of social behaviour at the end of year 2 by Low Family Income (Free School Meals Indicator)**

| Free School Meals | Self-regulation | | | Positive social behaviour | | | Anti-social Behaviour | | | Anxious behaviour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | mean | sd | n | mean | sd | n | mean | sd | n | mean | sd |
| Yes | 593 | 2.20 | 0.54 | 593 | 2.39 | 0.50 | 593 | 1.38 | 0.42 | 593 | 1.34 | 0.42 |
| No | 1982 | 2.41 | 0.49 | 1985 | 2.53 | 0.45 | 1985 | 1.25 | 0.34 | 1984 | 1.28 | 0.37 |
| Unknown | 79 | 2.38 | 0.49 | 79 | 2.53 | 0.41 | 79 | 1.26 | 0.36 | 79 | 1.36 | 0.44 |
| Total | 2654 | 2.36 | 0.51 | 2657 | 2.50 | 0.47 | 2657 | 1.28 | 0.36 | 2656 | 1.30 | 0.39 |

## Language

There is little evidence of any association between language (English as mother tongue versus EAL) and teachers' rating of children's social behaviour. This is in contrast to results for the pre-school period when, as a group, EAL children received slightly lower ratings on Peer Sociability.

**Table 1.13: Language background and differences in social behaviour at the end of Year 2**

| | Self-regulation | | | Positive social behaviour | | | Anti-social Behaviour | | | Anxious behaviour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | mean | sd | n | mean | sd | n | mean | sd | n | mean | sd |
| English as Mother Tongue | 2385 | 2.36 | 0.51 | 2388 | 2.50 | 0.46 | 2388 | 1.28 | 0.36 | 2387 | 1.30 | 0.39 |
| EAL | 267 | 2.32 | 0.49 | 267 | 2.44 | 0.48 | 267 | 1.28 | 0.37 | 267 | 1.25 | 0.35 |
| Unknown | 2 | 2.28 | 0.39 | 2 | 2.25 | 1.06 | 2 | 1.57 | 0.81 | 2 | 1.40 | 0.00 |
| Total | 2654 | 2.36 | 0.51 | 2657 | 2.50 | 0.47 | 2657 | 1.28 | 0.36 | 2656 | 1.30 | 0.39 |

## Mother's Qualification level

Mother's highest qualification level showed an association with differences in teacher ratings of child behaviour in Year 2. The differences are most notable comparing children whose mother's have a degree or higher degree level qualification and those with no qualifications for the factor Self-regulation. In each case, a group of children whose mothers' had no qualifications were rated somewhat less favourably than those whose mothers had the highest qualification levels. Again, such behaviour differences may be related to the different patterns of attainment identified in Key Stage 1.

**Table 1.14: Mother's Qualification level and differences in social behaviour at the end of Year 2**

| Mother's qualification level | Self-regulation | | | Positive social behaviour | | | Anti-social Behaviour | | | Anxious behaviour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | mean | sd | n | mean | sd | n | mean | sd | n | mean | Sd |
| None | 539 | 2.21 | 0.53 | 539 | 2.41 | 0.49 | 539 | 1.33 | 0.40 | 539 | 1.32 | 0.40 |
| vocational | 371 | 2.31 | 0.52 | 371 | 2.44 | 0.47 | 371 | 1.34 | 0.41 | 371 | 1.30 | 0.38 |
| 16 academic | 965 | 2.37 | 0.51 | 966 | 2.52 | 0.46 | 966 | 1.26 | 0.35 | 966 | 1.30 | 0.41 |
| 18 academic | 217 | 2.41 | 0.48 | 217 | 2.54 | 0.45 | 217 | 1.25 | 0.31 | 217 | 1.27 | 0.35 |
| Degree or equivalent | 312 | 2.54 | 0.44 | 313 | 2.59 | 0.42 | 313 | 1.20 | 0.29 | 313 | 1.28 | 0.37 |
| Higher degree | 108 | 2.56 | 0.40 | 108 | 2.58 | 0.42 | 108 | 1.21 | 0.31 | 107 | 1.20 | 0.29 |

Categories 'not known', 'other professional' and 'miscellaneous' are excluded due to small numbers.

## Family SES

Family SES (measured by highest SES of either parents' employment) is also associated with teachers' ratings of child behaviour in Year 2. Again, the mean differences are largest for the factor Self-regulation. This is in line with findings identified when children were younger and is in accord with those for mother's qualification level (these two characteristics are themselves associated).

**Table 1.15: Family SES and differences in social behaviour at the end of Year 2**

| Family SES | Self-regulation | | | Positive social behaviour | | | Anti-social Behaviour | | | Anxious behaviour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | mean | sd | n | mean | sd | n | mean | Sd | n | mean | sd |
| Professional non-manual | 233 | 2.59 | 0.40 | 233 | 2.55 | 0.44 | 233 | 1.20 | 0.30 | 232 | 1.24 | 0.35 |
| Other Professional non-manual | 650 | 2.45 | 0.48 | 651 | 2.56 | 0.44 | 651 | 1.24 | 0.33 | 651 | 1.26 | 0.35 |
| Skilled non-manual | 834 | 2.37 | 0.50 | 836 | 2.51 | 0.46 | 836 | 1.27 | 0.35 | 836 | 1.31 | 0.39 |
| Skilled manual | 394 | 2.26 | 0.52 | 394 | 2.46 | 0.46 | 394 | 1.32 | 0.40 | 394 | 1.31 | 0.39 |
| Semi-skilled | 337 | 2.21 | 0.56 | 337 | 2.42 | 0.52 | 337 | 1.32 | 0.39 | 337 | 1.33 | 0.41 |
| Unskilled | 62 | 2.21 | 0.51 | 62 | 2.46 | 0.44 | 62 | 1.34 | 0.40 | 62 | 1.31 | 0.41 |
| Never worked | 72 | 2.21 | 0.51 | 72 | 2.35 | 0.50 | 72 | 1.46 | 0.49 | 72 | 1.34 | 0.49 |
| Total | 2654 | 2.36 | 0.51 | 2657 | 2.50 | 0.47 | 2657 | 1.28 | 0.36 | 2656 | 1.30 | 0.39 |

**Multiple disadvantage**

The index of multiple disadvantage developed by EPPE, is related to cognitive attainment at the end of Year 2, as described earlier in the section on national assessment results. The correlations with social behaviour were weaker but still statistically significant. Correlations were also calculated for the four social/behavioural outcomes. Two were negative indicating poorer behavioural outcomes for more disadvantaged children for Self-regulation (r = -0.21) and Positive social behaviour (r = -0.13). Two were positive indicating increases in Anti-social behaviour (r =0.13) and Anxious behaviour (r =0.08) associated with higher levels of disadvantage. Table 1.16 shows the mean scores for different levels of multiple disadvantage. The results confirm findings for the pre-school period on the importance of multiple disadvantage as a factor, which increases the risk of both poor cognitive outcomes and less favourable social/behavioural development in pre-school and across the early years of primary school.

**Table 1.16: Total Multiple Disadvantage and differences in social behaviour at the end of Year 2**

| No. of factors | Self-regulation | | | Positive social behaviour | | | Anti-social Behaviour | | | Anxious behaviour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | mean | sd | n | mean | sd | n | mean | sd | n | mean | sd |
| 0 | 558 | 2.47 | 0.453 | 559 | 2.57 | 0.422 | 559 | 1.23 | 0.307 | 559 | 1.26 | 0.361 |
| 1 | 667 | 2.43 | 0.472 | 667 | 2.54 | 0.464 | 667 | 1.25 | 0.343 | 667 | 1.27 | 0.348 |
| 2 | 517 | 2.35 | 0.503 | 518 | 2.50 | 0.442 | 518 | 1.27 | 0.341 | 517 | 1.30 | 0.378 |
| 3 | 323 | 2.24 | 0.575 | 324 | 2.50 | 0.494 | 324 | 1.34 | 0.413 | 324 | 1.37 | 0.452 |
| 4 | 209 | 2.20 | 0.518 | 209 | 2.43 | 0.496 | 209 | 1.32 | 0.388 | 209 | 1.36 | 0.451 |
| 5 plus | 170 | 2.16 | 0.511 | 170 | 2.35 | 0.510 | 170 | 1.39 | 0.437 | 170 | 1.31 | 0.388 |
| Total | 2444 | 2.36 | 0.508 | 2447 | 2.51 | 0.464 | 2447 | 1.28 | 0.359 | 2446 | 1.30 | 0.386 |

As with cognitive outcomes the home learning environment (HLE) index continued to show a significant positive association with better social/behavioural development in three of the four measures. Correlations reveal that the association is strongest for Self-regulation in Year 2 but that Anxious behaviour is statistically independent of the HLE.

**Table 1.17: Correlations between Home Learning Environment Index and Children's social behaviour at the End of Year 2**

| | Self Regulation | Positive social behaviour | Anti-social Behaviour | Anxious behaviour |
|---|---|---|---|---|
| HLE Index | 0.231 | 0.158 | -0.129 | 0.03 |

As with cognitive outcomes it is possible to examine differences in social behaviour scores by type of pre-school experience, however, due to the differences in characteristics of children attending different types of provision (or the 'home' group who had not attended a pre-school centre), differences must be treated with caution. The figures in Table 1.18 indicate that the 'home' group continued to show poorer social behaviour in terms of Self-regulation, Positive social behaviour and Anxious behaviour. However, for the Anti-social measure children from Local authority day nurseries group and Integrated centres have a relatively higher mean score. Both these forms of provision served relatively more children with multiple disadvantage. Multilevel analyses reported in Section 3 examine the impact of pre-school while controlling, statistically, for the combined influence of significant child, family and home environment factors.

**Table 1.18: Social behaviour at end of Year 2 by Type of Pre-school Provider**

| Type of pre-school | Self-regulation | | | Positive social behaviour | | | Anti-social Behaviour | | | Anxious behaviour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | mean | sd | n | mean | sd | n | mean | sd | n | mean | sd |
| Nursery Class | 506 | 2.35 | 0.52 | 506 | 2.52 | 0.48 | 506 | 1.25 | 0.34 | 506 | 1.28 | 0.38 |
| Playgroup | 486 | 2.38 | 0.50 | 488 | 2.56 | 0.45 | 488 | 1.27 | 0.37 | 487 | 1.33 | 0.41 |
| Private Day Nursery | 449 | 2.48 | 0.47 | 449 | 2.54 | 0.44 | 449 | 1.24 | 0.32 | 449 | 1.23 | 0.32 |
| Local Authority | 346 | 2.27 | 0.52 | 347 | 2.42 | 0.49 | 347 | 1.36 | 0.41 | 347 | 1.29 | 0.35 |
| Nursery School | 441 | 2.36 | 0.51 | 441 | 2.49 | 0.46 | 441 | 1.28 | 0.36 | 441 | 1.32 | 0.42 |
| Integrated Centre | 146 | 2.28 | 0.50 | 146 | 2.40 | 0.45 | 146 | 1.37 | 0.41 | 146 | 1.35 | 0.43 |
| Home children | 280 | 2.30 | 0.52 | 280 | 2.45 | 0.49 | 280 | 1.27 | 0.38 | 280 | 1.32 | 0.41 |
| Total | 2654 | 2.36 | 0.51 | 2657 | 2.50 | 0.47 | 2657 | 1.28 | 0.36 | 2656 | 1.30 | 0.39 |

There were moderate correlations between the different measures of social behaviour at entry to primary school and at the end of Year 2 (Table1.19). The strongest was between earlier scores on Independence & Concentration and later scores for Self-regulation (r = 0.49).

**Table 1.19: Correlations between Children's social behaviour at Primary School entry and at end of Year 2**

| Entry to primary school / Year 2 | Independence & Concentration | Cooperation & Conformity | Peer Sociability | Anti - social/worried |
|---|---|---|---|---|
| Self Regulation | 0.490 | 0.427 | 0.252 | -0.264 |
| Positive social behaviour | 0.351 | 0.368 | 0.200 | -0.258 |
| Anti-social Behaviour | - 0.356 | - 0.396 | - 0.040 ns | 0.385 |
| Anxious behaviour | - 0.108 | - 0.083 | - 0.155 | 0.067 |

All correlations are statistically significant at the 0.01 level unless indicated ns

Table 1.20 shows the associations between attainment at the end of Year 2 and the four measures of social behaviour. The strongest positive association is between Self-regulation and attainment in reading. Both Anti-social and, to a lesser extent, Anxious behaviour are negatively correlated with attainment.

**Table 1.20: Correlations between Attainment and Measures of Social Behaviour at End of Year 2***

| | Self Regulation | Positive social behaviour | Anti-social Behaviour | Anxious behaviour |
|---|---|---|---|---|
| Decimalised Reading score | 0.568 | 0.311 | -0.279 | -0.173 |
| Decimalised Mathematics score | 0.531 | 0.264 | -0.254 | -0.204 |

The relationships between child, parent and home environment characteristics and social behaviour are generally much weaker than those found for cognitive attainment in Year 2 and this is in line with findings at earlier time points (during the pre-school period and in Year 1).

Although significant differences are identified, the differences are relatively modest. Nonetheless, both multiple disadvantage and the home learning environment continue to show a significant correlation particularly with Self-regulation, which is more closely related to attainment in Year 2 than other measures of social behaviour. Multilevel analyses are used to identify the net impact of different child, family and home environment factors in subsequent sections of this Technical Paper. These analyses are also used to test whether pre-school continues to show a relationship with children's attainment and social behaviour at the end of Year 2, net of the impact of background.

## Special Education Needs

EPPE collected details for each child in the sample on whether their class teacher reported that they had been identified as having any form of special educational need (SEN) during Key Stage 1. It is not possible to give further details about how children were identified as having any SEN in school, except for those recorded as having a Statement of need. Table 1.21 provides descriptive details about selected characteristics of children with SEN compared with children not identified as having any SEN in Year 2. It can be seen that, proportionally, more children identified as having a need were boys (59 percent). By contrast, of those not identified as having a need, only 45 percent were boys. More children with SEN were 'home' children (13 percent versus 8 percent respectively), had mothers who were not employed, and mothers with no qualifications. They were also more likely to be recorded as having free school meals than other children. Children identified with SEN also tended to have lower family SES and had lower scores on the HLE. Overall they had higher scores in terms of multiple disadvantage than children who were not identified as having SEN.

**Table 1.21: Characteristics of children reported by their Year 2 teacher to have been identified as having a SEN during Key Stage 1**

| | Children identified with SEN | | Children without SEN | |
|---|---|---|---|---|
| | N | % | N | % |
| **Gender:** | | | | |
| Male | **679** | **59.2** | **695** | **45.4** |
| Female | **468** | **40.8** | **836** | **54.6** |
| Total | **1147** | **100.0** | **1531** | **100.0** |
| **Ethnicity:** | | | | |
| White UK Heritage | **852** | **74.4** | **1145** | **74.8** |
| White European Heritage | **45** | **3.9** | **47** | **3.1** |
| Black Caribbean Heritage | **36** | **3.1** | **61** | **4.0** |
| Black African Heritage | **20** | **1.7** | **27** | **1.8** |
| Black Other | **14** | **1.2** | **5** | **0.3** |
| Indian | **21** | **1.8** | **36** | **2.4** |
| Pakistani | **66** | **5.8** | **80** | **5.2** |
| Bangladeshi | **15** | **1.3** | **14** | **0.9** |
| Chinese | **1** | **0.1** | **3** | **0.2** |
| Other | **17** | **1.5** | **31** | **2.0** |
| Mixed Heritage | **56** | **4.9** | **81** | **5.3** |
| White Non European Heritage | **2** | **0.2** | **0** | **0** |
| Total | **1145** | **100.0** | **1530** | **100.0** |

| | | | | |
|---|---|---|---|---|
| **Type Of Pre-School:** | | | | |
| Nursery Class | **266** | **23.2** | **246** | **16.1** |
| Playgroup | **185** | **16.1** | **309** | **20.2** |
| Private Day Nursery | **137** | **11.9** | **315** | **20.6** |
| Local Authority | **158** | **13.8** | **190** | **12.4** |
| Nursery Schools | **175** | **15.3** | **267** | **17.4** |
| Combined Centres | **71** | **6.2** | **75** | **4.9** |
| Home | **155** | **13.5** | **129** | **8.4** |
| Total | **1147** | **100.0** | **1531** | **100.0** |
| **Mother's Employment:** | | | | |
| Not Employed | **621** | **56.1** | **698** | **46.7** |
| Employed Full Time | **139** | **12.6** | **262** | **17.5** |
| Employed Part Time | **296** | **26.7** | **477** | **31.9** |
| Self-Employed/Part Time Combination | **51** | **4.6** | **58** | **3.9** |
| Total | **1107** | **100.0** | **1495** | **100.0** |
| **Father's Employment:** | | | | |
| Not Employed | **165** | **14.8** | **154** | **10.3** |
| Employed Full Time | **541** | **48.5** | **838** | **55.8** |
| Employed Part Time | **41** | **3.7** | **41** | **2.7** |
| Self-Employed/Part Time Combination | **108** | **9.7** | **198** | **13.2** |
| Father Absent | **260** | **23.3** | **270** | **18.0** |
| Total | **1115** | **100.0** | **1501** | **100.0** |
| **Mother's Qualification:** | | | | |
| None | **299** | **27.4** | **242** | **16.4** |
| Vocational | **166** | **15.2** | **210** | **14.2** |
| 16 Academic | **417** | **38.2** | **556** | **37.6** |
| 18 Academic | **84** | **7.7** | **135** | **9.1** |
| Degree Or Equivalent | **92** | **8.4** | **222** | **15.0** |
| Higher Degree | **23** | **2.1** | **86** | **5.8** |
| Other | **10** | **0.9** | **29** | **2.0** |
| Total | **1091** | **100.0** | **1480** | **100.0** |
| **Father's Qualification:** | | | | |
| None | **223** | **20.1** | **197** | **13.2** |
| Vocational | **124** | **11.2** | **187** | **12.5** |
| 16 Academic | **245** | **22.1** | **344** | **23.0** |
| 18 Academic | **72** | **6.5** | **113** | **7.5** |
| Degree Or Equivalent | **94** | **8.5** | **222** | **14.8** |
| Higher Degree | **30** | **2.7** | **102** | **6.8** |
| Other | **9** | **0.8** | **19** | **1.3** |
| Father Absent | **312** | **28.1** | **314** | **21.0** |
| Total | **1109** | **100.0** | **1498** | **100.0** |

| | | | | |
|---|---|---|---|---|
| **Family Social Class:** | | | | |
| Professional Non Manual | **47** | **4.2** | **188** | **12.6** |
| Other Professional Non Manual | **237** | **21.4** | **418** | **28.0** |
| Skilled Non-Manual | **348** | **31.4** | **494** | **33.0** |
| Skilled Manual | **215** | **19.4** | **182** | **12.2** |
| Semi Skilled | **187** | **16.9** | **154** | **10.3** |
| Unskilled | **38** | **3.4** | **25** | **1.7** |
| Never Worked | **37** | **3.3** | **34** | **2.3** |
| Total | **1109** | **100.0** | **1495** | **100.0** |
| **Home Learning Environment:** | | | | |
| 0-13 | **143** | **13.2** | **96** | **6.5** |
| 14-19 | **273** | **25.2** | **300** | **20.3** |
| 20-24 | **268** | **24.7** | **344** | **23.3** |
| 25-32 | **315** | **29.0** | **522** | **35.4** |
| 33-45 | **86** | **7.9** | **213** | **14.4** |
| Total | **1085** | **100.0** | **1475** | **100.0** |
| **Total Multiple Disadvantage Factors:** | | | | |
| 0 | **182** | **17.5** | **380** | **26.7** |
| 1 | **253** | **24.3** | **421** | **29.6** |
| 2 | **219** | **21.1** | **302** | **21.2** |
| 3 | **153** | **14.7** | **173** | **12.1** |
| 4 | **118** | **11.3** | **94** | **6.6** |
| 5+ | **115** | **11.1** | **54** | **3.8** |
| Total | **1040** | **100.0** | **1424** | **100.0** |
| **English as an additional language:** | | | | |
| Yes | **126** | **11.0** | **146** | **9.5** |
| No | **1020** | **89.0** | **1384** | **90.5** |
| Total | **1146** | **100.0** | **1530** | **100.0** |
| **Free School Meals:** | | | | |
| Yes | **333** | **30.0** | **263** | **82.3** |
| No | **777** | **70.0** | **1223** | **17.7** |
| Total | **1110** | **100.0** | **1486** | **100.0** |

There were significant differences in the social/behavioural characteristics of children identified by teachers as having a SEN in Year 2. Overall, the SEN group had lower scores in terms of Self-regulation and Positive social behaviour and higher mean scores for Anti-social behaviour and Anxious behaviour (see Table 1.22).

**Table 1.22: Social/behavioural mean scores of children identified as having a SEN**

| | Children identified with SEN | | | Children without SEN | | |
|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD |
| Age at Social/behavioural Assessments In Months | 1147 | 85.50 | 3.43 | 1531 | 86.51 | 3.45 |
| Self Regulation | 1122 | 2.07 | 0.52 | 1523 | 2.57 | 0.39 |
| Positive social behaviour | 1124 | 2.33 | 0.49 | 1524 | 2.62 | 0.40 |
| Anti-social behaviour | 1124 | 1.41 | 0.43 | 1524 | 1.19 | 0.28 |
| Anxious behaviour | 1124 | 1.38 | 0.42 | 1523 | 1.23 | 0.35 |

The national assessment attainment levels of children identified by their teachers as having a SEN in Key Stage 1 were significantly different from those of children without SEN. Table 1.23 shows that 6 percent of SEN children were working towards level 1 and 24 percent were at level 1, whereas just under 11 percent were at level 3. Children with SEN tended to be younger than other children also (by an average of one month). Overall, significantly more Summer born (young for their year) than Autumn born children (old for their year) were identified as having a SEN (34% compared with 21%). This suggests that primary schools may not be very good at taking into account a child's age in identifying SEN (perhaps because age standardised tests are little used by primary teachers in Key Stage 1). The Early Years Transition and Special Educational Needs Project (EYTSEN) provides a more detailed analysis of EPPE children 'at risk' of SEN and those identified as having needs (see EYTSEN Technical Papers 1-3).

**Table 1.23: Highest attainment Level for children having a SEN during Key Stage 1**
**i) Reading**

| Level Achieved | Children identified with SEN | | Children not identified with SEN | |
|---|---|---|---|---|
| | N | % | N | % |
| w* | 66 | 6.0 | 0 | 0 |
| 1 | 268 | 24.3 | 27 | 1.8 |
| 2c | 228 | 20.7 | 88 | 6.0 |
| 2b# | 218 | 19.8 | 283 | 19.1 |
| 2a | 203 | 18.4 | 445 | 30.1 |
| 3 | 119 | 10.8 | 635 | 43.0 |
| Total | 1102 | 100.0 | 1478 | 100.0 |

| Age At SATS assessment In months | N | Mean | SD | N | Mean | SD |
|---|---|---|---|---|---|---|
| | 1147 | 85.50 | 3.43 | 1531 | 86.51 | 3.45 |
| Decimalised reading score | 1102 | 1.95 | 0.84 | 1478 | 2.72 | 0.45 |

***** working towards level 1
# Nationally expected level of achievement at Key Stage 1

**ii) Mathematics**

| Level Achieved | Children identified with SEN | | | Children not identified with SEN | | |
|---|---|---|---|---|---|---|
| | N | % | | N | % | |
| w* | 59 | 5.5 | | 3 | 0.2 | |
| 1 | 124 | 11.5 | | 15 | 1.0 | |
| 2c | 289 | 26.8 | | 109 | 7.5 | |
| 2b# | 265 | 24.6 | | 306 | 21.0 | |
| 2a | 207 | 19.2 | | 418 | 28.7 | |
| 3 | 133 | 12.3 | | 605 | 41.6 | |
| Total | 1077 | 100.0 | | 1456 | 100.0 | |
| Age At SATS assessment in months | N | Mean | SD | N | Mean | SD |
| | 1147 | 85.50 | 3.43 | 1531 | 86.51 | 3.45 |
| Decimalised mathematics score | 1077 | 2.13 | 0.75 | 1478 | 2.69 | 0.42 |

***** working towards level 1

# Nationally expected level of achievement at Key Stage 1

The next two sections examine the net influence of different child, family and home environment characteristics in contextualised multilevel statistical models, which identify and separate their influence simultaneously. Section 2 focuses on attainment in reading and mathematics and Section 3 provides details for the four social/behavioural measures.

## Section 2: Children's Cognitive Attainments in National Assessments at the end of Year 2 in Primary School: Results from Contextualised Multilevel Analyses

Relationships between child, family and home environment characteristics and children's national assessment results, at the end of Year 2, were explored using contextualised multilevel models. Background details about children's early childcare experiences during the pre-school period, health, family and home learning environment were obtained from parental interviews conducted when children entered the EPPE study.

This section investigates whether the associations between cognitive attainments and various child, family and home environment factors evident at primary school entry and in Year 1 remain significant when children reach the end of Key Stage 1. The extent of differences in national assessment results attributable to a child's background is of interest, given the equity implications for later progress at school, and the challenges facing early years teachers in seeking to meet the needs of young children from a range of backgrounds and with different levels of prior attainment, learning dispositions and social/behavioural profiles. Taken together with results at younger ages, the findings can show whether background influences reduce or increase, and thus, how far school and pre-school experiences can help to reduce inequity and thus promote social inclusion.

Multilevel models provide a method of exploring the extent of variation in children's cognitive attainments (and progress) that can be attributed to differences between individual children and group attributes such as the institution they attend. The contextualised analyses reported here shows variation in children's attainments in Year 2 national assessments in terms of the extent of net differences related to particular child, family and home environment characteristics, while taking into account any clustering related to the primary school attended. Section 3 reports equivalent analyses for social behaviour.

The analyses used outcomes measures based on decimalised levels of national assessment results in reading and mathematics, because the Key Stage 1 levels on their own are not finely differentiated. Appendix 3 describes these measures in further detail; essentially information about highest national assessment level obtained was combined with test scores within each level to provide a more detailed measure of differences in attainment. In contrast to the NFER-Nelson standardised reading and mathematics assessments administered to the sample at the end of Year 1, national assessments are not age standardised and the materials used vary each year. Because the EPPE sample covered four age cohorts national assessment data were collected for EPPE children in the years 2000 to 2003. The two largest cohorts were assessed in 2001 and 2002. Additional analyses were conducted to explore whether there were any differences related to year of assessment as well as child age.

Table 2.1 shows the null models (i.e. with no explanatory variables included) for the two cognitive outcomes. The intra-school correlation measures the extent to which the scores of children in the same primary school resemble each other as compared with those from children at different schools. The intra-school correlations for mathematics and reading indicate that approximately 12 to 15 percent of the variation in children's scores is related to differences between schools, while the majority reflects differences between individual children. These proportions are in line with those identified in standardised assessments conducted at the end of year 1 and in previous studies of primary school aged children. It should be noted that the results do not take account of the impact of differences in pupil intake characteristics.

**Table 2.1: Null model showing primary school and child level variance of Key Stage 1 decimalised scores in reading and mathematics in Year 2**

| | Decimalised reading score Estimate (se) | Decimalised mathematics score Estimate (se) |
|---|---|---|
| School level variance estimate (se) | 0.0703351 (0.01108) | 0.0555388 (0.008667) |
| Child level variance: estimate (se) | 0.4904014 (0.01471) | 0.3610994 (0.011004) |
| Intra-school correlation | 0.125 | 0.154 |
| Number of children (number of schools) | 2722 829 | 2669 814 |

The results from a contextualised analysis, where a range of explanatory variables related to child, family and home environment characteristics were added to the multilevel model to control for the influence of background characteristics, are reported in Table 2.2. As with cognitive outcomes, a large number of factors identified as potentially influential from analyses of social behaviour during the pre-school period were tested, including age, gender SES, mother's qualification level and HLE. Details of the measures identified as statically significant predictors in the models are reported in Appendix 4. The results show the proportion of total variance in Year 2 attainment at the end of Key 1 that is accounted for by such predictor measures. Overall, background factors account for around 25 percent of the total variance in reading attainment in Year 2. For maths, the proportion is similar but slightly lower at just under 21 percent. The intra-school correlations for both reading and mathematics are fairly similar, indicating that 7 to 9 percent of the variation in attainment is associated with the school attended. These figures are somewhat lower than those found in Year 1.

**Table 2.2: Contextualised models of reading and mathematics attainment at the end of Key Stage 1 in Year 2 showing primary school and child level variance**

| | Decimalised reading score Estimate (se) | Decimalised mathematics score Estimate (se) |
|---|---|---|
| School level variance: estimate (se) | 0.3896633 (0.012158) | 0.298930 (0.00938) |
| Child level variance: estimate (se) | 0.0289115 (0.007237) | 0.027776 (0.00059) |
| Intra-school correlation | 0.0675 | 0.0850 |
| % Reduction in school level variance | 58.90 | 48.06 |
| % Reduction in child level variance | 20.54 | 17.26 |
| % Reduction in total variance | 25.35 | 20.76 |
| Number of children N of schools over 770 | 2531 | 2498 |

There were no statistical differences related to the year the national assessments were conducted for reading, after control for background influences. For mathematics, however, the results suggest an improving trend. This can be interpreted either as indicating that the national assessments were relatively easier in 2002 and 2003 than in 2000, or that there was real improvement in children's attainments possibly related to the impact of the National Numeracy Strategy in primary schools during this period. The latter interpretation seems more likely, given reports by other researchers using comparisons with different tests, which suggest somewhat greater improvements in mathematics and writing than in reading attainment during this time

period (see discussion by Tymms, 2003). The National Literacy Strategy was introduced a year earlier than the National Numeracy Strategy and its impact may have been felt before 2002/2003 (the most rapid improvements in attainment levels at Key Stage 2 being recorded between 1997 and 2000/2001). Recent international comparisons in 2001 on older pupils also point to significant improvements in the attainments of 11 year old primary pupils in literacy (Progress in International Reading Literacy Study [PIRLS], Mullis et al., 2003). The Effect Size for mathematics results for 2002 compared with 2000 was 0.204, after control for background (the results in 2003 were also higher but the small size of the cohort in this case means the differences between 2003 and 2002 though positive were not statistically significant).

The proportion of variance at the child level accounted for by child, family and home factors, is similar for reading and mathematics, at around 17 to 21 percent, being slightly higher for reading (see Table 2.2). Whilst this represents a significant proportion, it is clear that the majority of the variation in individual children's attainment at the end of Key Stage 1 is not attributable to factors such as gender, ethnicity, language background, socio-economic status and age. Far more of the school level variance is accounted for by children's background characteristics, reflecting the importance of intake differences between schools.[14]

The impact of child, family and home factors on attainment at the end of Key Stage 1 (Year 2) in primary school entry can be compared to the impact of these same factors on attainment at earlier time points during the pre-school period (see EPPE Technical Paper 8a for details). In terms of entry to primary school measures (age rising 5 years), it was found that, taken together, around 33 to 46 percent of the variance in attainment was accounted for by child, family and home environment characteristics. Such factors accounted for more of the variance in language scores (46 percent) than in early number concepts (33 percent) or pre-reading skills (37 percent). The present findings reveal that there is a reduction in the importance of such background factors taken together as predictors of children's reading and mathematics results at the end of Key Stage 1 compared with entry to primary school. It is hypothesised that both pre-school and primary school influences (possibly related to the impact of the national curriculum, national assessment, and the impact of OfSTED inspections, combined with the National Literacy and National Numeracy strategies) may have a part to play in the reduction of the overall importance of background influences. During the time period that the EPPE children were in KS1, there has been a marked increase in national assessment results in reading and mathematics in England, and recent international comparisons (PIRLS, Mullis et al., 2003) likewise indicate an improving trend at age 11 years. These results support the view that, taken together, the relative importance of background characteristics reduces as children move through school. This finding is in line with previous primary school studies, which have analysed attainment over several successive years (see Mortimore et al., 1988).

The net influence of different child, family and home environment factors is summarised below. Appendix 4 gives full details of the multilevel estimates for each factor tested, their significance, and reports Effect Sizes (ES).

## Child Measures

It is important to note that national assessments are not age standardised. It is clear that children who are relatively young for their age group (age 81 to 83 months) at assessment obtain significantly poorer results than children who are relatively old for their year group (age 89 to 91 months). For example, only 18.0 percent of the youngest pupils gained a level 3 in mathematics, whereas 38.7 percent of the oldest pupils achieved a level 3. By contrast, 21.1 per cent of the youngest pupils were classified as level 2c for mathematics, but only 11 percent of the older group. The association with a child's age in months in Year 2 was slightly stronger for maths than for reading ($r = 0.14$ for reading and $r = 0.19$ for mathematics). This is in line with findings at entry to primary school. It should be noted that the correlations between a child's age and

[14] These results are in line with those reported in other research, on school differences in pupils' reading and mathematics attainments, which indicates the importance of intake differences in accounting for variance at the school level.

attainment at entry to primary school were somewhat stronger (r = 0.26 for Pre-reading and r = 0.33 for Early number concepts) than those found at the end of Year 2. In terms of Effect Sizes (ES) the age effect was still moderately strong in Year 2 at 0.47 for mathematics and 0.38 for reading. The absence of age standardisation in national assessments (whether teacher based or on tests) is likely to be disadvantageous to children who are 'young' for their school year. As reported in Section 1, a significant proportion of children identified by teachers as having SEN during Key Stage 1 were 'young' for their school year (Summer born), while relatively few were 'old' (Autumn born). The findings suggest that schools should use age standardised assessments as part of the process of SEN identification, and that the date of birth of pupils added to SEN registers should be examined to avoid unintended age bias.

Gender differences in attainment in favour of girls, were identified for reading but not for mathematics. This is a change from year 1 and entry to pre-school where there were small but significant differences in favour of girls. These differences, though significant for reading, were only moderate in size (ES 0.24).

Children with low birth weight[15] showed significantly lower attainments at the end of Year 2. For reading, differences were only statistically significant for the very low birth weight group, but the effect size was large (ES 0.72). For mathematics, significant differences were found for both the very low and the low birth weight group (ES 0.42 and 0.24 respectively). This is in line with findings during the pre-school period and Year 1.

As a group, children from larger families (with 3 or more siblings) showed significantly lower scores for reading (ES 0.25), the difference being similar to the gender gap. However, differences were not statistically significant for mathematics.

Children with English as an additional language (EAL) attained significantly lower scores on the mathematics assessment (ES 0.20), but the differences for reading just verge on statistical significance ($p<0.07$), when other factors, including ethnic group and social disadvantage are controlled. For ethnicity, the relationships (in comparison to the white UK group) indicated that reading attainment for only one group, White European was significantly lower than that of white UK children. However, ethnicity was not significant for mathematics results at the end of Year 2.

It should be stressed that the ethnic and language differences reported are net of the influences of all other factors included in the model, including SES and mother's qualification in which there are also significant differences between ethnic groups.

### Family Measures

The free school meals (FSM) measure of low income showed a significant negative relationship with attainment in both reading and mathematics. The ES are moderate (ES 0.28 reading, 0.27 mathematics) and smaller than those found for either mother's highest qualification level or family SES.

Mother's education, as measured by highest level of qualification, continued to show a consistent pattern of strong and positive effects. The effect sizes are slightly larger for reading than mathematics. The categories, degree and higher degree, showed the strongest positive impact (compared with the group, no qualifications). For example, the group of children whose mothers had a degree had an ES score of 0.56 for reading, and 0.47 for mathematics compared with the group whose mothers had no qualifications. In addition, academic qualifications at age 18 and other professional qualifications also showed a significant positive impact. Mother's qualification level showed a stronger link than the equivalent qualification measure for fathers.

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

In terms of parents' social class (family SES), compared with professional occupations (Class I), all other categories were associated with lower attainment levels. The differences in attainment were largest between the semi/unskilled manual groups and those in the professional non-manual category, and were somewhat stronger for reading than mathematics. For example, the ES was 0.62 between pupils whose parents were in the professional non-manual I group and those in the semi/unskilled manual IV group for reading attainment at the end of Key Stage 1 .

Overall children whose parents' highest SES is non-manual (professional) and other non-manual (managerial) have significantly higher attainment levels than other groups. This is a consistent finding which mirrors those found at younger ages. Taken together, the results at Key Stage 1 demonstrate the continued importance of factors such as family SES and mother's qualification levels, as important influences on young children's attainments in reading and mathematics.

## Home Environment Measures

A number of measures collected at entry to the study from parent interviews provide an indication of aspects of the Home Learning Environment (HLE) during the pre-school period. These are based on the frequency of engagement in specific activities involving the child, as reported by parents when children were recruited to the study. During the pre-school period different aspects of the HLE were found to be significant predictors of cognitive attainment at age 3 years and at entry to primary school. The results of multilevel analyses of attainment at the end of Year 1, also showed that specific measures continued to have an impact on subsequent outcomes, net of the influence of other factors. For Key Stage 1 attainment the frequency with which parents had reported that the child was taught the alphabet during the pre-school period, compared with the never category showed a positive relationship with later attainment in reading and mathematics (ES 0.38 for reading and 0.27 for mathematics of frequent mention versus none reported). Likewise, those whose parents reported that their child visited the library regularly during the pre-school period showed higher subsequent attainment in reading and mathematics in Year 2. Children whose parents reported frequently teaching their child songs/poems/nursery rhymes also showed better mathematics attainment.

When the overall Home Learning Environment (HLE) index was tested (rather than individual measures) in the models it was found to have a stronger net impact than either the mother's qualification levels or family SES. This supports earlier conclusions from the pre-school period about the importance of the HLE and indicates that the impact of such parental engagement is sustained over several years. Table 2.3 illustrates the net impact of HLE after control for the impact of other significant child and family measures. It is clear that each decrease in the quality of the HLE is related to relatively lower attainment in Year 2. For reading the ES for lowest versus highest quality group on the HLE index is 0.79, and for mathematics 0.61.[16] It may be that those who have parents who are more involved in home learning in the pre-school years are also more involved with their child's learning during Key Stage 1 and that this helps to account for the continued strong effect sizes on later attainment. Alternatively, such early engagement may have fostered their child's interest in learning and helped them make the most of their pre-school and school experiences.

[16] These are similar in size to those found at entry to primary school and in Year 1.

**Table 2.3: Net impact of differences in home learning environment on Key Stage 1 attainment, after control for child and family background factors**

| HLE Index Versus highest score 33-45 | Decimalised reading | | | Decimalised mathematics | | |
|---|---|---|---|---|---|---|
| | Estimate | se | ES | Estimate | se | ES |
| **0-13** | -0.48960* | 0.0628 | 0.785 | -0.33529 | 0.0549 | 0.611 |
| **14-19** | -0.25956 | 0.0494 | 0.416 | -0.18063 | 0.0432 | 0.329 |
| **20-24** | -0.19968 | 0.0473 | 0.320 | -0.13812 | 0.0418 | 0.252 |
| **25-32** | -0.13044 | 0.0441 | 0.209 | -0.10732 | 0.0389 | 0.196 |

## Other Measures

Parents were asked, in the interviews at entry to the study, if their child had any developmental problems. As a group, children whose parents reported them as having no developmental problems at entry to the study, showed much higher attainment in reading and mathematics when followed up in Year 1 and again in Year 2. Children whose parents reported two or more developmental problems showed lower attainment (ES 0.54 for reading and 0.57 for mathematics). These results suggest that obtaining parents' views of whether their child has experienced any delay or specific problem could be a valuable source of information to schools when children first enter reception classes.

## Summary of Background Influences on Key Stage 1 Attainment

The contextualised multilevel models tested the net impact of different child, parent and home learning environment measures while controlling for all other measures simultaneously and thus provides rigorous and conservative estimates of statistical significance for specific background characteristics. It does not imply that measures are not of educational or policy importance if they are not statistical predictors after control for other, related measures. For example, family SES is related to mother's educational qualification level and income and to other aspects such as birthweight. Likewise, measures of the home learning environment are inter-related. The contextualised model shows which set of measures, taken together, provides the best set of predictors of children's attainment and which measures show a specific impact over and above other influences. It thus helps to tease out the strongest predictors.

The contextualised analyses show the strength of background influences on young children's Key Stage 1 attainments at the end of Year 2, age 7 years plus. They illustrate that a range of child, parent and home environment factors continue to have a significant relationship with better cognitive outcomes. The findings generally follow the patterns identified earlier at entry to pre-school, entry to primary school and in Year 1. Nonetheless, the models reveal that, taken together, background characteristics are less strongly associated with reading and mathematics attainment in Year 2 (in terms of percentage of variance accounted for) than they were with measures of general cognitive ability, pre-reading, language and early number concepts at entry to primary school. This is likely to reflect the impact of other influences such as attending school for a significant proportion of their waking lives, as well as variations between individual schools in their effectiveness, and also the growing influence of peer group.

## The Impact of Pre-school on Key Stage 1 Attainment

The contextual analyses reported above demonstrate that child, family and home learning environment characteristics continue to show significant relationships with cognitive attainment at the end of Year 2, although taken together relationships overall were somewhat weaker than those evident at earlier time points during the pre-school period. It is necessary to take account of such influences before attempting to identify the impact of other factors such as any continuing pre-school effect. An important feature of EPPE's findings for the pre-school period relate to the positive impact of the pre-school centre experience on children's cognitive attainment and social/behavioural development at reception entry, and, for the pre-school sample also on progress and developmental gains during the pre-school period up to school entry.

Two forms of multilevel analysis were used to explore pre-school influences at the point children started primary school (see EPPE Technical papers 8a and 8b).

1. Comparisons were made between children who had attended different types of pre-school and a 'home' group at entry to primary school. Contextual models, controlling for the important influences of child, family and home environment characteristics, were used to establish whether duration of time in the target pre-school setting (compared with none, for the 'home' group) showed a significant impact over and above the influence of background. Similarly, each type of pre -school was compared with the 'home' group. The results indicated that the 'home' group were at a significant disadvantage in cognitive attainment and social behaviour. Differences were especially marked for language, pre-reading, early number, Peer sociability, and Independence and Concentration.

2. Value-added analyses of progress and developmental gains were also conducted for children in the 141 pre-school centre sample (excluding the 'home' group). These analyses showed that there were significant differences in *effectiveness* between individual centres (residual estimates at the pre-school centre level provide indicators of effectiveness based on whether children had made more or less cognitive progress or social/behavioural gains over the pre-school period). In addition, the analyses revealed that while more effective centres were found in all types of provision, as a whole some types showed better child outcomes. The value added analyses also showed that measures of centre quality (measured by the ECERS and Child Interaction Scale [CIS] observation instruments) showed a significant positive impact on child outcomes measured at entry to primary school.

Given the consistency and strength of findings that pre-school experience gave children a better start to school, an important aim of the Year 2 analyses is to establish whether there is evidence of any continuing pre-school influence at the end of Key Stage 1, or whether the advantages of pre-school mainly influence children's readiness for school at reception entry. Three aspects are considered, quality, duration and effectiveness of pre-school centre provision.

### Duration and quality

Contextualised analyses were used to see whether, controlling for child, family and home learning environment factors, children who had attended a pre-school showed significantly better attainments in reading and mathematics at the end of Year 2 (age 7 years plus).

Results indicated that attending a pre-school centre compared with none (the 'home' group) remained associated with significantly better attainment levels, net of child, family and home environment differences. Table 2.4 shows the net impact of attending any pre-school centre versus none (the 'home' group), after control for child background factors. The results indicate that the pre-school group continue to show a significant advantage and that the effect size is larger for reading in Year 2 (ES 0.29). The difference is slightly larger than the gender gap in Year 2 for reading reported earlier. It is of interest that the pre-school impact on reading in Year 2 is slightly stronger than that found in Year 1, whereas for mathematics the reverse is the case.

It may be that curriculum priorities have an influence here; more emphasis may be given to reading in reception and Year 1, whereas mathematics may receive more attention in Year 2. Of course, the tests used in the two years also varied. In Year 1, finely differentiated standardised NFER tests were employed, while in Year 2 it was necessary to combine national assessment level and test score data to create decimalised scores.

In addition to a significant impact of pre-school versus none, it was found that each type of pre-school attended showed positive results in comparison with the 'home' group for both mathematics and reading, although differences did not always reach statistical significance.[17]

**Table 2.4: Key Stage 1 Attainments of EPPE Sample at end of Year 2 by whether attended a pre-school centre or not after control for child, family and home environment factors[18]**

| Compared with none i.e. the 'home' group | Decimalised reading score | | | Decimalised mathematics score | | |
|---|---|---|---|---|---|---|
| | Estimate | (se) | ES | Estimate | (se) | ES |
| Attended pre-school centre | **0.1785 | (0.056) | 0.286 | *0.1094 | (0.050) | 0.200 |

Where ES = Effect Size, n of pupils =2513 reading, n=2470 mathematics, ** p<0.001, * p<0.05

Further analyses were conducted to explore the impact of pre-school. The duration (in months) of time a child attended the target pre-school centre was found to be important at entry to primary school. It was also found to show a significant positive impact at the end of Year 2, as figures in Table 2.5 illustrate. It should be noted that these analyses control for differences in child, family and home environment factors found to be significant in the contextualised analyses described above. The estimates thus, represent the impact of duration 'net' of other influences. Because of this it is possible to make approximate comparisons of the relative continued influence of pre-school with the size of specific background factors. At the end of Key Stage 1 the impact of time in pre-school shows the strongest relationship with reading attainment at age 7 years plus, compared with none (the 'home' group). Lack of pre-school compared with three years (ES 0.36) shows a stronger impact than that associated with the low income indicator (free school meals), which had an ES of 0.28, or gender (ES 0.24). For mathematics, the impact is similar in size. These results indicate that children who attended a pre-school continue to show significantly better cognitive attainment at age 7 years plus. Taking other characteristics into account the 'home' group had not yet 'caught up' with their peers who had attended pre-school.

**Table 2.5: Key Stage 1 Attainments of EPPE Sample at end of Year 2 by duration of time in pre-school, after control for child, family and home environment factors**

| Compared with none i.e. the 'home' group | Decimalised reading score | | | Decimalised mathematics score | | |
|---|---|---|---|---|---|---|
| | Estimate | (se) | ES | Estimate | (se) | ES |
| Under 12 months | *0.1773 | (0.062) | 0.285 | *0.1136 | (0.055) | 0.209 |
| 12-24 months | *0.1698 | (0.058) | 0.273 | #0.0966 | (0.052) | 0.178 |
| 24-36 months | *0.1819 | (0.061) | 0.292 | *0.1168 | (0.054) | 0.215 |
| Over 36 months | *0.2234 | (0.070) | 0.359 | *0.1547 | (0.062) | 0.285 |

Where ES = Effect Size, n of pupils =2513 reading, n=2470 mathematics, * p<0.05, #p<0.07

[17] In particular, the number of children retained in the sample who had attended integrated centres was lower than for other groups, as only 133 had valid maths scores in year 2 and 149 valid reading scores. To reach statistical significance therefore a stronger effect would be required in comparison with other types of provision.

[18] For each outcome all measures identified as significant were retained in the final model (for details see tables in Appendix 4).

Analyses at entry to reception and over the pre-school period pointed to the positive impact of higher quality pre-school provision. Analyses divided the sample into groups of children whose pre-school experience could be classified as ranging from no quality (i.e. the 'home' group approx 10% of the sample) through low (14%), medium (54%) and high quality (22%), based on centres' ECERS-E scores. The results indicated that there were statistically significant differences between the no quality ('home') and the high quality groups but these were relatively small. However, this analysis does not take into account the impact of duration of time in pre-school. Previously reported analyses during the pre-school period have shown that both quality and duration had an impact on progress during the pre-school period (i.e. in analyses excluding the 'home' group) and because of this, it is appropriate to model their joint influence.

Given that EPPE has already demonstrated the importance of both duration and quality on progress over the pre-school period and on attainment at entry to primary school, their joint effects were investigated. Further analyses were conducted to explore the impact of different combinations of quality and duration of pre-school experience on attainment at the end of Key Stage 1. The comparison group was again the 'home' sample (defined as having no duration and thus no quality of pre-school centre experience). The results are shown in Table 2.6.

**Table 2.6: Key Stage 1 Attainments of EPPE Sample at end of Year 2 by Duration and Quality of Pre-school, after control for child, family and home environment factors**

| Compared with none i.e. the 'home' group | Decimalised reading score | | | Decimalised mathematics score | | |
|---|---|---|---|---|---|---|
| | Estimate | (se) | ES | Estimate | (se) | ES |
| Low quality, under 24 months | *0.1513 | (0.079) | 0.243 | *0.0817 | (0.071) | 0.150 |
| Low quality, 24-36 months | *0.1834 | 0.074) | 0.294 | *0.1064 | (0.066) | 0.196 |
| Low quality, over-36 months | 0.1130 | (0.126) | 0.181 | *0.2264 | (0.115) | 0.417 |
| Medium quality, under 12 months | *0.1337 | (0.067) | 0.215 | 0.0832 | (0.060) | 0.153 |
| Medium quality, 12-24 months | *0.1416 | (0.061) | 0.227 | 0.0779 | (0.054) | 0.143 |
| Medium quality, 24-36 months | *0.2030 | (0.065) | 0.326 | *0.1314 | (0.057) | 0.242 |
| Medium quality, over 36 months | *0.2320 | (0.075) | 0.372 | *0.1313 | (0.066) | 0.242 |
| High quality, under 12 months | *0.2428 | (0.073) | 0.390 | *0.1489 | (0.065) | 0.274 |
| High quality, 12 - 24 months | *0.2574 | (0.069) | 0.413 | *0.1608 | (0.062) | 0.296 |
| High quality, 24 - 36 months | 0.0644 | (0.103) | 0.103 | 0.0532 | (0.094) | 0.098 |
| High quality, over 36 months | *0.3217 | (0.121) | 0.516 | *0.2201 | (0.107) | 0.405 |

Where ES = Effect Size, n of pupils =2490 reading, n=2448 mathematics, * p<0.05.

The effect sizes for duration and quality of pre-school are slightly higher for reading attainment at the end of Year 2 than for mathematics. This is a reversal of the pattern in Year 1. The results suggest that, in general, longer duration in pre-school (in months) is associated with somewhat better cognitive outcomes for each level of quality. Likewise, medium quality shows better effects than low quality for similar durations. For the relatively small category high quality and long duration, (3 years plus) the results are particularly strong (ES 0.52 for reading and 0.41 for maths). However, the results for one group, high quality 24-36 months duration, though positive do not conform to this general trend being weak and not reaching statistical significance. It should be noted that these analyses do not take account of differences in the quality of primary school experiences, although the multilevel models indicate that there is significant variance between schools. The findings confirm that 'home' children continue to show significantly poorer attainment at the end of Year 2, even when control is made for other factors.

It is of interest to establish whether duration and quality influences are also evident when the pre-school sample is considered separately, in other words excluding the 'home' group. Quality was not found to have a statistically significant separate effect on attainment outcomes in Year 1 (see EPPE Technical Paper 9) and the Year 2 analyses of cognitive outcomes, likewise did not point to a continuing quality impact on the pre-school sample after control for other factors. In contrast to the findings in Year 1, the effect of the longest duration, though positive is no longer statistically significant at the end of Year 2. These results indicate that by the end of Year 2 the main evidence of a continuing pre-school impact is in comparisons with the 'home' group, and that differences in duration/quality amongst those who attended pre-schools no longer show an impact on attainment at the end of Year 2. At younger ages (during the pre-school period) differences within the pre-school sample in terms of longer duration and higher quality had a significant positive impact on attainment levels at entry to primary school and in Year 1.

## Effectiveness of pre-school experience

The value added analysis of the cognitive progress of children who had attended a pre-school centre, controlling for their prior attainment at entry to the study and background influences, produced estimates of centre effectiveness (value added residuals which measure relative gains over the pre-school period compared to those predicted by the multilevel model). For details of these analyses for cognitive measures, see EPPE Technical Paper 8a. In order to establish whether the effectiveness of the pre-school setting attended shows any continuing impact on later attainment, further analyses were conducted on the Year 2 decimalised reading and mathematics outcomes. These analyses focus first on the pre-school sample, because the 'home' group by definition had not attended a pre-school centre. In these analyses the centre level residuals are treated as continuous variables.

Controlling for child, family and home environment influences, the results indicate that measures of centre effectiveness in promoting children's progress in Early number concepts still shows a relatively small but positive significant net impact on children's attainment in both reading and mathematics at age 7 years plus (see Table 2.7). In addition, the measure of centre effectiveness in promoting children's progress in Pre-reading up to school entry has a weak positive impact that verges on statistical significance for later reading attainment. These comparisons provide additional evidence of a pre-school effect operating at the centre level, and are more rigorous because they do not include the 'home' group.

**Table 2.7 Key Stage 1 Attainments of EPPE Pre-school Sample at end of Year 2 by Effectiveness of Pre-school centre attended, after control for child, family and home environment factors**

| Residual effectiveness estimate for pre-school centre attended | Decimalised reading score | | | Decimalised mathematics score | | |
|---|---|---|---|---|---|---|
| | Estimate | (se) | ES | Estimate | (se) | ES |
| **Early number** | ***0.05993** | **(0.021)** | **0.153** | ***0.05104** | **(0.018)** | **0.145** |
| **Language** | **0.02546** | **(0.024)** | **0.053** | **0.02220** | **(0.021)** | **0.052** |
| **Pre-reading** | **#0.01218** | **(0.007)** | **0.088** | **0.00458** | **(0.006)** | **0.037** |

Where ES = Effect Size, n of pupils =2295 reading, n=2258 mathematics, * p<0.05, # p< 0.07

For further comparison, centre effectiveness categories were used to enable the 'home' sample to be added to the analysis as a comparison group. The centre level residuals were divided into five groups ranging from most effective (significant positive centre outliers) to least effective (significant negative outlier centres). Table 2.8 summarises the overall pattern of results in terms of direction and statistical significance. In comparison with the 'home' group, those who attended pre-school settings of average to above average effectiveness generally show significantly better cognitive outcomes at the end of Year 2. However, the least effective centres on each of the three pre-school outcomes analysed do not show a significant advantage over the 'home' group for later reading attainment. It should be noted that there was greater variation between pre-school centres in their effectiveness in promoting young children's Pre-reading progress than for Early number or Language progress (see EPPE Technical Papers 8a).

**Table 2.8: Summary of Comparisons of the impact of centre effectiveness on Key Stage 1 attainment including the 'home' group for comparison**

| Residual effectiveness estimate for pre-school centre attended compared with none i.e. the home group | Year 2 Decimalised reading score | Year 2 Decimalised mathematics score |
|---|---|---|
| **Early number** | | |
| **Lowest** | Positive ns | Positive ns |
| **Below average** | **Positive sig** | **Positive** p<0.08 |
| **Average** | **Positive sig** | **Positive sig** |
| **Above average** | **Positive sig** | **Positive sig** |
| **High** | **Positive sig** | **Positive sig** |
| **Language** | | |
| **Lowest** | Positive ns | **Positive sig** |
| **Below average** | **Positive** p<0.08 | Positive ns |
| **Average** | **Positive sig** | **Positive sig** |
| **Above average** | **Positive sig** | **Positive sig** |
| **High** | Negative ns | Positive ns |

| | | |
|---|---|---|
| **Pre-reading** | | |
| **Lowest** | Positive ns | **Positive sig** |
| **Below average** | **Positive sig** | **Positive sig** |
| **Average** | **Positive sig** | **Positive sig** |
| **Above average** | **Positive sig** | **Positive sig** |
| **High** | **Positive sig** | **Positive sig** |

Where ES = Effect Size, n of pupils =2534 reading, n=2545 mathematics, sig = $p<0.05$.

These findings are broadly in line with those identified at the end of Year 1. Taken together with results already reported in this section, it appears that in all comparisons, the attainment of the 'home' group is significantly poorer than that of children who had attended a pre-school centre. It is not possible to fully separate the influence of quality, duration and effectiveness of pre-school attended in comparisons of the pre-school and 'home' sample, since pre-school is experienced as a 'package' combining these different features. However, taken together, the findings support the conclusion that these three features generally remain predictors of better cognitive attainment during Key Stage 1. Specific measures of the effectiveness of the pre-school attended continue to show a measurable and significant impact on young children's subsequent attainments at the end of Year 2 in analyses which focus just on the pre-school sample.

## Section 3: Children's Social/behavioural Development at the end of Year 2 in Primary School: Results from contextualised multilevel analyses

This section presents the results of a contextualised multilevel analysis establishing the pattern of relationships between child, family and home environment characteristics and children's social/behavioural development at the end of Year 2. The models follow the same pattern as those described in Section 2 for cognitive outcomes, linking background details about child, family and home learning environment with four factors measuring different aspects of social behaviour.

The aim is to establish whether the associations between social behaviour and various child, family and home environment factors evident at primary school entry are similar to the patterns found when children are older, at the end of Year 2 (7 years plus). As with the cognitive analyses, multilevel models are used to explore the net impact of different predictors.

Table 3.1 shows the null models (i.e. with no explanatory variables included) for the four social/behavioural outcomes. The intra-school correlation measures the extent to which the scores of children in the same primary school resemble each other, as compared with those from children at different schools. The intra-school correlations indicate that approximately 5 to 11 percent of the variation in children's scores is related to differences between primary schools, while the majority reflects differences between individual children. The results do not take account of the impact of differences in pupil intake characteristics. It can be seen that there is significant school level variation in social/behavioural outcomes at the end of Year 2, but that it is generally lower than was found for the equivalent analyses of reading and mathematics attainments. The greatest variation is for Positive social behaviour and the least for Anti-social behaviour. This is in line with findings, on the same factors based on teachers' ratings of children's social behaviour, at the end of Year 1. This suggests that primary schools vary more in their impact on Positive social behaviour that other areas of social behaviour

**Table 3.1: Null model showing primary school and child level variance in social/behavioural outcomes at the end of Year 2**

| | Self-regulation | | Positive social behaviour | | Anti-social behaviour | | Anxious behaviour | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | (se) | Estimate | (se) | Estimate | (se) | Estimate | (se) |
| School level variance: | 0.011488 | (0.0041) | 0.021945 | (0.0042) | 0.007404 | (0.0025) | 0.012028 | (0.0028) |
| Child level variance: | 0.248819 | (0.0075) | 0.194604 | (0.0059) | 0.12581 | (0.0039) | 0.13792 | (0.0042) |
| Intra-school correlation | 0.0459 | | 0.1014 | | 0.0556 | | 0.0809 | |
| Number of children | 2654 | | 2657 | | 2657 | | 26564 | |

n of schools with social/behavioural data in Year 2 = 826 or more

The results from a contextualised multilevel analysis, where explanatory variables related to child, family and home environment characteristics are added to the model to control for the influence of significant background characteristics, are reported in Table 3.2. The results show the proportion of total variance in Year 2 social/behavioural outcomes accounted for by such predictor measures. Overall, background factors account for around 16 percent of the total variance in Self-regulation in Year 2 and for slightly lower proportions for Positive social behaviour and Anti-social behaviour. For Anxious behaviour, however, background accounts for around 2 percent of total variance. It can be concluded that such factors have very little impact on this aspect of behaviour. The intra-school correlations range between 0.06 to 0.12 indicating

that there is significant variation between primary schools in pupils' social/behavioural outcomes, taking into account the influence of background factors. It is interesting that when background is controlled the variation between schools in Anti-social behaviour increases. This suggests that Anti-social behaviour may be more affected by differences between schools (for example in behaviour climate etc). Again this is in accord with findings for Year 1.

**Table 3.2: Contextualised models of Social Behaviour at the end of Year 2 showing primary school and child level variance.**

| | Self-regulation | | Positive social behaviour | | Anti-social behaviour | | Anxious behaviour | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | (se) | Estimate | (se) | Estimate | (se) | Estimate | (se) |
| School level variance: | 0.013256 | (0.0039) | 0.023861 | (0.0041) | 0.007166 | (0.0023) | 0.010806 | (0.0027) |
| Child level variance: | 0.2068109 | (0.0065) | 0.168419 | (0.0054) | 0.108615 | (0.0036) | 0.135981 | (0.0042) |
| Intra-school correlation | 0.060 | | 0.122 | | 0.062 | | 0.074 | |
| % Reduction in school level variance | No reduction, school level variance increased 15.4% | | No reduction, school level variance increased 6.8% | | 3.2 | | 10.2 | |
| % Reduction in child level variance | 16.4 | | 13.5 | | 13.7 | | 1.4 | |
| % Reduction in total variance | 15.5 | | 11.4 | | 13.1 | | 2.1 | |
| Number of children | 2496 | | 2490 | | 2435 | | 2580 | |

n of schools with social/behavioural data in Year 2, 814 or more

Whilst a significant proportion of variance is attributable to differences in background for three of the social/behavioural outcomes, taken together the predictive power of background characteristics is weaker than for cognitive outcomes. The majority of the variation in children's social behaviour in Year 2 is not attributable to the influence of factors such as age, gender, ethnicity, language or socio-economic status. Overall, background characteristics are better predictors of Self-regulation, the social/behavioural outcome, which has the strongest association with attainment in reading and mathematics.

The impact of child, family and home factors on social behaviour at the end of Year 2 in primary school can be compared to the impact of these factors on similar measures of social behaviour collected at entry to primary school, thus allowing comparisons across Key Stage 1 (see EPPE Technical Paper 8b for details). At entry to primary school, the social/behavioural factors identified were slightly different than in Year 2. In terms of the entry to primary school measures, it was found that background accounted for slightly more of the variance in Independence & Concentration (16.3 percent) than other measures at primary school entry. Self-regulation is the most similar social/behavioural dimension for Year 2 and background factors taken together accounted for a similar proportion of the total variance in children's scores on this dimension (15.5 percent). For Peer Sociability background accounted for only 7.1 percent of the variance at entry to primary school. This is somewhat lower than the Year 2 figure for Positive social behaviour (11.4 percent). The same pattern is evident for Anti-social behaviour. At primary school entry, background factors taken together accounted for 7.4 percent of total variance in this measure, but in Year 2 the figure increased to 13.1 percent. Overall, these findings tend to suggest that background influences may increase over Key Stage 1 for some aspects of social behaviour, in contrast to the findings for reading and mathematics; where taken together, the impact of background factors reduces quite markedly over time. These Year 2 results are broadly in line with those identified at the end of Year 1.

The net influence of different child, family and home environment factors on the four social/behavioural factors is summarised below. Appendix 5 gives details of the multilevel estimates and ES for each factor tested.

## Child Measures

The impact of a child's age in months was statistically significant in Year 2, for several social/behavioural measures with older children showing significantly better behaviour. The association with age was strongest for Self-regulation (r = 0.12) and positive, but weakly negative for Anxious behaviour (r =-0.05). These correlations are a little weaker than those found between age and attainment at the end of Year 1. Age had showed similar levels of association with aspects of social behaviour at entry to primary school (r = 0.10) being strongest for the factor Cooperation and Conformity. In the contextualised multilevel results the ES for age was 0.30 for Self-regulation, 0.09 for Anxious behaviour and 0.10 for Positive social behaviour. The Year 2 results for age are in line with those found for Year 1.

Girls showed significantly better behaviour in terms of teachers' ratings for Self-regulation at the end of Year 2 (ES 0.40). This aspect of behaviour is strongly associated with higher attainment (correlations of r = 0.57 for decimalised reading score and r = 0.53 for decimalised mathematics score in Year 2). This behaviour difference may help to account for the gender gap in reading achievement. Girls also showed significantly higher scores in terms of Positive social behaviour (ES 0.56). In addition, there was a strong gender effect on Anti-social behaviour with girls showing more positive outcomes (i.e. lower teacher ratings for this dimension) in this aspect (ES 0.46).

Children with very low and those with low birth weight showed poorer scores on Self-regulation (ES 0.34 and 0.22 respectively). Very low birth weight children also scored less well on Positive social behaviour (ES 0.39), but differences did not reach statistical significance for the low birth weight group. There were indications, which verged on statistical significance ($p<0.063$), that very low birth weight was related to increased incidence of Anti-social Behaviour at the end of Year 2. However, birth weight was not significant for Anxious behaviour in the multilevel analysis.

As a group, children from smaller families (with 1-2 siblings) showed significantly better scores for the dimension Positive social behaviour than singletons (there were no significant differences between singletons and children with 3 plus siblings).

There were no significant ethnic or language differences in teachers' ratings of social behaviour, in contrast to findings at younger ages.

## Family Measures

The free school meals (FSM) measure of low income showed a significant negative relationship with Self-regulation (ES 0.20) and Positive social behaviour (ES 0.21). It was, by contrast, associated with increased scores on the Anti-social measure (ES 0.23).[19]

Mother's education, as measured by highest level of qualification, showed a positive effect for Self-regulation. The category degree (ES 0.31) showed a significant impact (compared with the group no qualifications). A small group whose mothers had 'other professional' qualifications showed a particularly positive relationship with self-regulation (ES 0.56). Mother's qualification level showed stronger links with behaviour than the equivalent qualification measure for fathers. Mothers' highest qualification level showed a weak negative relationship with increased Anti-social behaviour (children whose mothers had a degree showing reduced Anti-social scores ES 0.19).

[19] It also showed a relationship with increased Anxious behaviour but this was removed when mother's employment status was included in the model.

Parents' highest social class of occupation (family SES) showed associations with social behaviour at the end of Year 2. Compared with professional occupations (Class I), those from lower SES groups showed significantly lower scores for Self-regulation (the ES for the semi skilled and unskilled manual groups were 0.48 and 0.38 respectively). Those children whose parents had never worked also had lower scores for Self-regulation. They had higher scores for Anti-social behaviour (ES 0.55) as well. Children whose mothers had worked full-time during the pre-school period were found to have relatively increased Anti-social behaviour scores than those whose mothers never worked by the end of Year 2 (ES 0.24). However, there were no differences for those whose mothers worked part time or were self-employed. Children whose mothers had worked full-time, however, showed less Anxious behaviour at the end of Year 2 (ES 0.24).

There were some indications that children whose parents were married and living with their spouse showed less Anti-social behaviour, though the results only verged on the significant ($p<0.065$, ES 0.14).

## Home Environment Measures

Several measures related to the home learning environment showed significant effects for social behaviour at the end of Year 2, in line with findings for the pre-school period. For example, the frequency with which parents reported visiting the library was related to better scores on Self-regulation. Teachings songs and nursery rhymes, and reading to the child were both associated with Positive social behaviour. Reading to the child more frequently, was also linked with Positive social behaviour and reduced Anti-social behaviour.

Although including individual items related to home learning improved model fit, the HLE index provides a useful summary measure of the quality of the home learning environment when children were younger. It continued to show a positive relationship with social behaviour in Year 2, after control for other child and family factors and table 3.3 illustrates the net impact. It can be seen that the ES for low quality home learning and Self-regulation (the social/behavioural factor most closely associated with cognitive attainment) is particularly strong (ES 0.46 for the lowest versus the highest scores on HLE), although there are significant ES for HLE and both Positive social behaviour and Anti-social behaviour also. A higher quality home learning environment in the pre-school is associated with better behavioural outcomes at the end of Key Stage 1.

**Table 3.3: Net impact of differences in home learning environment on Key Stage 1 social behaviour at end of Year 2, after control for child and family background factors**

| HLE Index Versus highest score 33-45 | Self-regulation | | | Positive social behaviour | | | Anti-social behaviour | | |
|---|---|---|---|---|---|---|---|---|---|
| | Estimate | se | ES | Estimate | se | ES | Estimate | se | ES |
| **0-13** | **-0.209 | 0.045 | 0.462 | **-0.113 | 0.042 | 0.275 | #0.059 | 0.033 | 0.179 |
| **14-19** | **-0.169 | 0.036 | 0.374 | *-0.083 | 0.033 | 0.202 | *0.069 | 0.026 | 0.209 |
| **20-24** | **-0.141 | 0.034 | 0.312 | *-0.078 | 0.032 | 0.190 | 0.036 | 0.025 | 0.109 |
| **25-32** | *-0.074 | 0.032 | 0.164 | -0.025 | 0.030 | 0.061 | 0.028 | 0.050 | 0.085 |

**p<0.001, * p<0.05, # p<0.08

These results indicate that greater reported involvement in activities with the child that are indicative of a better home learning environment, has positive effects on later social behaviour as well as on cognitive attainment that are independent of other influences, including family SES and mother's qualification levels.

### Other Measures

Parents were asked in the interviews at entry to the study if their child had any developmental problems or behaviour problems. In general those children whose parents reported them as having no developmental problems in the early years, were later rated significantly more favourably for Self-regulation than other children by KS1 teachers (ES 0.38 compared with children with 2 plus problems reported). Likewise, children whose parents had reported that their child had some form of behaviour problem(s) in the early years showed less favourable scores for Self-regulation at the end of Year 2 (ES 0.34 for a behavioural problem compared to none reported). Those children, whose parents had reported an earlier behaviour problem(s) scored less highly in terms of Positive social behaviour and, in particular, had increased teacher ratings for Anti-social behaviour (ES 0.45). They also tended to have higher scores for Anxious behaviour (ES 0.20). This suggests that parent concerns may prove helpful in identifying young children's needs when they first start pre-school (parents' report of early developmental and behavioural problems related to the first 3 years of life).

### Summary of Background Influences

The contextualised models tested the net impact of different child, parent and home learning environment measures for social behaviour, following the same strategy used to analyse cognitive attainments. The contextualised models show which set of measures, taken together, provide the best predictors of four dimensions of children's social behaviour at the end of Year 2.

The results are similar to results from analyses at earlier time points in children's development (during the pre-school period and in Year 1) and indicate that a range of child, parent and home environment factors continue to show a significant relationship with different aspects of social behaviour. Self-regulation shows the strongest links with background factors and cognitive attainment. Overall, Anxious behaviour is very poorly predicted by background in contrast to other aspects of social behaviour.

## The Impact of Pre-school

### Duration and quality

Contextualised analyses were used to see whether, controlling for child, family and home learning environment factors, children who had attended a pre-school showed significantly better social behaviour at age 7 years plus.

Results indicated that attending a pre-school centre compared with none (the 'home' group) was not significantly associated with better social behaviour in Year 2, net of child, family and home environment differences. This is a change on findings at entry to primary school and in comparison with results at the end of Year 1. It is also different from the pattern of findings for the cognitive measures of reading and mathematics attainment in Year 2. This may be because social behaviour varies more as children grow older. At primary school, the peer group and school and classroom climate may be more influential in shaping a child's current behaviour in school than earlier pre-school attended. In interpreting these findings, it should be noted that by the end of Year 2 children had spent between 2 to 3 years in full-time attendance at primary school depending on when they entered reception classes. This is considerably longer than the average time spent in a pre-school setting (mean duration of time in a target pre-school centre was approximately 22 months usually on a part-time basis).

Table 3.4 shows the net impact of attending any pre-school centre versus none (the 'home' group), after control for background factors. The results indicate that the pre-school group continue to show a slight advantage for Positive social behaviour but this is weak (ES 0.11) and not statistically significant.

There were no significant differences in Self-regulation or Anxious behaviour by type of pre-school attended in comparison with the 'home' group in Year 2, in contrast to findings in Year 1 and at primary school entry. For Positive social behaviour as a group only playgroups showed a

statistically significant difference compared with no provision (ES 0.41). Local authority day nurseries (0.22) and integrated centres (ES 0.27) were associated with an increase in scores on the Anti-social behaviour in comparison with no provision (this is likely to be related to the impact of longer duration of pre-school associated with these forms of provider).

**Table 3.4: Social/behavioural outcomes of the EPPE Sample at the end of Year 2 by whether children attended a pre-school centre after control for child, family and home environment factors**

| Compared with none i.e. the 'home' group | Self-regulation | Positive social behaviour | Anti-social behaviour | Anxious behaviour |
|---|---|---|---|---|
| | Estimate (se) ES | Estimate (se) ES | Estimate (se) ES | Estimate (se) ES |
| **Attended pre-school centre** | 0.0043 (0.039) 0.01 | 0.0457 (0.038) 0.113 | 0.0353 (0.029) 0.107 | -0.002 (0.030) 0.005 |

Where ES = Effect Size, n of pupils =2450 Self-regulation, n=2452 Positive social behaviour, n=2435 Anti-social behaviour, n=2527 Anxious behaviour.

Further multilevel analyses were conducted to explore the impact of duration (in months) of time a child attended pre-school. These analyses included the 'home' sample for comparison; they formed the no duration group. These analyses controlled for differences in child, family and home environment factors found to be significant in the contextualised analyses described earlier in this section. The results, shown in Table 3.5, indicate, in contrast to findings for Year 1 where the no duration ('home') group showed poorer outcomes for Self-regulation, Positive social behaviour and Anxious behaviour, no statistically significant differences for these three dimensions. The only significant 'dose' related finding for Year 2 was for Anti-social behaviour. Children who were early starters (more than three years in target pre-school) showed increased scores for this measure (ES 0.25). This is in line with findings at entry to primary school and in Year 1. Other children who had attended pre-school for three years or less did not show significantly different behaviour for the Anti-social measure than the 'home' group.

**Table 3.5: Social/behavioural outcomes of EPPE Sample at end of Year 2 by Duration of Pre-school**

| Compared with none i.e. the 'home' group | Self-regulation | Positive social behaviour | Anti-social behaviour<br>Estimate (se) ES | Anxious behaviour |
|---|---|---|---|---|
| **Under 12 months** | Positive ns | Positive ns | 0.0278 (0.032) 0.084 | Positive ns |
| **12-24 months** | Positive ns | Positive ns | 0.0521 (0.03) 0.158 | Positive ns |
| **24-36 months** | Positive ns | Positive ns | 0.0291 (0.031) 0.088 | Negative ns |
| **Over 36 months** | Positive ns | Negative ns | *0.0829 (0.037) 0.251 | Negative ns |

Where ES = Effect Size, n of pupils =2435 self-regulation, n=2440 Positive social behaviour, n=2442 Anti-social behaviour, n=2515 Anxious behaviour, * p<0.05

Further analyses were conducted to explore the Anti-social measure in more detail because it was the one outcome where there were indications of potential poor outcomes for some children.

Due to the skewed nature of the Anti-social rating scale, it is important to establish to what extent the raised scores indicate poor behaviour in terms of the items included in the scale and proportions of children involved. The cut-off chosen was a mean score of 2.1 or above (where 2

indicates that a behaviour is perceived by the teacher as somewhat true for a child, and 3 indicates the behaviour is perceived as certainly true on the items in the scale). In all, 5.7 percent of children were categorised in this cut-off group. For early starters (under 2 years) the results indicated that 7.1 percent had raised scores in terms of this cut-off. For home children the figure was 6.8 percent. Early starters were more likely to show raised scores in the middle of the range, indicating that teachers thought they 'sometimes' showed behaviours included in the scale (mean score 1.5 to 2.0) than at the extremes, and this is likely to account for the negative associations identified in the multilevel analysis.

Analyses at entry to primary school and over the pre-school period pointed to the positive impact of higher quality pre-school provision for both cognitive and social/behavioural outcomes. Analyses of social/behavioural outcomes in Year 1 also suggested a continuing positive impact for higher quality. For the analyses the sample was divided into groups of children whose pre-school experience could be classified as ranging from no experience of pre-school centre quality (i.e. the 'home' group approx 10% of the sample), through low (14%), medium (54%) and high quality (22%), based on centres' ECERS-E scores. The results indicated that there were no statistically significant differences between the 'home' group and the high quality groups for any of the four social/behavioural outcomes at the end of Year 2, as summarised in Table 3.6.

**Table 3.6: Social/behavioural outcomes of the EPPE Sample at the end of Year 2 by Quality of Pre-school**

| Compared with high quality group | Self-regulation | Positive social behaviour | Anti-social behaviour | Anxious behaviour |
|---|---|---|---|---|
| **No quality i.e. 'home' group** | Negative ns | Negative ns | Negative ns | Positive ns |
| **Low quality** | Negative ns | Positive ns | Positive ns | Positive ns |
| **Medium quality** | Negative ns | Negative ns | Positive ns | Positive ns |

Further analyses were conducted to establish whether any duration and/or quality influences are evident when the pre-school sample is considered separately, in other words excluding the 'home' group. In these analyses, both duration and quality are treated as continuous measures and tested separately. For cognitive outcomes a longer duration had been found to show a significant positive impact for mathematics and reading attainment. For social/behavioural outcomes, however, longer duration showed a weak negative relationship, which verged on the significant ($p<0.06$) with one of the four outcomes, Positive social behaviour (ES 0.095). Quality ratings of the pre-school centre attended did not show a significant impact for the other social/behavioural outcomes in Year 2 and did not mediate the influence of duration. This is in contrast to findings at the end of Year 1.

## Effectiveness of pre-school experience

The earlier value added analysis of the social/behavioural gains made by children who had attended a pre-school centre (controlling for their prior social behaviour at entry to the study and background influences) produced estimates of pre-school centre effectiveness for each of the 141 target centres in the study[20]. For details of these analyses, see EPPE Technical Paper 8b. In order to establish whether the relative effectiveness of the pre-school setting, in promoting better social/behavioural outcomes, shows any continuing impact on social/behavioural development at KS1, further analyses were conducted on the Year 2 social/behavioural outcomes. These analyses focus first on the pre-school sample, because the 'home' group by definition had not attended a centre. In these analyses, the centre-level residuals are treated as a continuous variable.

[20] Residual estimates measure relative gains over the pre-school period compared to those predicted by the multilevel model for each centre

Controlling for child, family and home environment influences the results indicate that centre effectiveness, in promoting better social/behavioural outcomes during the pre-school period, still shows a significant impact on children's social behaviour at the end of Key Stage 1, at age 7 years (see Table 3.7). In each case, the pre-school effectiveness measures were tested separately to establish their relationship with social/behavioural outcomes at the end of Year 2, after control for significant child, family and home environment characteristics. Effectiveness in two areas showed small but significant positive impacts on subsequent social behaviour. However, the relationships are weaker than those identified in equivalent analyses at the end of Year 1 (see EPPE Technical Paper 9), again suggesting that pre-school influences on social behaviour reduce over time.

**Table 3.7: Social/behavioural outcomes of the EPPE pre-school Sample at the end of Year 2 by Effectiveness of Pre-school**

| Pre-school centre effectiveness VA residual | Self-regulation Year 2 | Positive social behaviour Year 2 | Anti-social behaviour Year 2 | Anxious behaviour Year 2 |
|---|---|---|---|---|
| | Estimate (se) ES | Estimate (se) ES | Estimate (se) ES | Estimate (se) ES |
| **Independence & Concentration** | ***0.1859 (0.096)** **0.094** | Positive ns | Negative ns | **#- 0.1535 (0.080)** **0.096** |
| **Peer Sociability** | ***0.2396 (0.099)** **0.116** | Positive ns | Negative ns | ***- 0.2144 (0.082)** **0.128** |
| **Cooperation & Conformity** | Positive ns | Positive ns | Negative ns | Negative ns |
| **Anti-social** | Positive ns | Negative ns | Positive ns | Negative ns |

Where ES = Effect Size, n of pupils =2236 self-regulation, n=2236 Positive social behaviour, n=2242 Anti-social behaviour, n=2292 Anxious behaviour, * p<0.05, # p<0.06

Children who had attended a pre-school centre that promoted better outcomes in terms of Independence & Concentration when they entered primary school, continued to show slightly better outcomes in Year 2 in Self-regulation and, in their teacher's judgements, also showed reduced Anxious behaviour. Those who had attended a centre that promoted better outcomes in terms of Peer Sociability during the pre-school period also showed significantly better Self-regulation in Year 2 and reduced Anxious behaviour.

In addition to testing pre-school centre effectiveness, in terms of social/behavioural outcomes, measures of pre-school centre effectiveness in promoting cognitive progress were also tested, in order to see if these also predicted social/behavioural outcomes in Year 2. Centre effectiveness in promoting progress in language outcomes during the pre-school period was weakly but significantly related to better outcomes in terms of both Self-regulation (ES 0.10) and Positive social behaviour (ES 0.14) in Year 2. In addition, centre effectiveness in promoting Early number concepts was associated with better child outcomes on Self-regulation in Year 2 (ES 0.11). Relationships were not statistically significant for centre effectiveness in promoting pre-reading when tested as a continuous measure. However, as a group, children who had attended the most effective centres in promoting pre-reading outcomes (the positive significant outlier centres) showed significantly less Anxious behaviour, and better scores for Self-regulation. These results thus suggest that the effectiveness of the pre-school centre attended in promoting cognitive progress before children start primary school, shows some later benefits in terms of better social behaviour in Year 2. The EPPE research has already shown that, at the child level, there are weak but significant correlations between a child's attainment levels and their social behaviour,

particularly for Independence and Concentration at entry to primary school, and in Year 2 between Self-regulation and attainment. The present findings support the conclusion from case study research (see EPPE Technical Paper 10), that the promotion of social behaviour and cognitive development as complementary aims during the pre-school period tends to promote better outcomes for children in the longer term. In particular, Independence and Concentration and Self-regulation appear to be features of social behaviour which are important for attainment and which can be influenced by both the pre-school attended and the home learning environment.

For further comparison, centre effectiveness categories were used, to enable the 'home' sample to be added to the analysis as a comparison group. The centre level residuals were divided into five groups ranging from most effective (significant positive centre outliers) to least effective (significant negative outlier centres). Table 3.8 summarises the results in terms of statistical significance and direction of the relationship. There is little evidence of any clear pattern favouring the pre-school group in comparison with the 'home' group. This is in contrast to previous findings reported at entry to primary school and at the end of Year 1.

These results, in line with other findings already reported in this section, suggest that, by the end of Year 2 for social behaviour, the 'home' group show little difference in comparison with those who had attended a pre-school centre. This is in contrast to findings at entry to primary school and again at the end of Year 1. Although the 'home' group continue to show a significant cognitive disadvantage at the end of Key Stage 1 in both mathematics and reading results, for social behaviour the lack of pre-school experience no longer shows an impact. Amongst those who had attended a pre-school, however, there were indications of a continuing influence of the effectiveness of the particular pre-school attended in promoting better behavioural outcomes at the end of Key Stage 1.

**Table 3.8: Summary of Comparisons of the impact of centre effectiveness categories with 'home' group for social/behavioural outcomes in Year 2, after control for child, family and home environment factors**

| **Effectiveness Measure** Residual value added estimate for pre-school centre attended compared with none i.e. the 'home' group | **Self-regulation** | **Positive social behaviour** | **Anti-social behaviour** | **Anxious behaviour** |
|---|---|---|---|---|
| | **Year 2** | **Year 2** | **Year 2** | **Year 2** |
| **Independence & Concentration** | | | | |
| **Lowest** | Negative ns | Positive ns | Positive ns | Positive ns |
| **Below average** | Negative ns | Negative ns | **Positive sig** | Positive ns |
| **Average** | Positive ns | Positive ns | Positive ns | Negative ns |
| **Above average** | Positive ns | **Positive sig** | Positive ns | Positive ns |
| **High** | Negative ns | Negative ns | Positive ns | Negative ns |
| **Cooperation & Conformity** | | | | |
| **Lowest** | Positive ns | Positive ns | Positive ns | Positive ns |
| **Below average** | Negative ns | Positive ns | Positive ns | Positive ns |
| **Average** | Positive ns | Positive ns | Positive ns | Negative ns |
| **Above average** | Positive ns | **Positive sig** | Positive ns | Negative ns |
| **High** | Negative ns | Negative ns | Positive $p<0.06$ | Positive ns |
| **Peer Sociability** | | | | |
| **Lowest** | Negative ns | Positive ns | Negative ns | Positive ns |
| **Below average** | Negative ns | Positive ns | Positive ns | Positive ns |
| **Average** | Positive ns | Positive ns | Positive ns | Negative ns |
| **Above average** | Positive ns | Positive ns | Positive ns | Negative ns |
| **High** | Positive ns | Positive ns | Negative ns | Negative ns |
| **Anti-social** | | | | |
| **Lowest** | Negative ns | Positive ns | Positive ns | Negative ns |
| **Below average** | Positive ns | **Positive sig** | Positive ns | Positive ns |
| **Average** | Negative ns | Positive ns | Positive ns | Negative ns |
| **Above average** | Positive ns | Positive ns | Positive ns | Negative ns |
| **High** | Positive ns | Positive ns | Positive ns | Negative ns |

n of pupils =2527 Self regulation, n=2452 Peer sociability, n=2454 Anti social behaviour, n=2527 Anxious behaviour
sig = $p<0.05$

## Section 4: Exploring Cognitive Progress and Social/behavioural Gains

Young children's cognitive progress and social/behavioural gains were investigated over the pre-school period from age 3 years plus to primary school entry at rising 5 years (EPPE Technical Papers 8a & 8b). The results were used to identify measures of pre-school centre effects, based on value-added analyses, tested in earlier sections of this report in relation to attainment or social/behavioural outcomes at the end of Year 2.

Further analyses were conducted to explore progress and developmental gains from primary school entry to the end of year 2. The school entry assessments provide the baseline measures for these analyses. The results of the simple value-added models control only for prior cognitive attainments at reception entry (for prediction of decimalised reading and decimalised maths scores) or, for social/behavioural measures, prior social behaviour at reception entry (for prediction of Year 2 outcomes in Self-regulation, Positive social behaviour, Anti-social, or Anxious behaviour) and age.

Table 4.1 summarises the results for reading and mathematics progress. It can be seen that more of the total variance in children's reading attainments at the end of year 2 is accounted for by prior attainment at entry to school and age, than is the case for mathematics (around 46 percent, compared with nearly 41 percent for mathematics). The intra-school correlation is a measure of the variation in children's progress associated with the school level and is an indicator of potential differences in effectiveness. It is somewhat greater for mathematics than reading. It is possible that, this variation between schools, in progress, may reflect differences in teaching approaches and emphases in the reception year, Year 1 and Year 2.

The existence of significant variation between schools makes the study of primary school, as well as pre-school effects on the educational outcomes of young children, extremely relevant. The longer-term follow up of the sample through EPPE 3-11 over Key Stage 2 will investigate the issue of school effects in more detail.

**Table 4.1: Simple value-added analysis of cognitive progress from primary school entry to the end of Year 2 showing primary school and child level variance**

| | Decimalised reading score | | Decimalised mathematics score | |
|---|---|---|---|---|
| | Estimate | (se) | Estimate | (se) |
| School level variance: Estimate (se) | 0.0344852 | (0.00666) | 0.036889 | (0.00587) |
| Child level variance: Estimate (se) | 0.2705291 | (0.00878) | 0.2090368 | (0.00687) |
| Intra-school correlation | 0.1131 | | 0.1500 | |
| % Reduction in school level variance | 50.97 | | 33.58 | |
| % Reduction in child level variance | 49.04 | | 42.11 | |
| % Reduction in total variance | 45.61 | | 40.97 | |
| Number of children | 2444 | | 2404 | |
| Number of schools | 826 | | 826 | |

Table 4.2 shows estimates for the influence of General Cognitive Ability (GCA) measured by BAS scales at entry to school, and those for the relevant prior attainment measure (pre-reading for later reading outcomes and early number for later mathematics scores). GCA shows a much stronger relationship with later mathematics than reading results at age 7 years.[21]

**Table 4.2: Multilevel model estimates of prior attainment measures on year 2 attainment in Key Stage 1 decimalised reading and mathematics outcomes**

| Prior attainment measures at entry to primary school | Decimalised reading score | | Decimalised mathematics score | |
|---|---|---|---|---|
| | Estimate | (se) | Estimate | (se) |
| **Intercept** | *0.090621 | (0.01602) | *0.810606 | (0.014878) |
| **Early number concepts standardised score** | Not tested | | *0.001744 | (0.00132) |
| **General Cognitive Ability (BAS)** | *0.024881 | (0.0018) | *0.0215745 | (0.00138) |
| **General Cognitive Ability (BAS) squared#** | *- 0.000395 | (0.00008) | *- 0.000426 | (0.00001) |
| **Pre-reading standardised score** | *0.026912 | (0.00145) | Not tested | |
| **Age at assessment in months** | *0.034627 | (0.0031) | *0.0346142 | (0.00286) |

* p<0.0001, # the inclusion of a quadratic term for prior attainment improves model fit

There was no evidence that measures of pre-school experience (duration, quality and effectiveness), which showed a continuing relationship with attainment in Year 2 in the contextualised analyses presented in Section 2, were associated with better progress during primary school. This is not surprising, in that such measures showed their strongest impact on level of attainment achieved at entry to primary school. The contextualised results on attainment in national assessment reading and mathematics outcomes, taken together with those at entry to school, in Year 1 and the earlier findings on progress during the pre-school period, support the view that pre-school experience significantly benefits cognitive progress before children enter primary school, and that the attainment benefit remains statistically significant up to the end of Key Stage 1 (Year 2). However, the three pre-school measures do not add an additional boost to progress rates over Key Stage 1. Indeed, there are indications that 'home' children begin to make some relative gains compared with their very low starting points, although they still show a significant achievement gap. The existence of significant school-level variation in progress over the first years in primary school suggests that primary schools vary in their effectiveness in promoting both reading and mathematics progress for this age group. This is in line with a number of previous studies of primary school effects at Key Stage 1 and 2 (for example Tymms et al., 1997; Sammons & Smees, 1998; Strand, 2000; 2002).

Similar value-added analyses were conducted for the four social/behavioural measures to explore 'gains' or changes in social behaviour during the first years of primary school. The models tested the relevant prior social/behavioural measures collected at entry to primary school and all significant predictors were retained. Age was not found to be statistically significant in the value-added analyses for any of the four social/behavioural outcomes in Year 2, in contrast to the analyses of cognitive progress. The results of the simple value-added analyses are shown in Table 4.3 Self-regulation shows the strongest relationship with prior social behaviour, overall nearly a quarter (24.3 percent) of the total variance in children's scores on this dimension in Year 2 is accounted for in the value-added models.

[21] Squared terms were tested for both the pre-reading and the early number concepts measures but were not found to be statistically significant.

**Table 4.3: Simple value-added of social/behavioural progress from primary school entry to the end of Year 2 showing primary school and child level variance**

| | Self-regulation | | Positive social behaviour | | Anti-social behaviour | | Anxious behaviour | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | (se) | Estimate | (se) | Estimate | (se) | Estimate | (se) |
| School level variance: Estimate (se) | 0.01691 | (0.004) | 0.02429 | (0.004) | 0.007569 | (0.002) | 0.0122561 | (0.003) |
| Child level variance: estimate (se) | 0.17951 | (0.006) | 0.15871 | (0.004) | 0.098745 | (0.003) | 0.133533 | (0.004) |
| Intra-school correlation | 0.0861 | | 0.1327 | | 0.0712 | | 0.0841 | |
| % Reduction in school level variance | No reduction increase in school level variation by 47.2% | | No reduction increase in school level variation by 10.7% | | No reduction increase in school level variation by 2.2% | | No reduction increase in school level variation by 1.9% | |
| % Reduction in child level variance | 27.9 | | 18.4 | | 21.5 | | 3.2 | |
| % Reduction in total variance | 24.5 | | 15.5 | | 20.2 | | 2.8 | |
| Number of children | 2507 | | 2508 | | 2507 | | 2508 | |
| Number of schools | 862 | | 862 | | 862 | | 862 | |

There is significant school-level variation for each of the four social/behavioural measures in year 2, suggesting that primary schools vary in their impact on young children's social/behavioural development, taking into account children's social behaviour profile at the start of primary school. The intra-school correlations indicate that the greatest variance at the school-level is for Positive social behaviour (0.133), and this may reflect the influence of peer group and school or classroom climate .

Table 4.4 shows, which measures of prior social behaviour at entry to primary school, are significant predictors of the four main measures of social behaviour at the end of Year 2.[22] For Self-regulation, the measure of Independence and Concentration at the start of primary school is the strongest predictor. For Positive social behaviour the measure of Co-operation and Conformity, followed by Peer Empathy, at the start of primary school show the strongest association. For Anti-social behaviour the entry to primary school measure of Co-operation and Conformity is the strongest predictor, the link being negative, meaning that children rated more highly in terms of Co-operation and Conformity at entry to primary school, were less likely to show raised scores for Anti-social behaviour later, at the end of Year 2.

[22] Squared terms for the prior social behaviour models were tested but in the main were not significant. Only statistically significant findings are reported ($p<0.05$).

**Table 4.4: Multilevel model estimates of prior social behaviour measures on end of Year 2 social/behavioural outcomes**

| Prior social/behavioural measures at entry to primary school | Self-regulation | | Positive social behaviour | |
|---|---|---|---|---|
| | Estimate | (se) | Estimate | (se) |
| Intercept | 2.349 | (0.012) | 2.481 | (0.011) |
| Independence & Concentration | **0.24071 | (0.019) | **0.06730 | (0.018) |
| Peer Sociability | *0.02920 | (0.013) | Not significant | |
| Co-operation & Conformity | **0.07981 | (0.022) | **0.12587 | (0.024) |
| Peer Empathy | Not significant | | **0.08027 | (0.060) |
| Anti-social/worried | Not significant | | Not significant | |
| **Prior social/behavioural measures at entry to primary school** | **Anti-social behaviour** | | **Anxious behaviour** | |
| Intercept | 1.2663 | (0.010) | 1.2984 | (0.009) |
| Independence & Concentration | **-0.08047 | (0.014) | *-0.02047 | (0.010) |
| Confidence | **0.06737 | (0.011) | Not significant | |
| Peer Sociability | Not significant | | -0.06983 | (0.011) |
| Co-operation & Conformity | **-0.11580 | (0.020) | Not significant | |
| Anti-social/worried | **0.06370 | (0.0166) | Not significant | |
| Anti-social/worried squared | **0.05372 | (0.014) | Not significant | |

* p<0.05, ** p<0.001

Further analyses indicated that the three measures of pre-school impact (duration, quality and effectiveness) did not generally show any significant relationships when tested in the value-added models. As with the analyses of cognitive progress it appears that, the positive benefits of pre-school on three measures (Self-regulation, Positive social behaviour and reductions in Anxious behaviour) remain evident in terms of children's social/behavioural profiles at the end of Year 2 (as illustrated in the contextualised models reported in Section 3), in line with results from Year 1. However, there is no additional impact in promoting further cognitive or behavioural progress. At this stage therefore, it appears that the benefits of pre-school centre impact seems to operate by providing young children with a better start to primary school (as described in EPPE Technical Papers 8a & 8b), not by fostering increased progress or social/behavioural gains across Key Stage 1.

## Section 5: Summary and Conclusions

The EPPE project adopted an educational effectiveness design to increase understanding of the nature and impact of potential pre-school influences on young children's cognitive and social/behavioural development from age 3 years plus to the end of Key Stage 1 (age 7 years). A series of 12 EPPE Technical papers has been produced reporting analyses investigating children's progress and development over the pre-school period up until entry to school, and the characteristics of pre-school provision, including variations in quality and by type of provider. In addition, evidence of the continuing influence of pre-school on children's outcomes in Year 1 has been reported (EPPE Technical Paper 9). In Paper 11 we have explored evidence of continuing pre-school effects at the end of Key Stage 1, using children's national assessment attainments in reading and mathematics and different dimensions of social behaviour as measures of child outcomes at age 7 years plus. Social/behavioural development was assessed by teachers using an extended version of the Goodman (1997) Strengths and Difficulties Questionnaire. A range of statistical methods was used to analyse data for 2793 children for whom attainment and/or social/behavioural outcome data was collected in Year 2; representing 91.6 per cent of the total child sample tracked and assessed at entry to primary. Four measures of social behaviour were explored: Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour.

Multilevel models were used to investigate the influence of different background factors on young children's attainments at different time points and to explore the impact of primary as well as pre-school. These contextualised multilevel analyses are equivalent to those conducted previously when children entered primary school (see EPPE Technical Paper 8a & 8b) and in Year 1 (Technical Paper 9). A comparison of the results of the analyses at the different time points allows us to establish the extent to which particular background influences change (reduce or increase) over the first years of school. Contextualised analyses identify the unique (net) contribution of particular characteristics to variation in children's outcomes, in this instance their attainments in different cognitive assessments or social/behavioural outcomes, while other influences are controlled. Thus, for example, the impact of family SES, is established while taking into account the influence of age, gender, mother's qualification levels, low income, ethnicity, birth weight, home learning environment etc.

A total of 141 pre-school centres were involved in the pre-school research. Value-added indicators of each pre-school centre's effectiveness in promoting progress in a given outcome (e.g. reading, language, early number concepts or different aspects of social behaviour such as Independence & Concentration, Peer Sociability etc) were calculated during the first phase of the study (over the pre-school period). Centres where children had made significantly greater progress than predicted, on the basis of their prior attainment and intake characteristics, can be viewed as *more effective* (positive outliers in value added terms). Centres where children made less progress than predicted can be viewed as *less effective* (negative outliers in value added terms).

The multilevel valued-added analyses over the pre-school period showed that variations in quality and extent of time in pre-school had an impact on children's cognitive gains and social/behavioural development. They indicated that higher quality and longer pre-school experience showed a positive relationship with better child outcomes. This paper extends the earlier findings of the EPPE research for the pre-school phase and in Year 1 by establishing whether the positive impacts of pre-school are still evident in child outcomes measured at the end Key Stage 1. This is after children have been in primary school full-time for more than 2 to 3 years; depending on the amount of time, they attended reception classes. It should be noted that on average, children had spent around 21 months in pre-school and for most, provision was part time during the pre-school years.

Findings concerning a sample of 'home' children, who had no pre-school centre experience before starting primary school, provide important comparisons with the pre-school sample. The

contextualised multilevel analyses indicate that 'home' children are still at a disadvantage in terms of cognitive attainments at the end of Year 2 (reflecting differences evident when they started primary school). A gap in terms of academic achievement in national assessments of reading and mathematics remains evident at the end of Year 2. The results suggest that the attainment gap can be attributed to the absence of pre-school experience, rather than to other differences in their background characteristics, which are controlled in all the multilevel statistical analyses. The findings provide further evidence concerning the longer term impact of pre-school provision. As well as comparisons with the 'home' group, additional analyses have focused just on the sample of children who attended pre-school to further explore any continuing pre-school influence.

## Main Findings

The Year 2 multilevel analyses of child outcomes show that background characteristics such as gender, age, family SES and mother's qualification level, and the quality of the home learning environment experienced during the pre-school years, remain significant predictors of children's reading and mathematics attainments and social behaviour at age 7 years plus and also provide additional evidence concerning the positive impact of different aspects of pre-school.

### The impact of a child's background

Multiple disadvantage continues to show significant negative associations with all child outcomes in Year 2. The impact of child background factors is broadly in line with that found when children were younger (at the three earlier assessment time points, entry to the pre-school study at 3 years plus, entry to school at rising 5 years, and at the end of Year 1 at age 6 years plus). However, taken together, background characteristics are relatively weaker predictors of reading and mathematics attainment at age 7 years than was found for General Cognitive development at age 3 years, or of attainment in pre-reading, early number or language at entry to primary school. In particular, the impact of EAL status has reduced, probably reflecting improvements in fluency in English as children move through pre-school and primary school. Both pre-school and school influences may be acting together to help reduce the power of background influences on attainment in subjects such as reading and mathematics, in comparison with assessments of General Cognitive Ability (GCA). By contrast, the impact of background on social behaviour (which was much weaker during the pre-school period than was found for cognitive outcomes) shows somewhat stronger influences on Positive social behaviour and Anti-social behaviour as children move through Key Stage 1.

### Home learning environment

Aspects of the home learning environment (related to activities as reported in the parent interview conducted when children entered the study) experienced by children during the preschool period, continue to show significant positive effects on attainment and social behaviour at age 7 years plus, net of the influence of child and family background influences such as family SES and mothers' qualification levels. It has been found that boys and girls have significant differences in HLE (based on parent self-reports), with boys tending to have lower scores on HLE. Such differences in this feature of parenting may account for some of the gender differences in cognitive attainment and social behaviour evident from age 3 years onwards. Individual items contributing to the HLE are not found to be as strong predictors as in the pre-school period but, taken together, the HLE index remains an important influence on later educational outcomes; both attainment and social behaviour at the end of Key Stage 1. This suggests that the quality of the home learning environment in the pre-school period has a sustained impact at different ages. The quality of the HLE may provide a general indicator of the level of parental interest and involvement in both the early years and of involvement with/support for school.

### The continued impact of pre-school – Duration, quality and effectiveness

Analyses explored cognitive attainment at the end of Year 2 and whether this relates to duration (in terms of number of months), quality and effectiveness of pre-school experience. Taken together, in all comparisons the attainment of the 'home' group is significantly poorer than that of

children who had attended a pre-school centre. It is not possible to fully separate the influence of quality, duration and effectiveness of pre-school attended in comparisons of the pre-school and 'home' sample, since pre-school is experienced as a 'package' combining these different features. However, the findings support the overall conclusion that these three features generally remain predictors of better cognitive attainment during Key Stage 1, although results were stronger at the end of Year 1 than a year later. Measures of the effectiveness of the pre-school centre attended continue to show a measurable and significant impact on young children's subsequent attainments at the end of Year 2 in analyses which focus just on the pre-school sample. This shows that the positive impact of pre-school on cognitive attainment is not evident only in comparisons with the 'home' group. The EPPE pre-school and Key Stage 1 results combined suggest that, overall, longer duration, higher quality and attending a more effective pre-school centre have significant benefits in preparing young children for a better start to school, and that such children continue to show higher levels of reading and mathematics attainment in national assessments up to the end of Key Stage 1 (further follow up will establish whether the impact of pre-school can be identified at older ages up to the end of Key Stage 2).

Figure 5.1 illustrates the relative impact on attainment of attending preschool at three time points across Key Stage 1. The results are expressed in terms of effect sizes (ES), these give a measure of the strength of the relationship between attending a pre-school and not attending a pre-school on attainment at different ages, after statistical control for the impact of significant child, family and home learning environment factors. It can be seen that the initial difference at the start of primary school is largest for early number skills but declines over Key Stage 1 for mathematics. The impact on pre-reading is more modest but, by contrast, shows little change over the three time points when reading attainment is considered. It is possible that the strong impact for early number concepts is related to the importance of language development (which showed a strong pre-school effect at primary school entry, as reported previously in EPPE Technical Paper 8a), because language attainment also shows a strong correlation with early number concepts.

**Figure 5.1: Bar Chart of the Effect of 'home' vs. pre-school attendance on cognitive attainment (contextualisedmodels).**

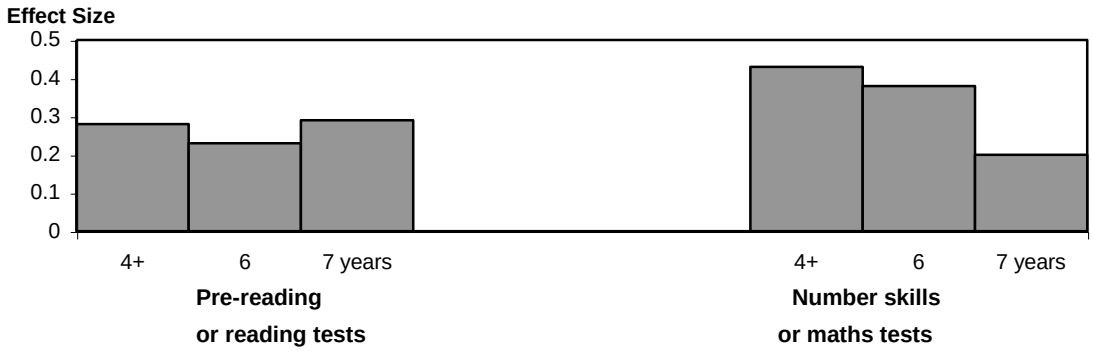



Table 5.1 shows in detail, effect sizes for different durations of pre-school over time. These indicate that the cognitive differences are largest for the early starters who had spent over three years in a target pre-school.

For social/behavioural outcomes at the end of Year 2 there is little evidence of the positive impact of duration and quality of pre-school (in contrast to findings of significant benefits at earlier time points at entry to primary school and Year 1). Nonetheless, measures of the effectiveness of pre-school centre attended continue to show a small positive impact for later scores on Self-

regulation and reductions in Anxious behaviour. As at earlier time points there were indications that a long duration of pre-school, related to an early start (under 2 years), was linked with slightly raised scores for the Anti-social behaviour measure at the end of Key Stage 1. In interpreting this finding it is important to take note the nature scale used and proportions of children involved. It appears that although scores are raised in absolute terms, early starters are only slightly more likely than other children to show poor behaviour, in terms of high teacher scores on this outcome in Year 2 (in all 7.1 percent of early starters have raised scores compared with 6.8 percent of 'home' children and 5.3 percent of those starting pre-school at age 2 years or over).

**Children who do not experience pre-school**

Data were collected for a group of 'home' children with none or only minimal pre-school centre experience. Comparison of the 'home' sample with children who had attended a pre-school centre showed that both the characteristics and attainments of 'home' children vary significantly from those who had been in pre-school. It is not possible to conclude with certainty that the much lower attainments of the 'home' group are directly due to lack of pre-school experience.[23] Nonetheless, statistical analyses of attainment and social behaviour from the pre-school phase of the EPPE research reveal that pre-schooling provided a significant cognitive boost at entry to reception and had benefits on most areas of social behaviour, particularly Peer Sociability after control for a wide range of child, family and home environment differences.

Analyses of attainments at the end of Year 1 and Year 2 explored the impact of child, parent and home environment factors. Even when these important influences are controlled, 'home' children's cognitive attainments are poorer than those of children who had attended a pre-school centre, as shown on the previous page. These findings, combined with those on the advantages of an early start date, reported previously (EPPE Technical Papers 8a & 8b) add weight to earlier conclusions that pre-schooling has a beneficial impact on young children's cognitive attainment. 'Home' children remain at a disadvantage during Key Stage 1 with a significant attainment gap remaining evident at the end of Year 2. Table 5.1 illustrates the extent to which the impact of duration of pre-school (one of the three indicators of pre-school influence studied) changes over time. In all cases, estimates were positive thus; the ES measure higher attainment levels.

**Table 5.1: Changes in the impact of different durations of pre-school attended over time for attainment in reading and mathematics measured by effect size (ES)**

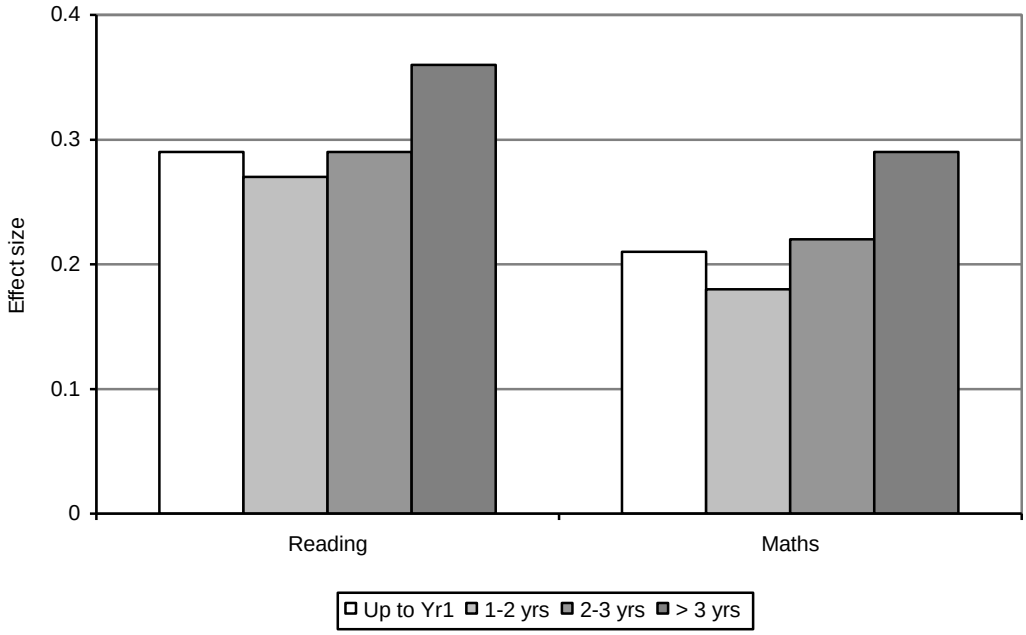
| **Duration** Compared with none (i.e. the 'home' group) | **Effect of duration at entry to school, end of Year 1 and end of Year 2** | | | | | |
|---|---|---|---|---|---|---|
| | **Reading ES** | | | **Maths ES** | | |
| | Entry to school | End of Year 1 | End of Year 2 | Entry to school | End of Year 1 | End of Year 2 |
| Up to 1 year | 0.12 | 0.26 | 0.29 | 0.34 | 0.32 | 0.21 |
| 1 – 2 years | 0.28 | 0.17 | 0.27 | 0.45 | 0.36 | 0.18 |
| 2-3 years | 0.39 | 0.26 | 0.29 | 0.56 | 0.46 | 0.22 |
| > 3 | 0.49 | 0.35 | 0.36 | 0.55 | 0.52 | 0.29 |

Overall, for reading the ES reduces by approximately a quarter, for mathematics the reduction is relatively larger at around a half for the longest duration group. It should be noted that the pre-school influence of duration was particularly strong for Language at entry to primary school, but data on this outcome were not collected in Year 1 or Year 2.

[23] A controlled experiment (which would not be feasible on either ethical or practical grounds) would be needed to draw firm conclusions.

Figure 5.2 Illustrates the size of differences in terms of effect sizes in graphical form for Year 2 for different durations of pre-school compared with none. This illustrates a general trend related to stronger effects for longer duration.

**Figure 5.2: Years of pre-school and attainment at Year 2**




However, there are no longer any statistically significant differences between the 'home' group and those who had attended any type of pre-school in terms of the four measures of social behaviour studied in Year 2. This is in contrast to findings reported at earlier time points when pre-school attendance was linked with better outcomes in terms of Independence and Concentration/Self-regulation, Peer Sociability/Positive social behaviour and reductions in Anxious behaviour; as figures in Table 5.2 show.

**Table 5.2: Changes in the impact of attending a pre-school centre versus not over time for different measures of social behaviour measured by effect sizes**

| **Compared with none i.e. the home group** | **Independence& concentration ES** | **Self-regulation ES** | | **Peer sociability ES** | **Positive social behaviour ES** | |
|---|---|---|---|---|---|---|
| | **Entry to school** | **End of Year 1** | **End of Year 2** | **Entry to school** | **End of Year 1** | **End of Year 2** |
| **Attended a pre-school setting** | ***0.30** | ***0.22** | **0.01** | ***0.54** | **0.16** | **0.11** |
| **Compared with none i.e. the home group** | **Anti-social behaviour ES** | | | **Anxious behaviour ES** | | |
| | **Entry to school** | **End of Year 1** | **End of Year 2** | **Entry to school** | **End of Year 1** | **End of Year 2** |
| **Attended a pre-school setting** | **0.10** | **0.12** | **0.11** | **Not measured separately[24]** | ***0.28** | **0.01** |

*p<0.05

[24] At entry to primary school the Anxious behaviour items formed one factor with Anti-social behaviour items

The results indicate that the beneficial impact of attending a pre-school centre on cognitive attainment is more long lasting than that on social behaviour. It is hypothesised that the latter may be more influenced by primary school peer group, school and classroom climate and possibly teachers' practice and expectations. It should be noted that the ES reported do not show the direction of effect for Anxious behaviour. Estimates were negative indicating that attending a pre-school compared with not, was associated with reductions in Anxious behaviour in Year 1. However, the estimates were not significant for Year 2. Anxious behaviour was not identified as a separate dimension in the social/behavioural assessment at entry to primary school.

Further analyses revealed no significant differences related to duration of pre-school for social behaviour except for the Anti-social behaviour dimension (see Table 5.3), where a long duration of pre-school attendance is linked with raised scores for teacher ratings at each time point. This is in line with findings reported for the EPPE sample at younger ages and with results from the US NICHD (2002) research.

**Table 5.3: Changes in the impact of different durations of pre-school attended over time for Anti-social behaviour measured by effect sizes**

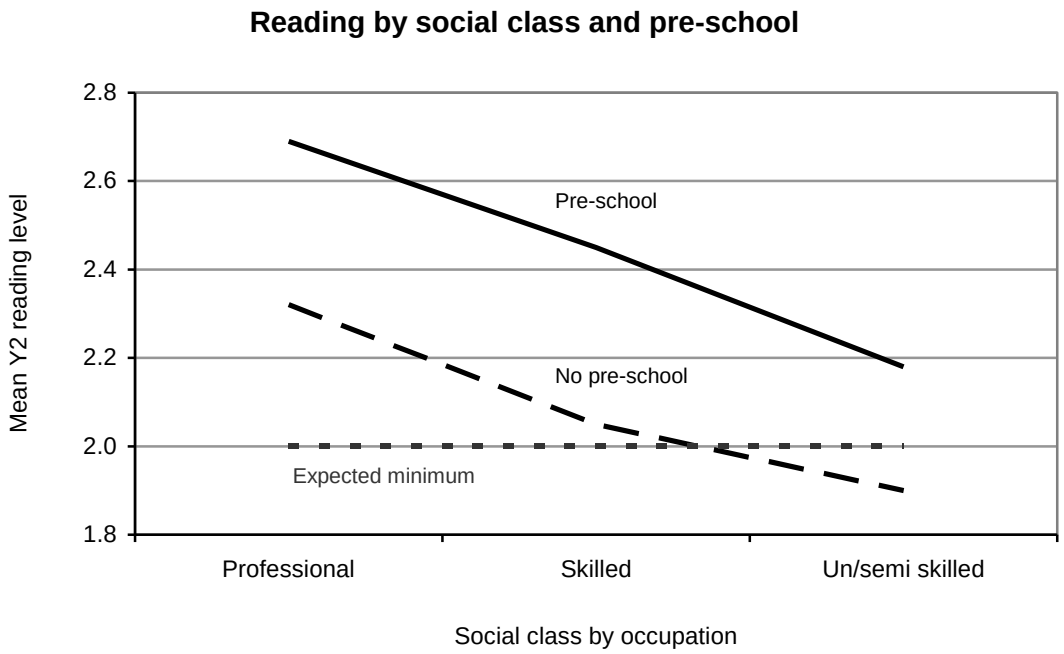
| Compared with none i.e. the 'home' group | Anti-social behaviour | | |
|---|---|---|---|
| | Entry to school | End of Year 1 | End of Year 2 |
| Under 12 months | 0.050 | 0.041 | 0.084 |
| 12-24 months | 0.127 | 0.156 | 0.158 |
| 24-36 months | 0.159 | 0.093 | 0.088 |
| Over 36 months | *0.238 | *0.326 | *0.251 |

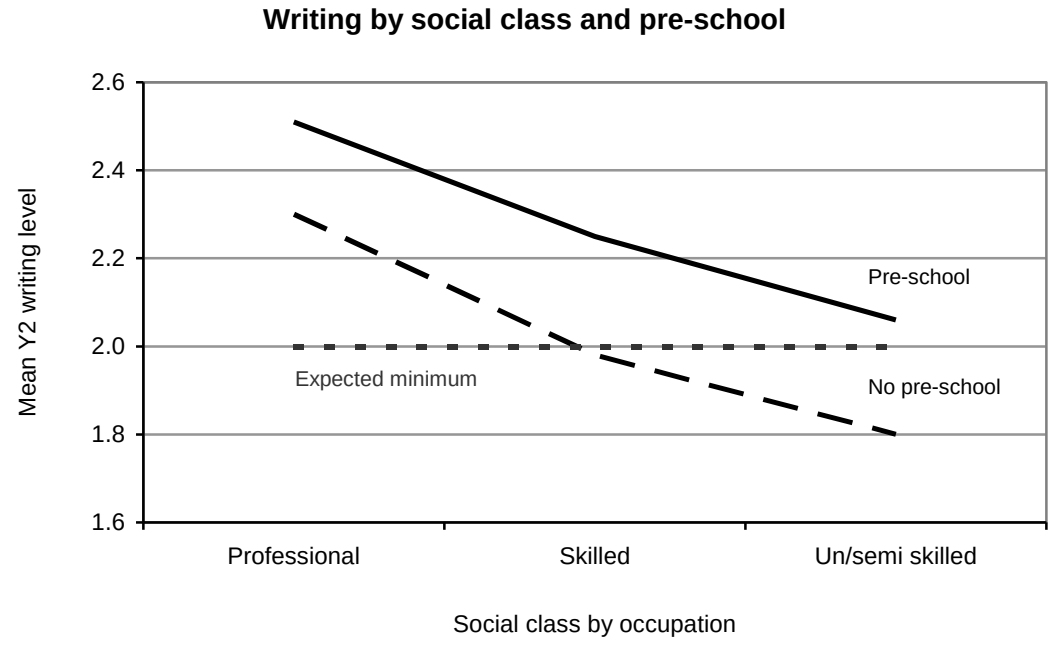
* $p<0.05$

Overall, the Year 2 analyses suggest that the early boost given by pre-school on subsequent reading and mathematics attainment has not washed out by the end of Key Stage 1, nor have 'home' children caught up. Thus, the absence of pre-school is still seen to disadvantage cognitive attainment across Key Stage 1. By contrast, the benefits of pre-school for social behaviour are marked at entry to school (especially for Peer sociability) but reduce in Year 1 and are not evident for duration or quality by the end of Year 2. Longer duration remains associated with an increase in mean scores for the Anti-social measure although this is not usually indicative of negative behaviour for the vast majority as discussed earlier (see Section 3). There is some evidence of weak but significant lasting benefits, in terms of social/behavioural outcomes in both Year 1 and Year 2, related to the effectiveness of the pre-school centre attended in promoting better social/behavioural development in the pre-school period. Pre-school centres, which promoted better cognitive progress, also showed some evidence of small but significant positive impacts on later social behaviour across Key Stage 1. There are indications that high quality and greater effectiveness of the pre-school centre attended tend to mitigate the impact of long duration for Anti-social behaviour (linked with an early start to pre-school).

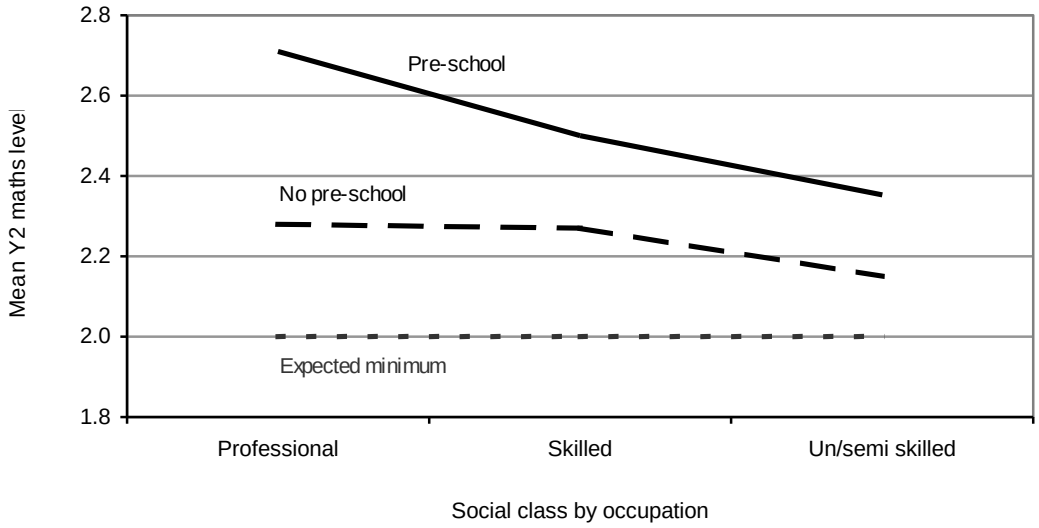
While the overall effect of pre-school is similar across all SES groups, a particular advantage accrues to disadvantaged children, in that pre-school experience allows them to move above the minimum expected levels in Key Stage 1 attainment. This means that, on average, disadvantaged children then start Key Stage 2 at a level at which they can access the KS2 curriculum. This is illustrated in figure 5.3 for three areas of the curriculum in relation to family SES.

**Figure 5.3: Relationship between pre-school attendance and Key Stage 1 attainment by family SES for three outcomes**



**Maths by social class and pre-school**




The longitudinal follow up of EPPE children confirms that pre-school continues to show a generally positive impact on developmental outcomes across Key Stage 1 for cognitive outcomes. It supports conclusions from the pre-school phase of the research, 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. These conclusions are in line with findings from major longitudinal studies in other contexts (particularly the US research by the NICHD, 2002). The research demonstrates that pre-school experience can be viewed as a 'package' with attributes of quality, effectiveness and duration. Analyses suggest that these aspects continue to influence child outcomes at the end of Key Stage 1 although the effects tend to be weaker than those evident at entry to primary school (age rising 5 years).

The EPPE research also points to a continuing significant and positive influence of the pre-school home learning environment (as reported by parents), separate from the impact of child and family characteristics. In addition, the Year 2 value-added analyses (reported in Section 4), in line with those in Year 1, indicate that there are significant primary school differences in children's attainment, progress and developmental gains. These will be explored further in the EPPE 3-11 continuation study, which is following the same group of pupils up to the end of Key Stage 2. Research elsewhere (reviewed by Currie, 2004) has indicated that both the quality of pre-school interventions and the quality of any primary school subsequently attended can influence children's outcomes in the mid to longer term. It has been argued in studies of teacher effects in France (Bressoux & Bianco, 2004) that both the size of the initial impact of an intervention and the size of any subsequent effects (teacher or school) will influence the extent to which continuing pre-school influences remain evident as children progress through primary school. Maughan (2004) has drawn attention to models, which stress the interdependencies among cognitive, social and emotional functioning, and the way the individual child is influenced by, and influences, his or her social world. She argues that, 'These individual differences - shaped by biology and early experience - continue to exert strong influences on development, and form the backdrop to any exploration of the impact of school life.' (Maughan, 2004, p3). The present research indicates that at the level of the individual child, there are only weak relationships between cognitive and social/behavioural outcomes, the strongest being between Self-regulation and cognitive attainments. Relatively little research, as yet, has explored the relationships between schools' effects on different types of outcome. No studies in England have explored the relationships between pre-school and school effectiveness and the way such influences may interact with child, family and home environment influences to shape children's attainment and social/behavioural development up to the end of Key Stage 2. EPPE 3-11 is designed to examine such interrelationships and joint influences in detail.

# Appendix 1: Details of Selected Measures used in the EPPE Study

### A: Reception Entry Assessments

All EPPE children were assessed at entry to primary school, providing a measure of current attainment at exit from pre-school and a baseline measure for entry to primary school. The assessments are shown in Table 1.1 and were specifically designed to be compatible with the Desirable Outcomes for Pre-School Education (DfEE, 1996) that have since been replaced by the Early Learning Goals/Curriculum Guidance for the Foundation Stage.

**Appendix Table 1.1 Cognitive Assessments at Entry to Primary School**

| Name of Assessment | Assessment Content | Administered one-to-one by: |
|---|---|---|
| British Ability Scales Second Edition (BASII) (Elliot et al., 1996): | Cognitive development battery | |
| • Verbal Comprehension | • Verbal skills | EPPE Researcher |
| • Picture Similarities | • Non-verbal reasoning skills | EPPE Researcher |
| • Naming Vocabulary | • Verbal skills | EPPE Researcher |
| • Pattern Construction | • Spatial awareness/reasoning | EPPE Researcher |
| • Early Number Concepts | • Reasoning ability | EPPE Researcher |
| Letter Recognition | Lower case letters | EPPE Researcher |
| Phonological Awareness (Bryant and Bradley, 1985) | Rhyme and Alliteration | EPPE Researcher |
| Children not fluent in English: Assessed only on two of the non-verbal BAS II scales (Picture Similarity and Pattern Construction). In addition they were assessed on BAS II Copying, a measure of spatial ability, (Elliot et al., 1996), which was also administered by the EPPE researcher | | |

A number of the assessments were added together to form 'composite' outcomes, for example, the two verbal BAS II scales; Verbal Comprehension and Naming Vocabulary. The pre-reading composite is formed by adding together the scores for phonological awareness (rhyme and alliteration) and letter recognition.

# Appendix 1 (continued)

### B. The Multiple Disadvantage Index

Analyses were conducted to investigate the impact of 'multiple disadvantage' as part of the EYTSEN Project ( [see EYTSEN reports in Appendix 6] which focuses on the identification of children 'at risk' of SEN). An index was created based on 10 indicators in total: three child variables, six parent variables, and one related to the home learning environment. All the variables were chosen because they related to low baseline attainment when looked at in isolation (as described above). Where indicators were closely related, such as first language and ethnicity, only the most significant was included.

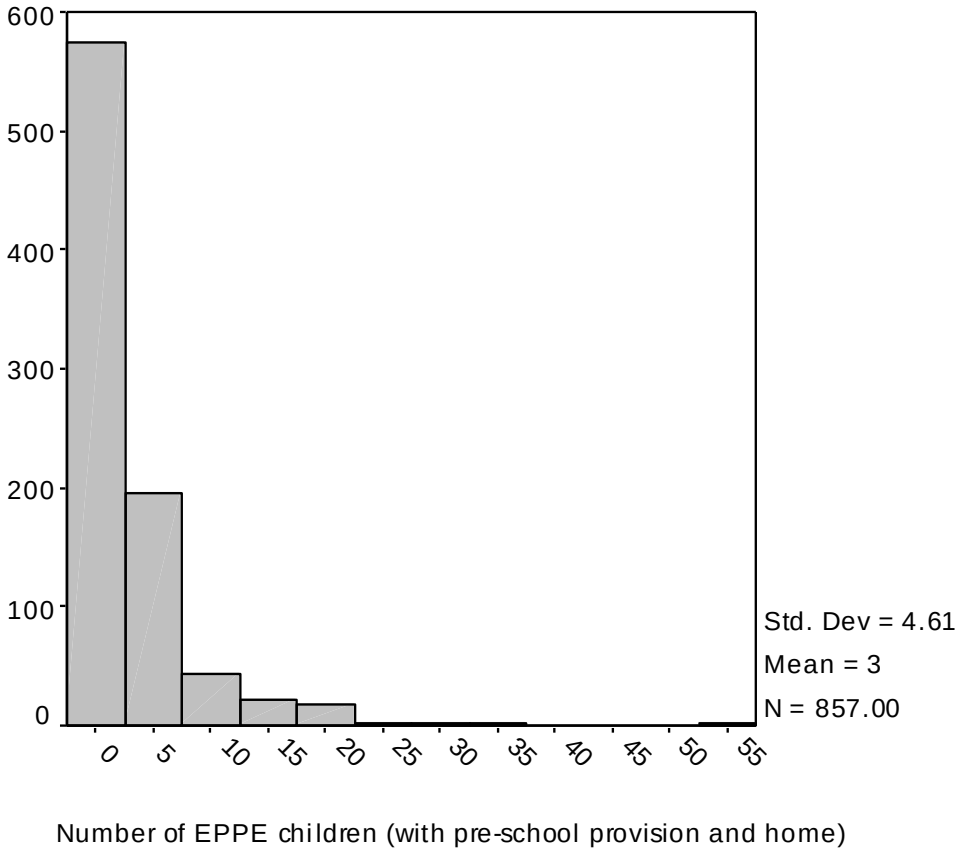
**Appendix Table 1.2 Multiple disadvantage indicators**

| Child variables | Disadvantage indicator |
|---|---|
| • First language<br>• Large family<br>• Pre-maturity/ low birth weight | English not first language<br>3 or more siblings<br>Premature at birth or below 2500 grams |
| Parent variables | |
| • Mother's highest qualification level<br>• Social class of Father's occupation<br>• Father's employment status<br>• Young mother<br>• Lone parent<br>• Mother's employment status | No qualifications<br>Semi-skilled, unskilled, never worked, absent father<br>Not employed<br>Age 13-17 at birth of EPPE/EPPE-E child<br>Single parent<br>Not working/Unemployed |
| Home environment variables | |
| • Home environment scale | Bottom quartile |

# Appendix 2

### Distribution of EPPE Sample at School Level at Entry to Primary School

**Chart: 1 Distribution of the number of EPPE children (with pre-school provision and 'home') in each primary school for whom valid year 2 outcome data were collected**




Note the smallest number of children in a school in the analyses for Year 2 was 1

# Appendix 3: Decimalised national assessment at Key Stage 1

## Background

Analyses of Key Stage 2 results have shown that test scores provide better indicators of variation in pupil attainment than reliance on test levels. Unfortunately, test scores at Key Stage 1 (KS1) are not available nationally. However the EPPE research team collected these details directly from schools. This enabled the creation of a more differentiated measure of attainment in comparison with traditional KS 1 national assessment (SATs) levels.

There is an overlap between KS1 levels and raw scores as the range of scores within each level changes from year to year, i.e. one raw score may correspond to two different levels in different cohorts. For example, as illustrated in table 3.1 below: a child with a raw score of 27 could have achieved either level 2a or level 3 on the reading test, and a child scoring a raw score of 19 for the maths test could have achieved level 2a or 2b, depending on the year, in which they took the test, and level of test attempted. The EPPE sample covered four age cohorts, reflecting differences in the ages children entered pre-school and were recruited to the 141 target centres in the pre-school phase of the research.

**Appendix Table 3.1: Scoring Criteria – English Reading Tasks and Tests**

| Level 2 Reading Comprehension | Cohort 1 1999/2000 | Cohort 2 2000/2001 | Cohort 3 2001/2002 | Cohort 4 2002/2003 |
|---|---|---|---|---|
| Level not achieved | 0-6 | 0-8 | 0-6 | 0-6 |
| Level 2c | 7-17 | 9-18 | 7-14 | 7-14 |
| Level 2b | 18-22 | 19-25 | 15-21 | 15-21 |
| Level 2a | 23-27 | 26-33 | 22-29 | 22-30 |
| **Level 3 Reading Comprehension** | | | | |
| Level not achieved | 0-16 | 0-17 | 0-16 | 0-14 |
| Level 3 | 17-28 | 18-31 | 17-27 | 15-26 |

**Appendix Table 3.2: Scoring Criteria – Mathematics Test**

| Level 2 and 3 Maths Test | Cohort 1 1999/2000 | Cohort 2 2000/2001 | Cohort 3 2001/2002 | Cohort 4 2002/2003 |
|---|---|---|---|---|
| Level not achieved | 0-4 | 0-4 | 0-4 | 0-4 |
| Level 1 | 5-7 | 5-7 | 5-7 | 5-6 |
| Level 2c | 8-13 | 8-13 | 8-13 | 7-13 |
| Level 2b | 14-18 | 14-19 | 14-18 | 14-18 |
| Level 2a | 19-24 | 20-25 | 19-24 | 19-30 |
| Level 3 | 25-36 | 26-36 | 25-36 | |
| **Level 3 Test** | | | | |
| Level 3 not achieved | | | | 0-10 |
| Level 3 achieved | | | | 11-30 |

In order to address this feature and enable comparisons across years, a number of researchers have used decimal levels at Key Stage 2. It was decided to adapt this method for the KS 1 national assessment results collected for the EPPE sample.

**Process For Decimalising KS1 SATs Levels and Raw Scores for the EPPE Sample**

*Calculating Raw Scores For Children Who Have A Valid Level But Are Missing A Raw Score:*

Child-level SATs data for individual children were collected from schools. A relatively small number of children had a valid test level supplied by their teacher but not a raw test score. We did not want to exclude these children from the analysis so a number of possible solutions were explored:

- The midpoint of the raw test score range could be used*. However, upon examining scatterplots of raw test scores (by cohort split by level), it was noted that the level 3 raw test scores are skewed.
- Alternatively, the mean raw test score range could be included*.

It was decided that the mean raw test score range would be the best method to use for decimalising KS1 levels and all children who were missing a raw test score but had achieved a valid level were allocated a score corresponding to the mean raw test score for that level*:

In the level 2 and level 3 English Reading tests for this sample, 173 children were found to have a level 2 test level but no level 2 raw score and 48 children were found to have a level 3 test level but no level 3 raw score. These children were allocated the mean test score as shown below:

**Appendix Table 3.3: Scoring Criteria–English Reading Tasks and Tests Mean Test Scores By Cohort**

| Level 2 Reading Comprehension | Cohort 1 1999/2000 | Cohort 2 2000/2001 | Cohort 3 2001/2002 | Cohort 4 2002/2003 |
|---|---|---|---|---|
| Level not achieved | 4.8 | 5.22 | 4.63 | |
| Level 2c | 12.16 | 13.96 | 10.58 | 11.75 |
| Level 2b | 19.84 | 21.78 | 18.07 | 17.12 |
| Level 2a | 24.74 | 28.28 | 25.22 | 25.48 |
| **Level 3 Reading Comprehension** | | | | |
| Level not achieved | 11.82 | 12.90 | 12.10 | 9.20 |
| Level 3 | 20.84 | 22.43 | 20.79 | 19.43 |

In the maths test, 176 children were found to have a valid level but no raw score. For these children, the mean test score was allocated as shown below:

**Appendix Table 3.4: Scoring Criteria–Maths Test Mean Test Scores By Cohort**

| Level 2 and 3 Maths Test | Cohort 1 1999/2000 | Cohort 2 2000/2001 | Cohort 3 2001/2002 | Cohort 4 2002/2003 |
|---|---|---|---|---|
| Level not achieved | | 3 | 1 | |
| Level 1 | 6 | 5.90 | 5.96 | 5 |
| Level 2c | 11.26 | 10.67 | 10.51 | 10.67 |
| Level 2b | 15.56 | 16.33 | 15.95 | 16.08 |
| Level 2a | 21.70 | 22.34 | 21.13 | 22.50 |
| Level 3 | 28.30 | 29.48 | 28.90 | |
| **Level 3 Test** | | | | |
| Level 3 not achieved | | | | |
| Level 3 achieved | | | | 16.38 |

The process was completed separately for each of the four EPPE cohorts:

**1. Children who scored highly enough to attain a valid level for the test taken, i.e. a child whose raw test score was equivalent to level 2 on a level 2 test:**
Decimal level = level of test + {(raw score - lowest valid raw score for corresponding level) / highest valid raw score possible for the level}

*Example: A cohort 2 child who achieved a raw test score of 17 on a level 2 reading test:*
*Decimal level = 2 + {(17-9)/33}, decimal level = 2.242*
*A cohort 3 child who achieved a raw test score of 15 on the maths test:*
*Decimal level = 2 + {(15 – 8)/36}, decimal level = 2.194*

Some children did not achieve a valid level on a particular test because their raw test score was too low to qualify for a valid level. It was assumed that these children are working at the level below the level of the test (i.e. level 1 on a level 2 test) and decimalised scores were created using the denominator as highest valid raw score + 1:

Decimal level = (level of test – 1) + {raw score / (highest valid raw score possible for corresponding level + 1)}

*Example: A cohort 3 child who achieved a raw test score of 6 for a level 2 test:*
*Decimal level = (2-1) + {6/(6 + 1)}, decimal level = 1.857*

**2. Children who completed more than one level of national assessment test**
A child might have taken the level 2 reading test and the level 3 reading test and so have more than one raw test score. Therefore it was necessary to create a new variable containing the highest decimal level for SATs tests where children could complete more than one level.

If a child completed the reading task and the level 2 SATs reading test and achieved 2a for both they can be entered by teachers for the level 3 reading test. In this case, both the level 2 and level 3 levels, and raw scores were decimalised separately.

However, although a child may be entered for the level 3 SATs test they may not have scored highly enough to achieve level 3 so will be given a decimal level of 2 plus their raw score calculated via the method above. As a result of this, they may have a higher decimal level on the level 2 test than on the level 3 test or vice versa. They may have also taken the level 3 test and achieved level 3. To ensure that the highest level the child achieved was used, the highest decimal level for subjects when more than one level of SATs test is attempted was calculated.

*For example:*
*In 2002 a child scored level 2a on the SATS reading task and level 2a on the SATS level 2 test with a raw test score of 29, which gives a decimal level of 2.76. The child was then entered for the level 3 reading test, attaining a raw test score of 12 which was not high enough to qualify for level 3 (see table3.1). For the level 3 test, the child was awarded a decimal level of 2.71. In this case the highest decimal level would be that of the level 2 test despite the fact that the child attempted the level 3 test.*

*In 2002 a child scored level 2a on the SATS reading task and level 2a on the SATS level 2 test with a raw test score of 24, which gives a decimal level of 2.59. The child was then entered for the level 3 reading test, attaining a raw test score of 13 which was not high enough to qualify for level 3 (see table 3.1). For the level 3 test, the child was awarded a decimal level of 2.76. In this case the highest decimal level would be that of the level 2 test.*

*In 2002 a child scored level 2a on the SATS reading task and level 2a on the SATS level 2 test with a raw test score of 29, which gives a decimal level of 2.76. The child was then entered for the level 3 reading test, attaining a raw test score of 22 which qualified them for level 3 (see table 3.1). For the level 3 test, the child was awarded a decimal level of 3.13. In this case the highest decimal level would be that of the level 3 test.*

There is often a variable relating to the task level but it was decided that the test variables were more reliable than the task variable. Therefore, the general rule was to use the test level in the calculation of highest decimal level. However, a number of children only have a task level as no

test level was supplied or they did not achieve a score high enough to be entered for the test. As we did not want to exclude this group from the analyses their decimal levels were calculated slightly differently as follows:

**For the English Reading, 373 children had only an English reading task raw score. These children were given the following decimal levels:**

- If the child's task level = 0 (working towards level 1), the highest decimal level was coded 0
- If the child's task level = 1, the highest decimal level was coded 1
- If the child's task level = 2a, 2b or 2c, the highest decimal level was coded 2

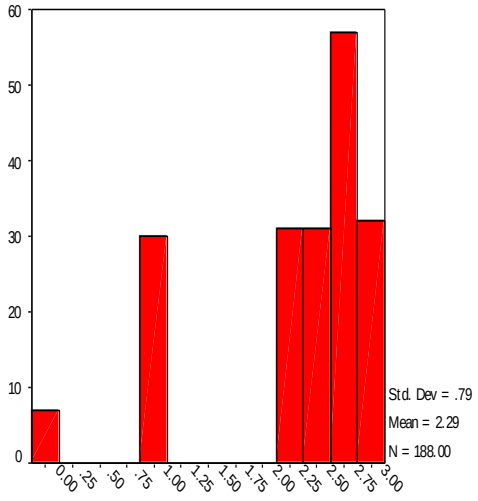
**For the Maths test, 142 had only a maths task raw score. These children were given the following decimal levels:**

- If the child's task level = 0, the highest decimal level was coded to 0
- If the child's task level = 1, the highest decimal level was coded to 1

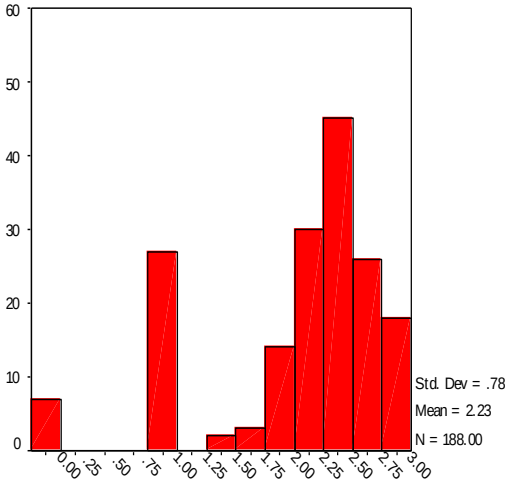
Histograms below display the more differentiated scale achieved when using decimal levels in comparison to traditional SATS levels by cohort:

**Key Stage One English Reading Comprehension Test (And For Low Attainers The Task)**

**Cohort 1 Children (1999/2000)**

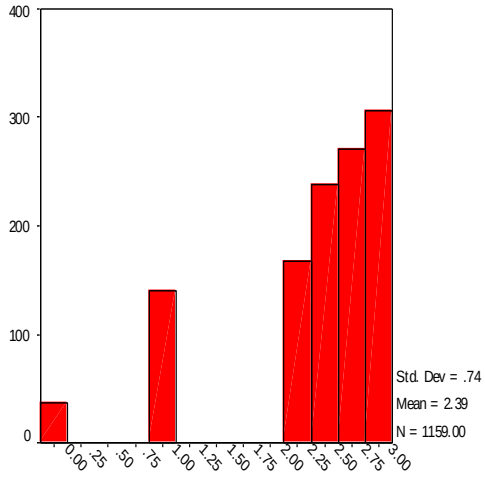



Year 2 Reading Highest Level

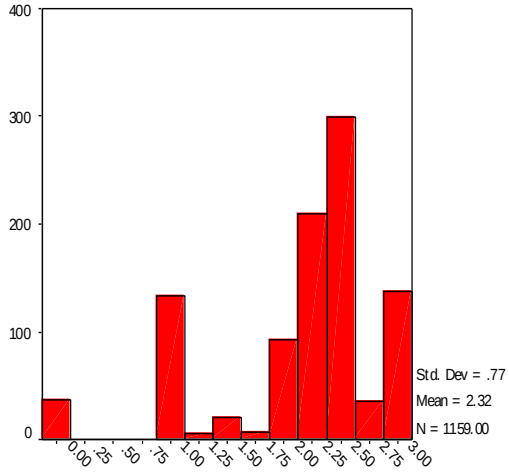



Year 2 Reading Highest Decimal Level

## Cohort 2 Children (2000/2001)

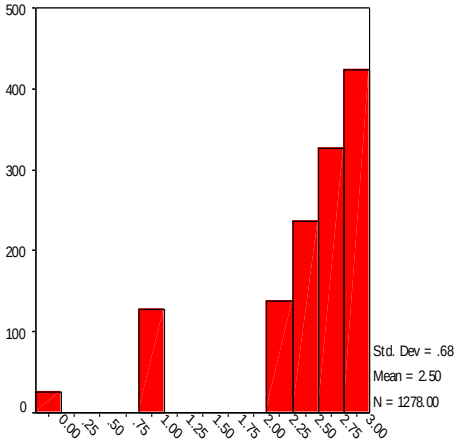



Year 2 Reading Highest Level

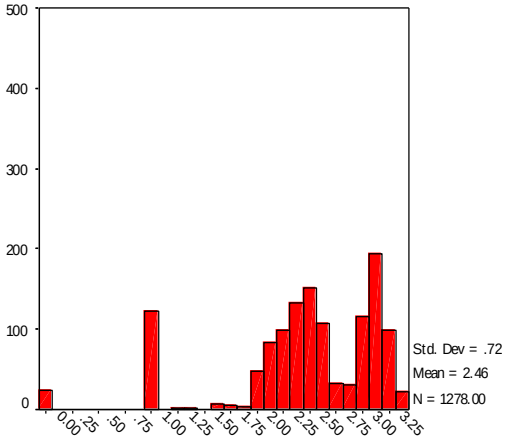



Year 2 Reading Highest Decimal Level

## Cohort 3 Children (2001/2002)

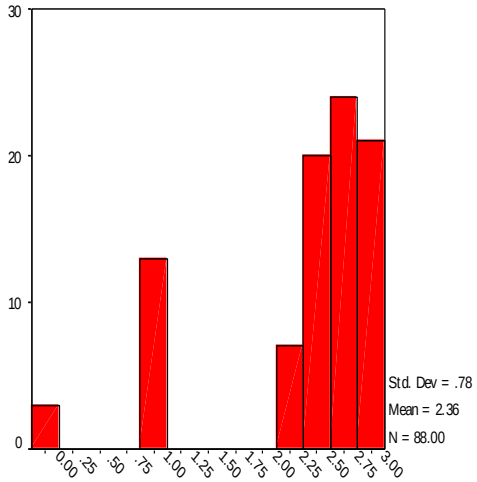



Year 2 Reading Highest Level

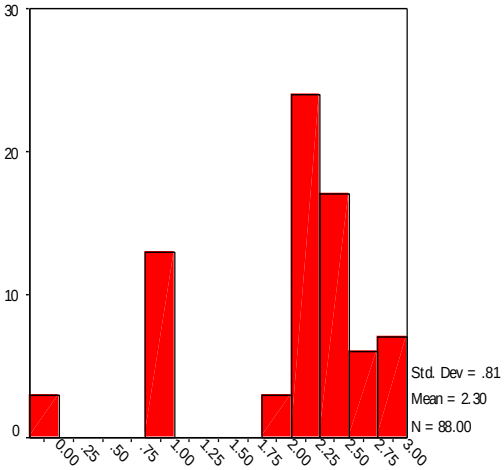



Year 2 Reading Highest Decimal Level

## Cohort 4 Children (2002/2003)



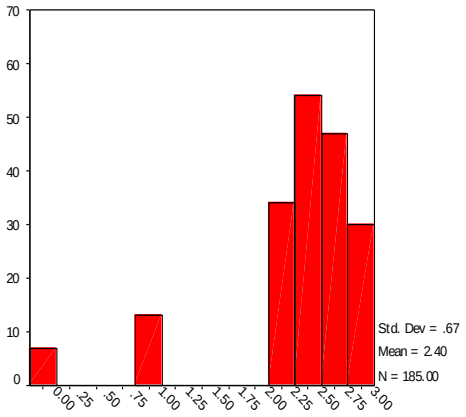

Year 2 Reading Highest Level



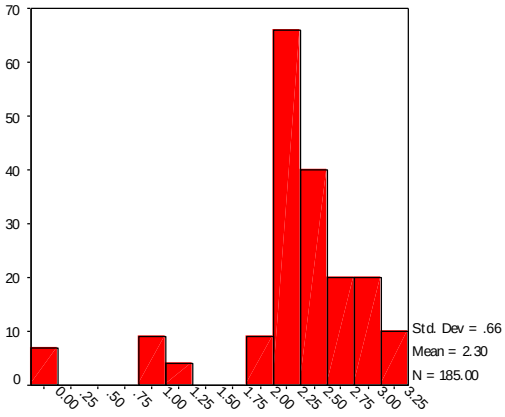

Year 2 Reading Highest Decimal Level

## Key Stage One Maths Test (And For Low Attainers The Task)

### Cohort 1 (1999/2000)

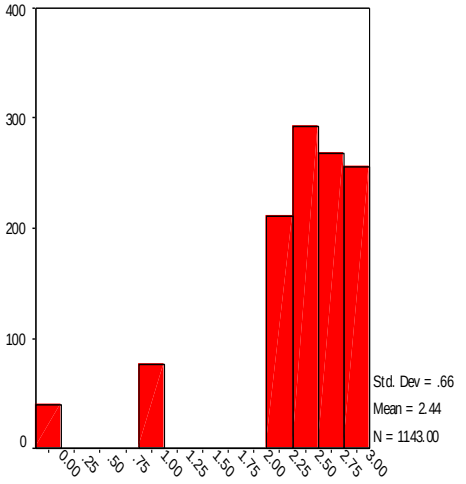



Year 2 Maths Highest Level

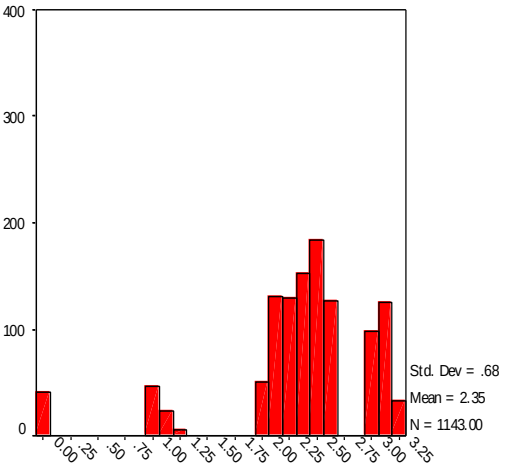



Year 2 Maths Decimal Level

### Cohort 2 (2000/2001)

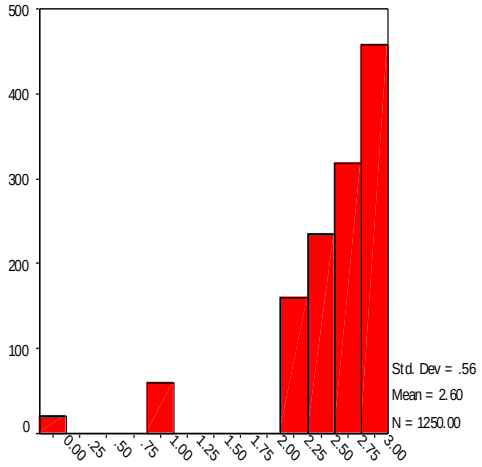



Year 2 Maths Highest Level

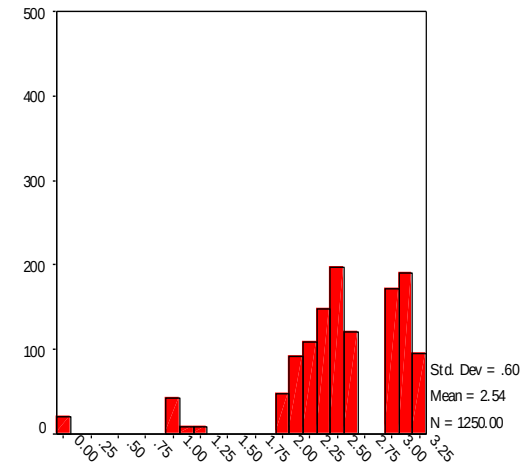



Year 2 Maths Decimal Level

### Cohort 3 (2001/2002)

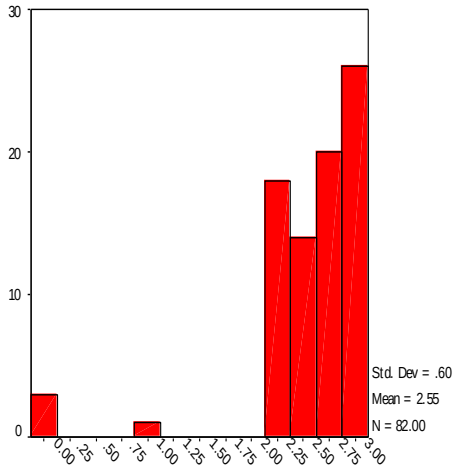



Year 2 Maths Highest Level

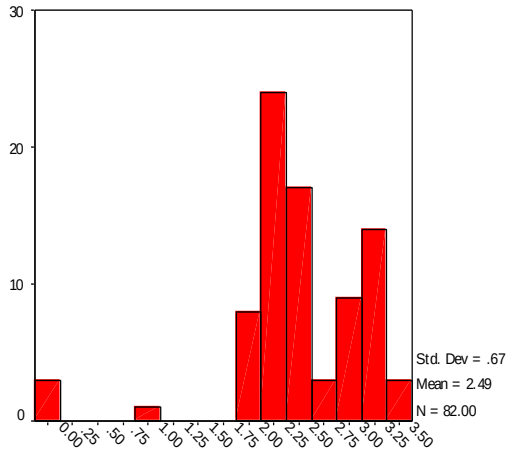



Year 2 Maths Decimal Level

## Cohort 4 (2002/2003)




Year 2 Maths Highest Level




Year 2 Maths Decimal Level

# Appendix 4: Results of Contextualised Multilevel Analyses: Cognitive[25]

**Appendix Table 4.1: Reading Contextualised Model with 'home' children (Impact of child, parent, home environment and other measures on Key Stage 1 decimalised reading attainment)**

| | | Estimate | SE | Effect Size |
|---|---|---|---|---|
| **Gender** (boys compared to girls) | | -0.151* | 0.026 | 0.242 |
| **Age at outcome test** (centred around mean) | | 0.034* | 0.004 | 0.379 |
| **Ethnicity** (compared to white UK) | White European | -0.300* | 0.074 | 0.481 |
| | Black Caribbean | 0.054 | 0.073 | 0.087 |
| | Black African | 0.145 | 0.100 | 0.232 |
| | Indian | 0.008 | 0.096 | 0.013 |
| | Pakistani | -0.095 | 0.077 | 0.152 |
| | Bangladeshi | -0.118 | 0.133 | 0.189 |
| | other | -0.087 | 0.084 | 0.139 |
| | mixed | -0.026 | 0.059 | 0.042 |
| **No. of siblings** (compared to none) | 1-2 | 0.011 | 0.034 | 0.018 |
| | 3+ | -0.153* | 0.046 | 0.245 |
| **Birthweight** (compared to average/above average) | very low | -0.452* | 0.115 | 0.724 |
| | low | -0.080 | 0.052 | 0.128 |
| **Free School Meal Eligibility** | | | | |
| (compared to not eligible) | not known | -0.091 | 0.076 | 0.146 |
| | eligible | -0.176* | 0.038 | 0.282 |
| **Mother's highest level of qualification** | vocational | 0.118* | 0.047 | 0.189 |
| (compared to no qualifications) | academic age 16 | 0.164* | 0.039 | 0.263 |
| | academic age 18 | 0.265* | 0.058 | 0.425 |
| | degree | 0.348* | 0.058 | 0.558 |
| | higher | 0.365* | 0.084 | 0.585 |
| | other | 0.365* | 0.111 | 0.585 |
| **Father's employment** (compared to full-time employment) | | | | |
| | not employed | -0.056 | 0.046 | 0.090 |
| | employed part-time | 0.023 | 0.076 | 0.037 |
| | self-employed/ part-time combination | -0.090* | 0.042 | 0.144 |
| | father absent | 0.005 | 0.040 | 0.008 |
| **Family SES** (compared to professional non-manual) | | | | |
| | intermediate non-manual | -0.117* | 0.054 | 0.187 |
| | skilled non-manual | -0.206* | 0.059 | 0.330 |
| | skilled manual | -0.305* | 0.065 | 0.489 |
| | semi-skilled manual | -0.384* | 0.069 | 0.615 |
| | unskilled manual | -0.331* | 0.104 | 0.530 |
| | never worked | -0.284* | 0.104 | 0.455 |
| **Frequency of library visits** (compared to never) | | | | |
| | special occasions | 0.013 | 0.046 | 0.021 |
| | monthly | 0.149* | 0.039 | 0.239 |
| | fortnightly | 0.148* | 0.045 | 0.237 |
| | weekly | 0.138* | 0.047 | 0.221 |
| **Frequency parent teaches letters/numbers** | never | -0.111* | 0.044 | 0.178 |
| (compared to daily) | 1-3 times a week | -0.037 | 0.035 | 0.059 |
| | 4-6 times a week | -0.038 | 0.040 | 0.061 |
| **Frequency parent teaches abc** (compared to never) | | | | |
| | 1-2 times a week | 0.141* | 0.041 | 0.226 |
| | 3 times a week | 0.239* | 0.049 | 0.383 |
| | 4-7 times a week | 0.191* | 0.048 | 0.306 |
| **Developmental problems** (compared to none) | | | | |
| | 1 developmental problem | -0.191* | 0.041 | 0.306 |
| | 2 + developmental problems | -0.337* | 0.124 | 0.540 |
| **English as mother tongue** (compared to English as an additional language) | | 0.144[#] | 0.076 | 0.23 |

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

[25] Models tested the impact of a wide range of child, family and home environment characteristics. Only measures which showed a significant ($p<0.05$) / nearly significant ($p<0.08$) relationship were retained in the models.

**Appendix Table 4.2: Mathematics Contextualised Model with 'home' children (Impact of child, parent, home environment and other measures on Key Stage 1 decimalised mathematics attainment)**

| | | Estimate | SE | Effect Size |
|---|---|---|---|---|
| **Age at outcome test** (centred around mean) | | 0.037* | 0.003 | 0.471 |
| **Birthweight** (compared to average/above average) | very low | -0.228* | 0.101 | 0.417 |
| | low | -0.133* | 0.046 | 0.243 |
| **Free School Meal Eligibility** | not known | -0.143* | 0.067 | 0.262 |
| (compared to not eligible) | eligible | -0.150* | 0.031 | 0.274 |
| **Mother's highest level of qualification** | vocational | 0.128* | 0.042 | 0.234 |
| (compared to no qualifications) | academic age 16 | 0.128* | 0.034 | 0.234 |
| | academic age 18 | 0.218* | 0.051 | 0.399 |
| | degree | 0.256* | 0.051 | 0.468 |
| | higher | 0.265* | 0.074 | 0.485 |
| | other | 0.264* | 0.097 | 0.483 |
| **Family SES** (compared to professional non-manual) | | | | |
| | intermediate non-manual | -0.117* | 0.048 | 0.214 |
| | skilled non-manual | -0.187* | 0.051 | 0.342 |
| | skilled manual | -0.236* | 0.057 | 0.432 |
| | semi-skilled manual | -0.262* | 0.060 | 0.479 |
| | unskilled manual | -0.195* | 0.091 | 0.357 |
| | never worked | -0.169# | 0.090 | 0.309 |
| **Frequency parent teaches songs/poems/nursery rhymes at home** | | | | |
| (compared to never) | 1-2 times a week | 0.128* | 0.046 | 0.234 |
| | 3-5 times a week | 0.119* | 0.043 | 0.218 |
| | 6 times a week | 0.133* | 0.047 | 0.243 |
| | 7+ times a week | 0.154* | 0.046 | 0.282 |
| **Frequency of library visits** (compared to never) | special occasions | 0.057 | 0.040 | 0.104 |
| | monthly | 0.076* | 0.034 | 0.139 |
| | fortnightly | 0.099* | 0.039 | 0.181 |
| | weekly | 0.098* | 0.041 | 0.179 |
| **Frequency parent teaches abc** (compared to never) | | | | |
| | 1-2 times a week | 0.063# | 0.036 | 0.115 |
| | 3 times a week | 0.145* | 0.043 | 0.265 |
| | 4-7 times a week | 0.149* | 0.043 | 0.273 |
| **Developmental problems** (compared to none) | | | | |
| | 1developmental problem | -0.165* | 0.036 | 0.302 |
| | 2 + developmental problems | -0.310* | 0.105 | 0.567 |
| **English as mother tongue** (compared to English as an additional language) | | 0.109* | 0.047 | 0.200 |

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

# Appendix 5 Results of Contextualised Multilevel Analyses: Social/behavioural Outcomes

**Appendix Table 5.1: 'Self-regulation' Contextualised Model (Impact of Child, Parent, Home Environment, Developmental and other Measures on 'Self-regulation' at the end of Key Stage 1)**

| | | Estimate | SE | Effect Size |
|---|---|---|---|---|
| **Gender** (boys compared to girls) | | -0.182* | 0.019 | 0.401 |
| **Age at outcome test** (centred around mean) | | 0.020* | 0.003 | 0.302 |
| **Free School Meal Eligibility** (compared to not eligible) | | | | |
| | not known | 0.007 | 0.035 | 0.015 |
| | eligible | -0.097* | 0.025 | 0.213 |
| **Mother's highest level of qualification** (compared to no qualifications) | vocational | 0.010 | 0.035 | 0.022 |
| | academic age 16 | 0.066* | 0.029 | 0.145 |
| | academic age 18 | 0.059 | 0.042 | 0.130 |
| | degree | 0.139* | 0.042 | 0.306 |
| | higher | 0.105# | 0.059 | 0.231 |
| | other | 0.253* | 0.084 | 0.557 |
| **Birthweight** (compared to average/above average) | very low | -0.155# | 0.082 | 0.341 |
| | low | -0.098* | 0.038 | 0.216 |
| **Family SES** (compared to professional non-manual) | | | | |
| | intermediate non-manual | -0.108* | 0.039 | 0.238 |
| | skilled non-manual | -0.131* | 0.042 | 0.288 |
| | skilled manual | -0.192* | 0.047 | 0.423 |
| | semi-skilled manual | -0.216* | 0.049 | 0.475 |
| | unskilled manual | -0.174* | 0.076 | 0.383 |
| | never worked | -0.246* | 0.073 | 0.541 |
| **Home Learning Environment (HLE) Index** (compared to 33-45) | 0-13 | -0.219* | 0.045 | 0.482 |
| | 14-19 | -0.173* | 0.036 | 0.381 |
| | 20-24 | -0.146* | 0.034 | 0.321 |
| | 25-32 | -0.074* | 0.032 | 0.163 |
| **Developmental problems** (compared to none) | | | | |
| | 1 developmental problem | -0.071* | 0.030 | 0.156 |
| | 2 + developmental problems | -0.148* | 0.087 | 0.326 |
| **Behavioural problems** (compared to none) | | | | |
| | 1 behavioural problem | -0.155* | 0.032 | 0.341 |
| | 2 + behavioural problems | -0.113 | 0.068 | 0.249 |

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

**Appendix Table 5.2: 'Positive social behaviour' Contextualised Model (Impact of Child, Parent, Home Environment and other Measures on 'Positive social behaviour' at the end of Key Stage 1)**

| | | Estimate | SE | Effect Size |
|---|---|---|---|---|
| **Gender** (boys compared to girls) | | -0.230* | 0.0178 | 0.558 |
| **Age at outcome test** (centred around mean) | | 0.006* | 0.003 | 0.095 |
| **No. of siblings** (compared to none) | 1-2 | 0.062* | 0.023 | 0.150 |
| | 3+ | 0.050 | 0.031 | 0.121 |
| **Free School Meal Eligibility** (compared to not eligible) | | | | |
| | not known | -0.008 | 0.056 | 0.019 |
| | eligible | -0.094*. | 0.024 | 0.228 |
| **Mother's highest level of qualification** | vocational | 0.003 | 0.032 | 0.007 |
| (compared to no qualifications) | academic age 16 | 0.082* | 0.026 | 0.199 |
| | academic age 18 | 0.089* | 0.038 | 0.216 |
| | degree | 0.122* | 0.036 | 0.296 |
| | higher | 0.128* | 0.051 | 0.311 |
| | other | 0.159* | 0.075 | 0.386 |
| **Mother's employment** (compared to not employed) | | | | |
| | employed full time | -0.047# | 0.028 | 0.114 |
| | employed part-time | 0.017 | 0.022 | 0.041 |
| | self-employed/ part-time combination | -0.018 | 0.046 | 0.044 |
| **Birthweight** (compared to average/above average) | very low | -0.161* | 0.074 | 0.391 |
| | low | -0.044 | 0.035 | 0.107 |
| **Home Learning Environment (HLE) Index** | | | | |
| (compared to 33-45) | 0-13 | -0.122* | 0.042 | 0.296 |
| | 14-19 | -0.090* | 0.033 | 0.218 |
| | 20-24 | -0.082* | 0.032 | 0.199 |
| | 25-32 | -0.029 | 0.030 | 0.070 |
| **Behavioural problems** (compared to none) | | | | |
| | 1 behavioural problem | -0.104* | 0.030 | 0.252 |
| | 2 + behavioural problems | -0.077 | 0.062 | 0.187 |

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

**Appendix Table 5.3: 'Anti-social behaviour' Contextualised Model (Impact of Child, Parent, Home Environment and other Measures on 'Anti-social behaviour' at the end of Year 2 in Primary School)**

| | | Estimate | SE | Effect Size |
|---|---|---|---|---|
| **Gender** (boys compared to girls) | | 0.150* | 0.014 | 0.455 |
| **Birthweight** (compared to average/above average) | very low | 0.113# | 0.061 | 0.343 |
| | low | 0.038 | 0.028 | 0.115 |
| **Free School Meal Eligibility** (compared to not eligible) | | | | |
| | not known | 0.006 | 0.044 | 0.018 |
| | eligible | 0.076* | 0.020 | 0.231 |
| **Mother's highest level of qualification** | vocational | 0.037 | 0.026 | 0.112 |
| (compared to no qualifications) | academic age 16 | -0.042* | 0.021 | 0.127 |
| | academic age 18 | -0.042 | 0.031 | 0.127 |
| | degree | -0.064* | 0.031 | 0.194 |
| | higher | -0.041 | 0.044 | 0.124 |
| | other | -0.021 | 0.060 | 0.064 |
| **Mother employment** (compared to not employed) | | | | |
| | employed full-time | 0.078* | 0.022 | 0.237 |
| | employed part-time | 0.014 | 0.017 | 0.043 |
| | self-employed/part-time combination | 0.057 | 0.037 | 0.173 |
| **Family SES** (compared to professional non-manual) | | | | |
| | intermediate non-manual | 0.018 | 0.028 | 0.055 |
| | skilled non-manual | 0.021 | 0.031 | 0.064 |
| | skilled manual | 0.060# | 0.035 | 0.182 |
| | semi-skilled manual | 0.025 | 0.036 | 0.076 |
| | unskilled manual | 0.041 | 0.056 | 0.124 |
| | never worked | 0.182* | 0.055 | 0.552 |
| **Mother's marital status** (compared to separated/divorced) | | | | |
| | never married, single parent | 0.041 | 0.029 | 0.124 |
| | never married, living with partner | -0.011 | 0.028 | 0.033 |
| | married, live with spouse | -0.045# | 0.025 | 0.137 |
| **Home Learning Environment (HLE) Index** | 0-13 | 0.059# | 0.033 | 0.179 |
| (compared to 33-45) | 14-19 | 0.069* | 0.026 | 0.209 |
| | 20-24 | 0.036 | 0.025 | 0.109 |
| | 25-32 | 0.028 | 0.024 | 0.085 |
| **Behavioural problems** (compared to none) | | | | |
| | 1 behavioural problem | 0.148* | 0.024 | 0.449 |
| | 2 + behavioural problems | 0.124* | 0.050 | 0.376 |

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

**Appendix Table 5.4: 'Anxious behaviour' Contextualised Model (Impact of Child, Parent, Home Environment and other Measures on 'Anxious behaviour' at the end of Year 2 in Primary School)**

| | Estimate | SE | Effect Size |
|---|---|---|---|
| **Gender** (boys compared to girls) | -0.042* | 0.015 | 0.114 |
| **Age at outcome test** (centred around mean) | -0.005* | 0.002 | 0.094 |
| **Mother's employment** (compared to not employed) | | | |
| employed full time | -0.087* | 0.022 | 0.236 |
| employed part-time | -0.027 | 0.018 | 0.073 |
| self-employed/ part-time combination | -0.025 | 0.038 | 0.068 |
| **Behavioural problems** (compared to none) | | | |
| 1 behavioural problem | 0.074* | 0.026 | 0.201 |
| 2 + behavioural problems | 0.060 | 0.054 | 0.163 |

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

# Appendix 6

**Social/behavioural assessments at end of Year 1 and Year 2: Adapted from Goodman's (1997) 'The Strengths and Difficulties Questionnaire'**

This questionnaire consists of 45 (51 in year 2) items rated on a 3-point scale:

1 = not true 2 = somewhat true 3 = certainly true

A factor analysis of these 45 (51 in year 2) items resulted in the extraction of 6 (7 in year 2) underlying factors (as detailed below). Factor scores for each child were calculated by averaging the ratings given by the teacher for the questions that form each factor. Internal consistency scores, using Cronbach alpha measuring whether respondents respond to items in a systemic way across the items, are also given. As a rule of thumb, values above 0.60 are considered appropriate.

**Factor 1: Self-regulation (**Cronbach alpha = 0.91)
15. Easily distracted, concentration wanders (note that this item is reversed in the analysis)
26. Can behave appropriately during less structured situations
30. Can move to a new activity on completion of a task
31. Can independently select and return equipment as appropriate
36. Can work easily in a small peer group
39. Perseveres in the face of difficult or challenging tasks
40. Likes to work things out for self; can work independently
44. Shows leadership in group work
45. Can take responsibility for a task

**Factor 2: Positive social behaviour** (Cronbach alpha = 0.90)
1. Considerate of other people's feelings
4. Shares readily with other children (treats, toys, pencils etc.)
9. Helpful if someone is hurt, upset or feeling ill
17. Kind to younger children
20. Often volunteers to help others (teachers, other children)
29. Will invite others to join a game
34. Says 'please' and 'thank you'
41. Apologises spontaneously
42. Offers to help other children having difficulties with a task
43. Is sympathetic towards other children when they are upset

**Factor 3: Anti-social behaviour** (Cronbach alpha = 0.84)
2. Restless, overactive, cannot stay still for long
5. Often has temper tantrums or hot tempers
10. Constantly fidgeting or squirming
12. Often fights with other children or bullies them
18. Often lies or cheats
22. Steals from home, school or elsewhere
35. Is calm and easy going (note that this item is reversed in the analysis)
37. Teases other children, calls them names
38. Prevents other children from carrying out routines

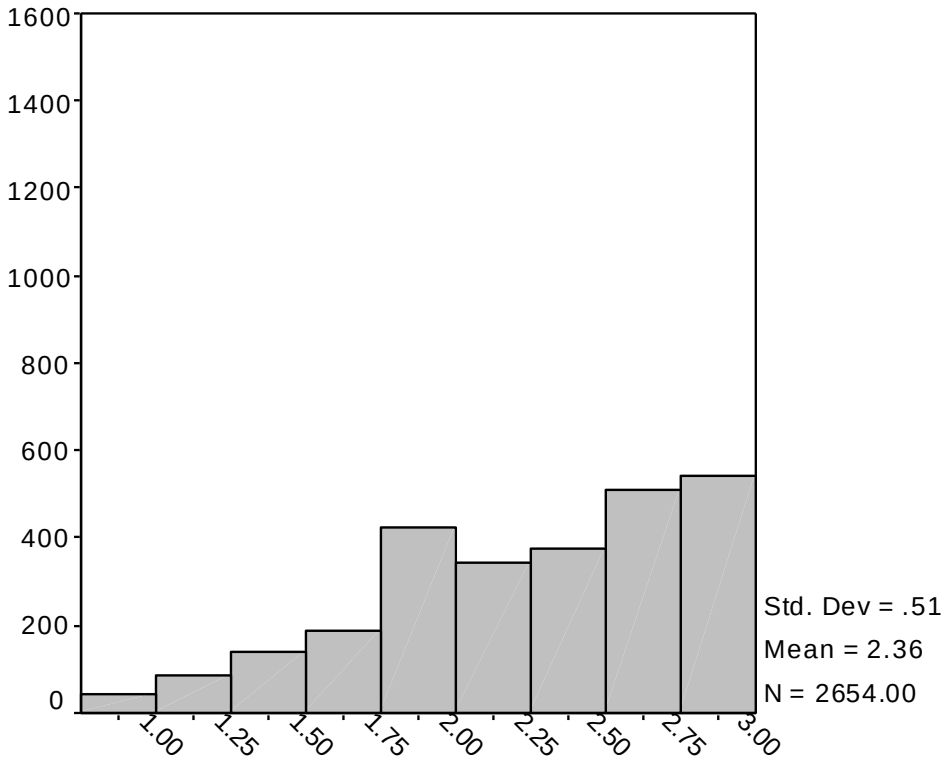
**Factor 4: Anxious behaviour** (Cronbach alpha = 0.76)
3. Often complains of headaches, stomach aches or sickness
8. Many worries, often seems worried
13. Often unhappy, downhearted or tearful
16. Nervous or clingy in new situations, easily loses confidence
24. Many fears, easily scared

**Factor 5: Social Isolation** (Cronbach alpha = 0.84)
6. Rather solitary, tends to play alone
7. Generally obedient, usually does what adults request (note that this item is reversed in the analysis)
19. Picked on or bullied by other children
21. Thinks things out before acting (note that this item is reversed in the analysis)
23. Gets on better with adults than with other children
25. Sees task through to the end, good attention span (note that this item is reversed in the analysis)

**Factor 6: Social Skills** (Cronbach alpha = 0.78)
11. Has at least one good friend
14. Generally liked by other children
27. Is open and direct about what s/he wants Is confident with others
28. Is confident with others
32. In social activities, tends to just watch others (note that this item is reversed in the analysis)
33. Will join a group of children playing

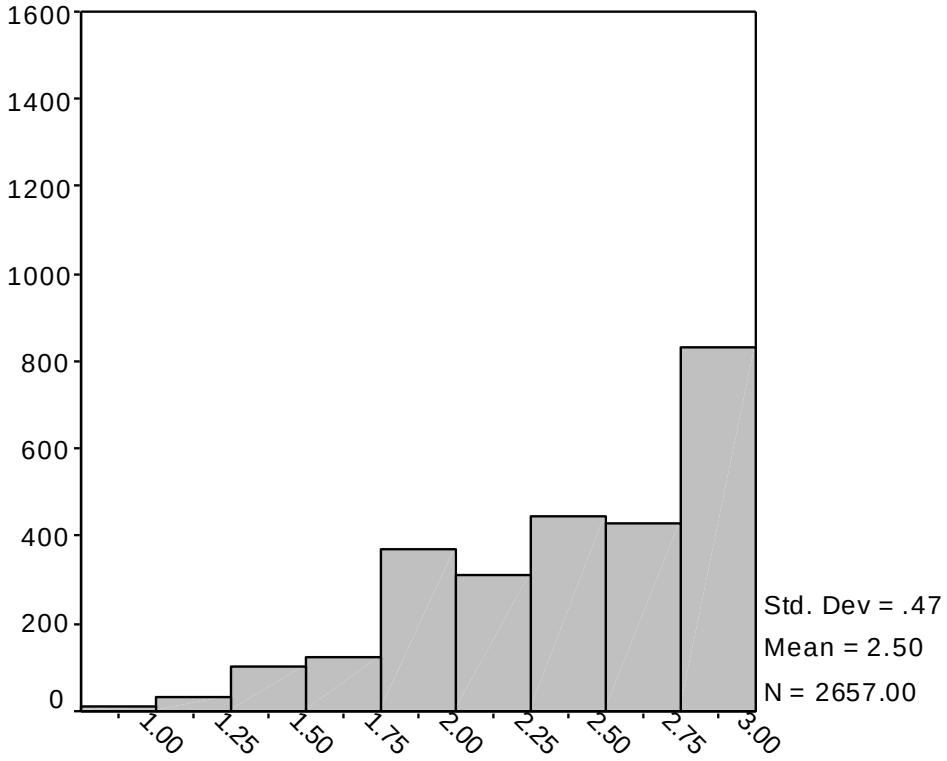
**Factor 7: Deviant Behaviour** (only at year 2)
49. Vandalises property or destroys things
50. Shows inappropriate sexual behaviour
51. Has been in trouble with the law

**Distribution of Year two social/behavioural Factor 1: Self-regulation**



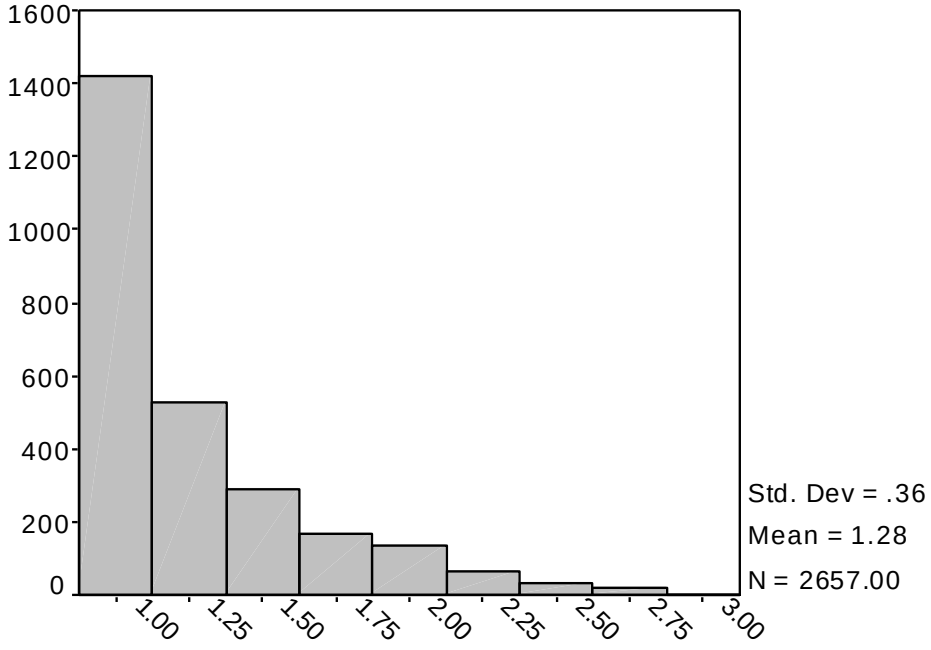

Year 2 social/behavioural Factor 1: Self-regulation

**Distribution of Year two social/behavioural Factor 2: Positive social behaviour**




Year 2 Social/behavioural Factor 2: Positive social behaviour

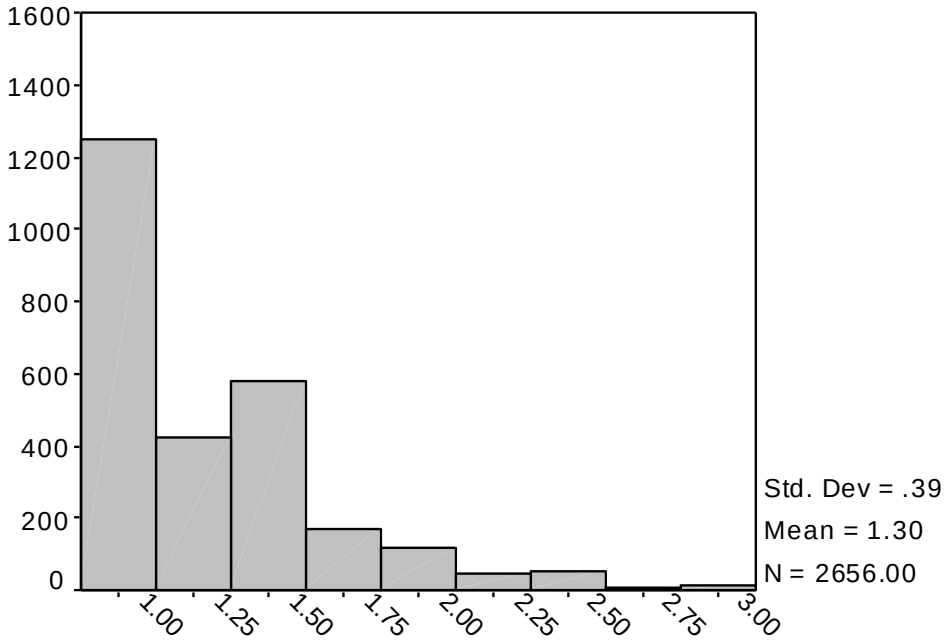
**Distribution of Year two social/behavioural Factor 3: Anti-social behaviour**




Year 2 social/behavioural Factor 3: Anti-social behaviour

Please note that a lower score indicates better behaviour on this measure (in terms of lower incidence reported by teacher ratings)

**Distribution of Year two social/behavioural Factor 4: Anxious behaviour**




Year 2 social/behavioural Factor 4: Anxious behaviour

Please note that a lower score indicates better behaviour on this measure (in terms of lower incidence reported by teacher ratings)

**Glossary of terms**

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

***ASBI*** The Adaptive Social Behaviour Inventory (ASBI) (Hogan et al., 1992) is a rating scale consisting of 30 items completed by a caregiver of a child. The items can be combined to produce factors that are measures of different aspects of the child's social behaviour. For further details, see EPPE Technical Paper 8b.

***'at risk'*** The ETYSEN report acknowledges that the term 'at risk' is a complex one, which will differ depending on the particular criteria used. In the ETYSEN study cognitive risk is defined as 1 sd below national average and strong cognitive risk as1 sd below sample average. These provide definitions of children who may be seen to be 'at risk' on the basis of their cognitive attainment at entry to pre-school.

***Attendance*** The number of sessions attended at the target centre by an EPPE child from entry to study (BAS assessment) until start of primary school (from attendance records of pre-school centre). This measure provides a crude indicator of amount of pre-school experience.

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

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

***British Ability Scales (BAS)*** This is a battery of assessments specially developed by NFER-Nelson to assess very young children's abilities. The assessments used at entry and end of pre-school / entry to reception were:
Block building - Visual-perceptual matching, especially in spatial orientation (only entry to pre-school)
Naming Vocabulary – Expressive language and knowledge of names
Pattern construction – Non-verbal reasoning and spatial visualisation (only end of pre-school)
Picture Similarities – Non-verbal reasoning
Early number concepts – Knowledge of, and problem solving using pre-numerical and numerical concepts.
Copying – Visual–perceptual matching and fine-motor co-ordination. Used specifically for children with-out English
Verbal comprehension – Receptive language: understanding of oral instructions involving basic language concepts.

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

***Caregiver Interaction Scale (CIS)*** A rating scale consisting of 26 items completed by an observer of the interactions between caregivers and children. The items are grouped to produce 4 sub-scales: positive relationships, punitiveness, permissiveness and detachment. The CIS was developed by Arnett (1989).
- Positive relationships is a sub-scale made up of 10 items indicating warmth and enthusiasm interaction with children by the caregiver.
- Punitiveness is a sub-scale made up of 8 items indicating harsh or over-controlling behaviour in interaction with children by the caregiver.
- Permissiveness is a sub-scale made up of 4 items indicating avoidance of discipline and control of children by the caregiver.

- Detachment is a sub-scale made up of 4 items indicating lack of involvement in interaction with children by the caregiver.

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

***Contextualised models*** Cross-sectional multilevel models exploring children's cognitive attainment at entry to primary school, controlling for child, family and home learning environment characteristics (but not prior attainment).

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

***CSBQ*** The Child Social Behaviour Questionnaire (CSBQ) is an extension of the ASBI and has 45 items concerning a child's social behaviour rated by caregivers. Several subscales can be computed from these items as measures of independence/ concentration, cooperation/conformity, peer sociability, antisocial/worried behaviour, confidence, and peer empathy. For further details see EPPE Technical Paper 8b

***Duration*** In terms of the value added models, the duration of pre-school covers the time period between the date of BAS assessment at entry to the EPPE study until entry to primary school[25]. In the contextualised models, duration of pre-school refers to the time period between entry to the target pre-school until entry to primary school. These duration measures provide a crude indication of length of pre-school experience.

***ECERS-R and ECERS-E*** The American Early Childhood Environment Rating Scale (ECERS-R) (Harms, Clifford and Cryer, 1998) is based on child centred pedagogy and also assesses resources for indoor and outdoor play. The English rating scale (ECERS-E) (Sylva, Siraj-Blatchford and Taggart, 2003; Sylva et al., 1999) was intended as a supplement to the ECERS-R and was developed specially for the EPPE study to reflect the Desirable Learning Outcomes (which have since been replaced by the Early Learning Goals), and more importantly the Curriculum Guidance for the Foundation Stage which at the time was in trial stage.

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

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

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

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

***Language*** Two of the BAS subscales (naming vocabulary and verbal comprehension) were combined to give a measure of language ability.

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

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

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

***Outliers*** Pre-school centres where children made significantly greater/less progress than predicted on the basis of prior attainment and other significant child, family and home learning environment characteristics.

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

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

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

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

***School level variance*** The proportion of variance in a particular child outcome measure (e.g. reading scores in year 1 of primary school) attributable to differences between individual schools rather than differences between individual children.

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

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

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

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

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

***Value added models*** Longitudinal multilevel models exploring children's cognitive progress over the pre-school period, controlling for prior attainment and significant child, family and home learning environment characteristics.

***Value added residuals*** Differences between predicted and actual results for pre-school centres (where predicted results are calculated using value added models).

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